

# **STANDARD VETERINARY TREATMENT GUIDELINES**

**FOR VETERINARY CLINICS  
(FIRST EDITION)**

**Drug Administration and Control  
Authority of Ethiopia**

**May, 2006**

# **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

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# Standard Veterinary Treatment Guidelines for Veterinary Clinics

## ABBREVIATIONS

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### 1. Prescription writing

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ante	before meals	.U	both eyes
ad lib	at pleasure	pc	after meals
amp	ampule	po	by mouth
aq	water	prn	as needed
bid	twice per day	qd	every day
C	with	qid	4 times per day
caps	capsules	qod	every other day
circ	about, approx.	q 4 h	every four hours
et	and	qA	sufficient quantity
ext	extract	rep	repeat
G	grain	s	without
Gr	grain	sid	once per day
gtt	drop	sig	instruction/label
im	intramuscularly	solv	dissolve
iv	intravenously	sol'n	solution
id	the same	sc	subcutaneously
m	mix	ss	half
m <sup>2</sup>	square meter	stat	medication to be given in one dose
mg	milligram	susp	suspension
non rep	do not repeat	tabs	tablets
O.D.	right eye	tbs	tablespoon
.m	every morning	tid	three times a day
.n	every evening	tr	tincture
O.S	left eye	tsp	teaspoon
		µg	microgram

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# Standard Veterinary Treatment Guidelines for Veterinary Clinics

## 2. General abbreviations

BES	=	Balanced Electrolyte Solution
CBPP	=	Contagious Bovine Pleuropneumonia
CCPP	=	Contagious Caprine Pleuropneumonia
CI	=	Contraindication
DACA	=	Drug Administration and Control Authority
DF	=	Dosage Forms
DI	=	Drug interaction
LDA	=	Left displaced abomasum
PO	=	Per os
RDA	=	right displaced abomasum
SE	=	Side effect
SVTG	=	Standard Veterinary Treatment Guideline
WP	=	Withdrawal period

# **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

## **FORWARD**

The objective of this Standard Veterinary Treatment Guideline (SVTG) is to provide information on epidemiology, clinical symptoms, diagnosis and treatment of terrestrial food animals, equine, small animals, the honeybee and fish.

In writing this manual, we have made our utmost effort to review available literature both locally and internationally and compile our knowledge, which we have acquired during our long experience in clinical practice, diagnostic and research laboratories, teaching and in veterinary public health.

The SVTG is organized as a compendium so that clinicians or those involved in the veterinary profession could be able to refer it within a short time possible. Despite the fact that many diseases affect different species of animals, an account of each disease has been described separately. However, a full account of the disease in each animal species is given only when there is a significant difference in the epidemiology or clinical symptoms. Since there are no sufficient data on the status of fish diseases in Ethiopia, a comprehensive review of fish diseases affecting fresh water fish and aquaculture are included.

In as much as possible, the most important descriptions on the epidemiology, clinical symptoms, diagnosis, and treatment are included. Much emphasis is given to the treatment part to select the most effective and economical drugs, which is acceptable by the practicing veterinarians and the farmers. The types of drugs included are based on the National Drug List issued by the Drug Administration and Control Authority of Ethiopia; however, some drugs which were found essential but not included in the list were also included.

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Since prevention is, in most part, more economical than clinical handling of sick animals, appropriate preventive measures are shortly described in each section. In addition, a summary of vaccines and their management, normal body parameters of domestic animals and anaesthetics, analgesics and tranquilizers are described in a separate section to make the guideline comprehensive for clinicians and professionals involved in animal health practice.

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# **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

## **INTRODUCTION**

Modern animal health services in Ethiopia started in the 1910's with the aim of improving productivity and trade in animals and animal products as well as protecting the public from zoonotic diseases. Despite one century of experience on modern animal health activities, there exist very few legislations and regulations on animal diseases control and meat inspection, standards on drug importation and standardized use of veterinary drugs. The absence of standardized treatment guidelines at all levels of veterinary practices has resulted in irrational use of drugs. It has become a common practice that veterinary drug importers import drugs on the basis of lowest price quotations and consequently the practitioners use drugs that are available locally rather than prescribing effective drugs. Others particularly midlevel animal health professionals prescribe a combination of drugs that probably have antagonistic action and they do not even consider withdrawal periods of drugs in food animals, a precaution that should be taken to protect the public from residue of drugs and insecticides. Therefore, the Drug Administration and Control Authority (DACA) of Ethiopia, which is mandated to control drug distribution in the country, has given priority to the development of Standard Veterinary Treatment Guideline (SVTG) to circumvent such irrational uses of drugs in animal health services in Ethiopia.

This SVTG comprises of guides to general and special prescription of veterinary drugs for the common diseases and syndromes in different species of livestock, pets, honeybee and fish and relevant annexes on drug treatment, normal physiological values anaesthetics , tranculizers, sedatives and preventions of animals. Diseases are classified based on the major groups of agents and systems whenever required as:

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

infectious diseases, non-infectious diseases, common reproductive problems, respiratory diseases syndromes and chemicals and plant poisoning. Accordingly, description of each disease, epidemiology, clinical symptoms (plus lesions in poultry and fish), and diagnosis and treatment and preventive measures are described. The descriptions on each section were relatively detailed so that professionals could use it as a compendium for diagnosis and treatment of animal diseases. Drugs are listed according to priority of use, and important information is included for each drug on side effects and contraindications, drug interactions, drug formulations and withdrawal periods particularly for food animals.

The drugs listed in this STVG are mainly those available locally but drugs that are not listed in the national drug list are also occasionally included when it is mandatory. It is hoped that this STVG could be updated whenever scientific knowledge proves a change. Comments on the general guideline by veterinary professionals, pharmacists and others are believed to improve its quality.

Comments or suggestions should be sent to:

The Drug Administration and Control Authority (DACA) of  
Ethiopia

P.O. Box 5681

Addis Ababa, Ethiopia

# Standard Veterinary Treatment Guidelines for Veterinary Clinics

## GENERAL GUIDANCE

### A. Rational Use of Drugs

National Standard Veterinary Treatment Guideline (SVTG) is important to rationalize treatment of animal diseases, utilization of drugs properly and protecting the public from exposure to unnecessary drug residues. Drugs should be used only when required at the required amount and combination. Improper use of drugs may result in ineffective treatment, unnecessary wastage of resources, and may harm the patient. In using veterinary drugs, certain steps have to be followed before deciding on what procedures have to be used. One way of promoting such a practice is developing SVTG.

Rational approach to therapeutics requires careful evaluation of the health problem in each species of animal and selecting appropriate therapeutic strategies. Proper diagnosis of animal diseases requires extensive discussions with owners and clinical examinations and confirmed by appropriate laboratory procedures. The efficacy of treatment largely relies on correct diagnosis. Whenever the alternatives exist, non-pharmacological treatment should be given priority to chemical treatment. In veterinary medicine, preventive measures are the option of the day than treatment. Thus possible preventive measures should be given attention to check the spread of animal diseases.

Selection of treatment requires cost/benefit analysis particularly in food animals. Uneconomical treatment is basically avoided unless and otherwise the animals have special attachment with the owner (e.g. dogs and cats) or the genetic make up of the animal should be conserved. Apart from the cost of a particular

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drug, its efficacy and safety with minimal adverse effects and minimal residues in food animals should be given due attention. Drug choice depends on individual patient and prescription; whenever written it should clearly indicate the species of animal, the age, sometimes breed, the dose of the drug in the formulations available locally and the duration of treatment. In food animals, considerations have to be given to the withdrawal period of drugs in case an emergency slaughter is recommended (included in prescription writing).

### **B. Prescription writing**

A prescription is an instruction from a prescriber to a dispenser. The prescription is the link between the prescriber, the drug dispenser and the patient. Appropriate prescription should give relevant information, instruction and warning to the patient. Currently veterinary doctors, animal health assistants and sometimes animal health technicians could prescribe to veterinary drugs dispensary and pharmacies. Prescriptions should be clear, legible and indicate precisely what should be given. It should include the following:

- Date of the prescription
- Name, form and strength of the drug. Generic name of the drug should be used.
- Formulation of the drug (e.g. tablet, oral solutions, feed additive, or ointment) should also be stated.
- Strength of the drug should be stated in standard units.
- Dose, route of administration and frequency should be clear and explicit; use of phrases such as “take as directed” or “take as before” should be avoided.

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- Quantity of the medical product to be supplied should be stated. Alternatively, the length of treatment course should be stated.

### **C. Adherence (compliance) with drug treatment**

Once drugs are dispensed according to the prescription, the owners or those who administer it should stick to the dose and frequency of treatment. Poor adherence (compliance) with the treatment plan is one of the most important reason for treatment failure so long as the the drug is well tolerated. In fact there may be mistakes in prescriptions, which might result is errors in calculations or different formulations have been quoted. It is not uncommon to find Veterinary drugs in Ethiopia whose active ingredient is one fifth or even less than the concentrations recommended in the British Pharmacopenia or other standards but the bolus size remains the same. In these circumstances, those lower level professionals may prescribe a bolus whose active ingredient is very low.

Non-compliance in veterinary medicine is also more common than in humans and particularly over the counter drugs where livestock owners have access.. The owners usually divide the drug between other animals of the group in order to save money. In this case the owners have to be informed on the hazards and disadvantages arising from such practices.

### **D. Veterinary considerations in drugs use**

The types of drugs to be used in veterinary medicines are chemically similar to those used in humans. However, certain

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conditions have to be considered before deciding to use a certain drug. These include: whether treatment is economical, if there are regulatory and public health concerns, compatibility, stability and compounding process, and pharmacokinetics of the active ingredient.

Apart from the diversity of animal species, the range of size of animals varies within each species of animals. For example, in cattle, the weights of an adult animal ranges from 200-250kg in zebu and 700 or more for certain improved breeds. Setting a standard dose for each group may be therefore difficult. It is thus imperative that a veterinary professional with sufficient experience should be involved in prescription of drugs. On the other hand some drugs may be applied to certain species but not to others requiring good knowledge of adverse effects on a particular species of animals. The type of feed is also another consideration. Drugs formulated as feed additives are preferred but these drugs could only be given to certain species of animals or age groups if they may not adversely affect the microflora. For example, tetracyclines in feed are more recommended to calves and not to adults.

### **E. Adverse drug reactions and drug interactions**

An adverse drug reaction may be defined as any unwanted response to a drug which is noxious, unintended and occurs at doses normally used for prophylaxis, diagnosis, or therapy. These reactions are mainly individual and thus closer attentions should be given to drugs with known adverse reactions. Adverse reactions may arise from old age.

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Drug interactions (drug-drug interactions) on the other hand are reactions that occur between two or more drugs when they are used to treat pathophysiologically distinct illnesses or a single illness in a patient. Interactions can occur between drugs competing for the same receptor or acting on the same physiological system. They may also occur indirectly when a drug-induced disease or a change in fluid or electrolyte balance alters the response to another drug. Interactions may also occur when one drug alters the absorption, distribution or elimination of another drug, such that the amount, which reaches the site of action, is increased or decreased.

When two drugs are administered to an animal, they may either act independently of each other, or interact with each other. Interactions may decrease or increase the action of the interacting drugs. In general, the combination of bactericidal and bacteristatic drugs is not recommended, as it results antagonistic effects.

### **F. Drug residues**

By eating animals and animal products, humans are liable to consume whatever chemicals the animal has consumed or been exposed to. Such chemicals include veterinary drugs, insecticides or herbicides. The residue limits and the withdrawal periods of these chemicals and drugs have been established though controversy still surrounds this issue. Withdrawal period is the time between the application of the drug and clearance to a level of its residue limit. Thus, the withdrawal period should be considered during treatment of food animals including livestock, honeybee and fish.

## **SITUATION ANALYSIS OF ANIMAL HEALTH SERVICES IN ETHIOPIA**

### **A. Introduction**

Ethiopia has an enormous livestock resource with a total contribution of 15% of Gross Domestic Product and 33% of the agricultural output. Current estimates show that there are 41.5 million heads of cattle, 28.2 million sheep and goats, 5.8 million equine species, million camels and over 42 million poultry. The population of dogs and cats are not known; however, each household in the rural area owns one or two dogs and owns a cat. There are also an estimated 4.6 million honeybee colonies contributing to the livelihood of the rural population. The contribution of fishing from at least 12 inland lakes and dams and many other rivers is also large. Recent advances in construction of small ponds and hydroelectric dams are giving another opportunity for fish farming.

Livestock are the main stay of the livelihood of the majority of the human population by giving draft power supply for crop production and transport, as a source of meat, milk and egg, and source of cash income. Despite their all-round advantages of livestock at farmer and national level, productivity has remained very low. The main constraints are lack of sufficient and standard nutrition, poor husbandry practices, lack of marketing facilities and opportunities, inadequate animal health services such as treatment practices, disease control activities, reporting systems, lack of standard treatment guidelines and uncoordinated development programs between various levels of government institutions and/or non-governmental organizations.

The presence of many diseases has resulted in low productivity and a significant obstacle to international market access. Lack of

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regulation on livestock movement, disease reporting system, drug and vaccine production, distribution and handling have remained major deficiencies for many years. Therefore the Federal government of Ethiopia and Regional governments are undertaking slow but organized action to improve animal health delivery system through legislations, manpower development and information disseminations. The major activities are: control of disease through organized activities between the two government strata, improving disease reporting system, training of different levels of animal health professionals, improving the existing legislations and formulating new ones for disease control, establishment and standardization of veterinary clinics, laboratories and training institutions. Veterinary drugs and biologicals production, importation and use and quality control have been given much attention by the Federal government than ever before. Thus this Veterinary Treatment Guideline was initiated to contribute to this concerted effort in improving animal health in the country.

### **B. Status of Animal diseases**

Animal diseases are of major concern at both the Federal and Regional government levels. Their main negative effects of animal diseases are: loss of production and productivity, hinderance to access the international animal and animal products' markets, reduction in the quality of hides & Skins, tick borne diseases constraints to improving the genetic potential through cross breeding with exotic breeds, and their zoonotic potential. In Ethiopia, the direct loss from mortality of food animals due to infectious diseases is estimated to be: 8-10% of cattle, 14-16% of sheep, and 11-13% of goats. Indirect losses are not available. Data is not available on losses on other animals including equine, honeybees and fish.

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According to the Office International des Epizooties, animal diseases are categorized into two as List A and List B diseases. List A: communicable diseases which have the potential for very serious and rapid spread, irrespective of national borders, which are of serious socioeconomic or public health consequence, and which are of major importance in the international trade of animals and animal products. Apart from their economic and public health significance at national level, these diseases have major impact on international animal market. Among the 15 List A diseases, 8 are currently confirmed to be prevalent in Ethiopia. These include: foot and mouth disease, peste des petits ruminants, contagious bovine pleuropneumonia, lumpy skin disease, bluetongue, sheep pox and goat pox, African horse sickness and Newcastle disease. Rinderpest, which was rampant for over a century, has recently been eradicated from Ethiopia.

List B: includes communicable diseases, which are considered to be of socio-economic, and/or public health importance within countries and which are significant in the international trade of animals and animal products. More than 83% of these diseases are confirmed to be found in Ethiopia. Zoonotic diseases such as Anthrax, leptospirosis, rabies, cysticercus bovis, campylobacteriosis, bovine tuberculosis, salmonellosis, and many others are among these diseases widespread throughout the country.

### **C. Infrastructure and humanpower**

Animal health services have traditionally been considered as duty of the government. It was not until very recently that most services became open for private practitioners. At present private practioners are sharing the load from state animal health services. The status of these activities between the two

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institutions are given in Table 1. According to the project document prepared in the mid 1980's, veterinary clinics were categorized into four as: Class A, B, C and D. Class A comprises at least six rooms including office (1), laboratory (1), surgery room, store (1), drug dispensary (1), and toilet and shower (1). Class B is composed of five rooms; class C three rooms and Class D contains two rooms. Class A is large and fully equipped to handle any veterinary health activities. The compound is fenced and animal handling facilities such as crush and a guardhouse are included. Existing veterinary clinics and those projected to be implemented within the next five years are given in Table 1.

The Food and Agricultural Organization of the United Nations recommends one veterinarian for every 37,000 Veterinary Livestock Units. The estimates of total Veterinary Livestock Unit are 39.2 million. With the current status, the ratio of animal health professionals to livestock units falls short of this recommendation by about two fold. To alleviate constraints in veterinary professions, five other Universities have been mandated to train veterinarians and one Technical and Vocational Training Center to train Animal Health Technicians. In additions to this the Faculty of Veterinary Medicine of the Addis Ababa University, which was the only institutions training veterinarians for the last 26 years has doubled its output at the undergraduate and postgraduate levels, existing animal health professionals at work and projected trainees are shown in Table 2 below.

Table 2 shows existing projected manpower plan for the next five years:

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**Table 1. The number of existing and projected animal health service delivery infrastructures in Ethiopia (January 2005).**

Type of infrastructure	Public		Private
	Existing, 1997 E.C.	Projected 2000 E.C.	
Clinic	937		64
Animal health post	650		21
Regional laboratory	10		-
Research and referral center	1		-
Vaccine production center	1		-
*NTTIC	1		-
Drug, equipment and Vaccine importer	-	Unknown	127
Drug shops	-		164
Clinic & Drug shop	-		70

\* NTTIC= National Tsetse and Trypanosomosis Investigation Center .

**Table 2. Existing and Projected Veterinary Professionals in Ethiopia (existing and until the year 2000 Ethiopian Calendar)**

Professional category	Clinic		New graduate (trainees)			Total manpower by 2000 EC.
	Public	Private	1997	1998	1999	2000
Vet.	546	57	46	496	384	1966
AHA	1125	58	650	325	2000	6158
AHT	3000	102	-	-		3102
CAHW	?	?	?	?	?	?

Vet = Veterinarian (DVM or BVSc); AHA = animals health assistants (diploma grad.); AHT=Animal Health technicians (6 to 12 months training); CAHW = up to three months training; ? unknown

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*Diagnostic and research facilities:* there are 10 public Regional Veterinary Laboratories throughout the country. These facilities are found in Mekele, Kombolcha, Bahir Dar, Addis Ababa, Bedele, Asela, Sodo (Wolaita), Asebe Teferi and Dire Dawa. The laboratories offer diagnostic services in their designated areas allocated by each National Regional states. Research activities are also undertaken on major diseases prevailing in the area particularly on the epidemiology, but also with few experimental works.

One of the legendary and traditional qualities of the Ethiopian Veterinary Services is the establishment of internationally recognized Vaccine production facilities at Debre Zeit. The institution, known as National Veterinary Institute, produces at least 13 types of vaccines for various species of animals. In addition, it gives some diagnostic activities. Upon request by National Regional governments and private livestock producers, the Institute distributes vaccines at low cost. It also exports vaccines to other African Nations and the Gulf states. It is currently under extensive review to produce more vaccines and diagnostic kits .

### **D.Organizational Setup and Activities of Veterinary Service**

Animal health services are organized at Federal & Regional levels, each acting independently and in cooperation. The main functions of the Federal Animal Health Department are: Formulation of Policies & Strategies, Collect and collate animal health information and distribute to those who need it, coordinate disease surveys and outbreak investigation, formulate projects to collect baseline data and disease control, involve in the control transboundary diseases, enforce animal health regulations, issue certificate for export purpose, prepare work

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plan & budget for its activities, and provide technical inputs to the regional governments.

The functions of the Regional Animal Health Services Department are as follows: provide preventive such as vaccination & clinical services, conduct annual vaccinations, collect data & report to the Federal Department of Veterinary Services, infrastructure development, training animal health technicians and community animals Health Workers (CAHW), diagnostic activities, procurement of veterinary drugs from licensed dealers, licensing private practices, laboratory activities and control, veterinary public health activities including meat and other animal foods inspection;

The Federal and Regional governments undertake disease control activities on major infectious diseases.

### **E. Drugs and Vaccine Control**

The Ministry of Agriculture used to import and distribute bulk veterinary drugs and equipment and regulate importation by private importers. With the liberalization of the economy during the last ten years, however, drugs and equipment are being mainly imported by private companies. The control and administration was also transferred to the newly established institution, the Drug Administration and Control Authority (DACA) of Ethiopia, licensing and control is no more a duty of the ministry of agriculture or regional governments.

According to the information obtained from private practitioners, public veterinarians and personnel from the ministry of agriculture, drugs including antibiotics and trypanocidal drugs have become ordinary commodities. All of 50 veterinarians, 35 animal health assistants and 80 licensed drug dispensers who participated in the questionnaire survey

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have indicated their concern that microorganisms may develop resistance to most available veterinary drugs unless control mechanisms are being enforced.

Livestock owners, the majority of whom do not have formal education, largely administer most antiprotozoal and anthelmintic drugs. While purchasing drugs from the open market, the size of the bolus or its attractive color or the presence of pictures of animals are the main criteria for the purchase of the drugs. The concentration of the active ingredient is not given much attention. There are anthelmintic boli that contains active ingredients sufficient for a small 20 kg sheep but as big as a bolus, that is used to treat an adult zebu animal. Two things are now a concern; the poor farmer does not treat his animals and the microorganism might develop resistance to similar or the same drug.

Based on the above existing situation, we believe that standards should be set to drug importers. In addition, not all drugs should be left free for abuse. A standard on this aspect should be set on who should which drugs.

### **F. Constraints**

Lack of professionals and finance has been major shortcomings mentioned by both regional and federal animal health services. Organizational structure, which hindered conducting independent activities, has recently been sorted out and the Federal Animal Health Service is now restructured and acquired a Department status. Since books on Veterinary Drugs and Diseases of livestock, pets, fish, honey bees and other animals are not available to buy from bookshops, many of the professionals have mentioned as a major shortcoming.

## **DISEASES OF CATTLE**

### **Non Infectious Diseases**

#### **Abomasal Displacement and Abomasal Volvulus**

The abomasum normally lies ventral to the rumen suspended loosely by the greater and lesser omenta. Left displaced abomasum or right displaced abomasums (LDA or RDA) and abomasal volvulus occur when it rotates on its mesenteric axis. Factors related to decreased motility of the abomasum and related to displacement of the abomasum are high-concentrate and low-roughage diets, hypocalcemia, concurrent diseases (mastitis, metritis, and ketosis), changes in position of intra-abdominal organs, and genetic predisposition.

#### ***Clinical Symptoms***

Anorexia and decreased milk production, ping (between ribs 9 and 13, middle to upper third of the abdomen) on simultaneous auscultation and percussion of the abdomen, which should be performed in the area are marked by a line from the tuber coxae to the point of the elbow, and from the elbow toward the stifle. Frequently, secondary ketosis is observed.

The characteristic rectal examination findings with LDA include a medially displaced rumen and left kidney. The abomasum is rarely palpable in LDA and only occasionally in RDA.

#### ***Diagnosis***

The spontaneous fluid splashing or gas tinkling sounds on the area of the ping or on simultaneous ballottement, rule out other causes of left- or right-sided pings.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Treatment and Prevention***

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#### **Management**

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Non-drug treatment

Non-surgical

- Rolling a cow through a 70° arc after casting on her right side corrects most LDA.

✓ *Note:* Recurrence is likely.

Surgical

- Right paramedian abomasopexy, right paralumbar fossa omentopexy, or left paralumbar abomasopexy.
- Right Omasal-abomasal volvulus is corrected only surgically.

Fluid therapy

*Initial treatment:*

- Balanced Electrolyte Solution (BES), 8 L (Ringers or isotonic sodium chloride solution) administered rapidly.
- 150 g of sodium chloride & 30 g potassium chloride dissolved in 10 L of water. Administer 40 L *per os*.

*Maintenance treatment:*

- BES, 5L/h until normal hydration is restored (ca. 20 liters).

*Precautions:* Sodium bicarbonate and/or sodium lactate should not be used.

Chemotherapy: Antibiotics could be administered if surgery is applied.

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Prevention

- Proper feeding is required for dry cows.
- 

## **Bloat**

Bloat or ruminal tympany is an overdistension of the rumenoreticulum with the gases of fermentation, either in the form of a persistent foam mixed with the ruminal contents called primary or frothy bloat, or in the form of free-gas separated from the ingesta called secondary or free-gas bloat. This condition is very common in Ethiopia during the rainy

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season when legumes (that have high percentage of soluble proteins) grow abundantly. Bloat-producing pastures include legume or legume-dominant pastures, particularly alfalfa, ladino, and red and white clovers, but also occur with grazing of young green cereal crops.

In secondary ruminal tympany, esophageal obstruction caused by a foreign body, stenosis, or pressure from enlargement outside the esophagus, acute onset of ruminal atony due to anaphylaxis, grain overload and hypocalcemia.

### ***Clinical Symptoms***

Distension of the left flank, protrusion of the paralumbar fossa above the ventral column and enlarged abdomen, dyspnea and grunting, mouth breathing, protrusion of the tongue, and extension of the head, and occasionally vomiting are observed.

### ***Diagnosis***

In frothy bloat, clinical diagnosis is obvious. The causes of secondary bloat must be ascertained by clinical examination to determine the cause of the failure of eructation.

### ***Treatment and Prevention***

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#### **Management**

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Non-drug treatment

Non-surgical

- *Free gas bloat*: Remove free-gas by passing a stomach tube.
- *Frothy bloat*: Oil, 226-454 g, PO per stomach tube, stat.

Surgical

*In life-threatening cases*: Emergency rumenotomy or use a trocar and cannula with a bore of 2.5cm

*plus*

- Antifoaming agents e.g. vegetable or mineral oils 80-250 ml/animal

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Prophylaxis

- Remove foreign body, if it caused the obstruction
-

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- Adapt to high-performance rations gradually
  - Supply antifoaming agents, during evening milking (as above)
- or

- Oils and fats (in dangerous situations), 60-120 ml/head/day; may be increased up to 240 ml if monoionic surfactants are used.

or

- Poloxalene, up to 22mg/kg q 24 h in water, as grain feed or molasses mixtures; at high risk increase to 44mg/kg;
  - ✓ S/E: it has poor absorption, thus toxicity is unlikely.
  - ✓ W/P: meat, 3 days; milk, nil

or

- Monensin, 300mg daily protects against pasture bloat.
  - ✓ S/E: at high dose, inappetence, anorexia, ruminal atony, depression, weakness, ataxia, diarrhea, dyspnea, prominent jugular pulse, ventral edema, rear leg weakness, torticollis, and death may occur.

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### Prevention

- Highly leguminous plants should wilt before being fed for cattle.
  - Feed cattle with hay before turning on to leguminous pasture.
- 

## **Grain Overload**

Grain overload (Rumen Overload; Rumen Acidosis) is an acute disease of ruminants characterized by indigestion, rumen stasis, dehydration, acidosis, toxemia, incoordination, collapse, and frequently death. It is most common in cattle that accidentally gain access to large quantities of readily digestible carbohydrates, particularly grain.

### *Clinical Symptoms*

Body temperature is usually below normal (36.5-38.5°C) however, it may be increased to 41°C if animals are exposed to the sun in hot weather. Respirations tend to be shallow and

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

rapid, up to 60-90/min and heart rate may be as high as 120-140/min. In severe cases, rumen motility is completely absent, the contents of the rumen may feel firm and doughy.

### ***Diagnosis***

The diagnosis is from the history if available, a low ruminal pH (5.5-6) and examining the microflora of the rumen where the number of protozoa per field will be reduced from its usual value of 6-7. A pH of <5 indicates severe acidosis.

### ***Treatment and Prevention***

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#### **Management**

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Non-drug treatment

Surgical/ non surgical

- Remove the rumen contents & replace with ingesta taken from healthy animals e.g. animals slaughtered in the abattoir

Antiacids

- Magnesium carbonate or magnesium hydroxide 1g/kg, PO mixed in 8 to 12 liters of warm water, repeated every 6 to 12 h; if the rumen is evacuated, do not exceed 225g/ 450kg cow
- Activated charcoal 2g/kg to inactivate endotoxemia

Fluid therapy

*Initial*

- Sodium bicarbonate 5% solution, 5 L/450 kg IV within ~30 min
  - ✓ S/E: Excess dose may cause systemic alkalosis especially if renal function is impaired resulting in muscle weakness and shortness of breath. Excessive sodium may cause diarrhea, abdominal cramp, tachycardia, and pulmonary edema.

*Maintenance*

- Balanced electrolyte solution (BES), or a 1.3% solution of sodium bicarbonate in saline, 60 L/450 kg, IV for the next 6-12 hr
  - ✓ S/E: *see above.*
  - ✓ *Precaution:* Restrict water intake for 18-24 hr

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Prophylaxis & control

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

- Avoid sudden and drastic ration changes
- Restrict animals from accessing grain and the feed should contain at least 10% of roughage
- In feedlot, give ionophore compounds e.g. monensin to maintain the rumen pH at higher level. For applications and dosage, *see* page 42.

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*Note:* Treatment should commence if animals are not in serious condition; otherwise slaughter the animal.

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### **Ketosis**

Ketosis (Acetonemia) is a metabolic disease of lactating dairy cows characterized by weight loss, pica, inappetance, decreased milk production, ketones in the urine and milk, odor of acetone of the breath and neurologic abnormalities that usually occur during the first 6 weeks of lactation. It occurs in dairy cows that are well fed and provide high milk yield, in cows at pasture and less frequently with rations of inadequate calorie content. It is generally a result of negative energy balance. Significant predisposing and concomitant conditions are retained fetal membranes, metritis, mastitis, displaced abomasum, fatty livers, environmental stresses, faulty nutrition, and mismanagement.

### ***Clinical Symptoms***

It occurs within a week time after calving. Inappetance, constipation, mucus covered feces, depression, a staring expression, a drop in milk production, hump back posture, loss of weight, circling, staggering, licking, chewing and bellowing, hypersthesia, compulsive walking, and head pressing are suggestive and common. The breath has acetone odour.

### ***Diagnosis***

History on the length of dry period, level of nutrition during the dry period and after parturition, and daily milk production records, if available. Blood glucose levels drops from the normal levels of 400-600 mg/ liter to 250 mg/liter in clinical

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ketosis. Ketone bodies in urine increases from a maximum of 500 mg/liter up to 12000 mg/liter.

### *Treatment and Prevention*

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#### **Management**

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##### Non-drug treatment

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##### Fluid Therapy

###### *Initial*

- Glucose, 500 mL, IV

###### *plus*

- Propylene glycol (glucose precursor) 125-250 g mixed with an equal volume of water, PO q12h for 2 days;
  - ✓ S/E: propylene glycol may cause hyperosmolality, lactic acidosis, central nervous system depression and ataxia if given parenterally.
  - ✓ D/F: Glucose in 40 or 50% solution; Propylene glycol as aqueous solution

###### *Maintenance*

- Propylene glycol 100 g PO, daily for 2 days
  - ✓ S/E and D/F: *see* above

###### Or

- Glucocorticoids like Dexamethasone 5-20 mg IM once, in combination with glucose or glucose precursors.
    - ✓ S/E: metabolic effects (e.g. osteoporosis), delayed wound healing, increased liability to infection and adrenal suppression
    - ✓ C/I: pregnant cows
    - ✓ D/F: Injection 1 or 2 or 3mg/ml and tablet, 250 mg
    - ✓ *Precautions:* following adequate fluid volume replacement, steroids should be given as a single IV injection over a 1- 3 minute period.
- 

##### Prophylaxis

- Cows at calving should not be too fat or in very poor condition; avoid sudden change of feed; add sufficient protein to the ration
-

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### **Parturient Paresis**

Parturient paresis (Milk fever) is a metabolic disease of mature high producing dairy cows (>5 years age) predominantly during the first 48 hours of parturition. The disease is associated with hypocalcemia and characterized by general muscle weakness, circulatory collapse and depression and contributes to dystocia, uterine prolapse, and retained fetal membranes.

#### ***Clinical Symptoms***

There are three clinical stages related to the severity of hypocalcemia.

*Stage 1:* inappetence, lethargy, dullness, cold ears, and the pupil might be dilated.

*Stage 2.* The cow stands the hocks straight and paddles from one hind foot to the other. Tremors of muscle, particularly of the head and limbs, grinding of teeth, and incoordination may occur. Sometimes, hyperexcitability and hypersensitivity might occur.

*Stage 3 (final stage):* the cow becomes recumbent, drowsy appearance and flaccid paralysis; at first lies on the sternum, with curvature of the neck, and may struggle to stand; then lies on her side and becomes comatose, with dilated pupil and a dry muzzle. At this stage, she does not pass urine and feces, ruminal tympany occurs, body temperature decreases but heart beat remains normal. At last, the heart rate and breathing becomes irregular; dystocia is common.

#### ***Diagnosis***

Clinical signs, particularly paresis in cows close to calving and quick response to calcium borogluconate solution are sufficient .

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

General rule for fluid therapy is to give 1 g calcium /45 kg body wt. The amount of fluid to be supplied as initial treatment is given below.

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### **Management**

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#### Drug treatment

##### *Initial*

- Calcium borogluconate single IV dose of between 8 and 10 g Ca; 400 ml of 40% solution will give 12 g of available Ca. The drug is infused within 5 to 10 minutes. It may also be concurrently administered SC

##### *Maintenance*

- Propylene glycol 125 – 250 g PO q 12 h mixed with an equal volume of water prevents relapse

##### *plus*

- Calcium borogluconate as above.
  - ✓ S/E: Excessive amount of calcium salts may lead to hypercalcemia. Symptoms include anorexia, abdominal pain, constipation, muscle weakness, mental disturbance, renal calculi, cardiac arrhythmia and coma. Too rapid administration of calcium IV is also associated with many symptoms of hypercalcemia, particularly cardiac symptoms, thus administer slowly (at least over 10-20 min) and monitor heartbeat. Hypercalcemia is usually associated with the parenteral route of administration but also if there is renal insufficiency. Administration of oral calcium avoids these side effects.
  - ✓ *Precaution:* store in a controlled temperature at 15-30°C
  - ✓ *Caution:* follow strict sterile procedures

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#### Prevention

- During the dry period, maintain low level calcium in feed (<50g Ca/day), supply Mg (>50 g per day).
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics **Pregnancy Toxemia**

Pregnancy toxemia in cattle is similar to the condition in small ruminants (*See Diseases of Sheep and Goats: Pregnancy toxaemia*) and is the result of fetal carbohydrate or energy demand exceeding maternal supply during the last trimester of pregnancy. It is precipitated by large or multiple fetuses, low energy or protein feeds, and health conditions that increase energy demand or decreased ability to take in feed.

### ***Clinical Symptoms***

*Mild cases:* Decreased appetite, rumination, fecal production, and nose licking are general signs of illness.

*Severe cases:* cows become depressed, weak, ataxic, and recumbent. Opisthotonus, seizures, or coma may be seen terminally.

### ***Diagnosis***

The history, stage of pregnancy, and nutritional status give tentative diagnosis. Elevated ketone and decreased calcium levels in blood are confirmatory.

### ***Treatment and Prevention***

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#### **Management**

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Supportive treatment

*Mild cases*

- Glucose 500 ml, IV

or

- Calcium borogluconate combined with phosphorus, magnesium, and 20% glucose 500 ml, IV, PO. For S/E, C/I, D/F etc., *see* page 9

*Severe cases*

- Propylene glycol 180-240 ml q 12 h (S/E, *see* page 7) and fluids 20-60 L/day, PO or IV.

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Drug treatment

- Anabolic steroids like dihydrotestosterone undecyclenate,

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

200-300 mg/animal, IM, stat.

- ✓ S/E: dihydrotestosterone may give rise to adverse effects related to its androgenic or anabolic effect. These include increasing in retention of nitrogen, sodium, and water, hypercalcemia, increased bone growth and skeletal muscle.

*Note:* Early treatment becomes successful

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### **Simple Indigestion**

Simple indigestion or ruminal atony is characterized by accumulation of indigestible feed in the rumen. It is caused by a sudden change of the feed, such as addition of urea to a ration, turning cattle onto a lush cereal grain pasture, or introducing feedlot cattle to a high-level grain ration which may lead to excessive fermentation or putrefaction and impairs rumen function for 24-48 hours.

#### ***Clinical Symptoms***

*Silage overfeeding:* anorexia, the rumen becomes full, firm, and doughy; primary ruminal contractions are absent, but secondary contractions may be present.

*Excessive feeding of grain:* anorexia and ruminal stasis; the rumen is not necessarily full and may contain excessive fluid; the feces is usually soft and foul smelling.

#### ***Diagnosis***

This is based largely on elimination of other possibilities and a history of a change in the nature or amount of the diet.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

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#### **Management**

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##### Non-drug treatment

- Warm water or saline, 20-40 L, PO, followed by vigorous kneading of the rumen.

##### Drug treatment

##### Indigestion due to excessive high-energy feeds intake:

- Magnesium hydroxide, 0.5 mg/kg in a 10% aqueous suspension, PO or by stomach tube.
  - ✓S/E: Magnesium hydroxide may cause diarrhea and may interfere with absorption of drugs administered PO.

##### Indigestion due to too much urea or protein intake:

- Acetic acid 5% or vinegar PO by stomach tube.

or

- 4-8 L of ruminal fluid from a healthy cow in case of reduced ruminal microbes.
- 

### **Traumatic Reticuloperitonitis**

Traumatic reticuloperitonitis (Hardware disease, Traumatic gastritis, Traumatic Reticulopericarditis) occurs as a consequence of perforation of the reticulum by sharp foreign objects such as nails or pieces of wire peritonitis and adhesions are common sequelae. If the object penetrates the diaphragm and enter the thoracic cavity, pleuritis and sometimes pneumonitis and pericarditis, sometimes followed by myocarditis, endocarditis, and septicemia may be observed. It is common in exotic breeds in urban and periurban dairy cattle.

### ***Clinical Symptoms***

Ruminoreticular atony, shallow & rapid respiration arched back, an anxious expression, reluctance to move, and an uneasy, careful gait, forced sudden movements as well as defecating, urinating, lying down, getting up, and stepping over barriers may be accompanied by groaning are observed.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

Thoracentesis may yield several liters of fluid. Traumatic pericarditis usually is characterized by muffled heart sounds; possibly with pericardial friction rubs, and occasionally by gas and fluid splashing sounds on auscultation. Jugular vein distention with a pronounced jugular pulse is present early in the course and congestive heart failure with marked submandibular and brisket edema is a frequent sequela. Prognosis is grave with these complications. Penetration through the myocardium usually produces extensive hemorrhage into the pericardial sac and sudden death.

### ***Diagnosis***

A grunt may be elicited by applying pressure to the xiphoid or by elevating this area firmly and then pinching the chine;  
Electronic metal detectors will identify metal in the reticulum;  
Ultrasonography of the heart and thorax is useful in the diagnosis of pleuritis and pericarditis

### ***Treatment and Prevention***

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#### **Management**

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Non-drug treatment

Open surgery

- Left-side laparotomy, exploratory, and rumenotomy.
- Removal of the object or objects manually
- Drain or aspirate abscess (if any)

Closed Surgery

- Ruminant fluid replacement (*see* page 13).

or

- Flexible magnetic metal retrievers PO or through an incision in the flank

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### Non-surgical procedures

- Confine cows for 1-2 wk, placing them on an inclined plane (elevated in front) to limit further advance to the thoracic cavity
- Slaughter should be considered if the carcass is likely to pass inspection. *Note:* W/P of antibiotics if treated.

### Drug treatment:

#### *First line*

- Oxytetracycline 2-10 mg/kg daily. *Precautions:* administer on both sides of the rump.
  - ✓ C/I, S/E, D/I: Renal impairment, last 2-3 weeks of ingestion in pregnant animals and up to 4 weeks of age in neonates. Gastrointestinal symptoms are more severe with oxytetracycline among the tetracyclines; discoloration of the teeth when used during pregnancy and drug interactions with anti-acids, dairy products, calcium salts, iron salts, magnesium salts, zinc salts and warfarin
  - ✓ D/F: Injection, 5, 10%
  - ✓ W/P: Meat 21 days, milk 7 days

or

- Procaine penicillin G 22,000 IU/kg, aqueous suspension, IM or SC, q 24 h for 3 to 5 days or repository preparations q 48-72 h.
  - ✓ C/I, S/E & D/I: Hypersensitivity reactions to penicillins, simultaneous administration of chloramphenicol, tetracycline or phenylbutazone.
  - ✓ D/F: 200,000 IU/ml to 400,000 IU/ml
  - ✓ W/P: meat 14 days and milk 3 days

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### Supportive therapy

- Oral or occasionally IV fluids and Calcium borogluconate, SC *see* page 10.

*Note:* Surgical intervention is indicated in chronic peritonitis and to prevent further migration of a non-stabilized foreign body.

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Urolithiasis**

Uroliths are common in cattle resulting from urinary tract obstruction by mineral-protein calculin. It is commonly reported in central Ethiopia.

It is common in males than females. In the bull, the sigmoid flexure is the most common site for uroliths to lodge. Early castration predisposes to urolith-induced urethral obstruction by removing hormonal influences necessary for mature development of the penis and urethra.

#### ***Clinical symptoms***

In partial obstruction, animals dribble blood-tinged urine, pain on urination & on complete obstruction tenesmus, tail twitching, weight shifting, and signs consistent with colic are observed. Inappetence, depression, and rectal prolapse may also be seen. Affected steers may elevate the tail and show urethral pulsations just ventral to the rectum. Complete occlusion results in urethral perforation or urinary bladder rupture and animals die of uremia.

#### ***Diagnosis***

The history, clinical signs, and physical examination are sufficient.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Treatment and Prevention***

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#### **Management**

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Non-drug treatment

- Establish patent urethra

*plus*

- Correct fluid imbalance (*see* page 2).

In severe uremic animals

- Rehydration and correction of acid-base and electrolyte abnormalities

*plus*

- Conservative therapy involving administration of antispasmodics and tranquilizers (*see* appendix 2) to straighten the sigmoid flexure.
- 

Prevention

- Adjust Calcium to phosphorus ratios of 1.2 to 2:1 of the feed; Sodium chloride may be raised to 4% together with sufficient water intake; feeding urine acidifiers such as ammonium chloride (45 g/steer/day).
- 

### **Infectious Diseases**

#### **Actinobacillosis**

Actinobacillosis also known as wooden tongue is a sporadic disease of cattle and sheep commonly caused by the bacteria, *A. lignieresii*. It is characterized by nodular abscession of soft tissues.

#### ***Clinical Symptoms***

The tongue shows hard tumorous abscess, and similar lesions are found in the stomach and other soft tissues of the head, neck, and limbs, and occasionally in the lungs, pleura, udder, and subcutaneous tissue. Abscesses forming nodules may ulcerate and discharge viscous, white faintly green exudates that may contain small grayish white granules.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Diagnosis*

Clinical manifestations are fairly distinctive; *Gram stained* preparations from crushed exudates, cultural examination and response to treatment with iodine preparations.

### *Treatment and Prevention*

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#### **Management**

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##### Drug treatment

##### *First line*

- Streptomycin or dihydrostreptomycin sulfate 5.5 mg/kg, IM, q 24 h for 5 days
  - ✓ S/E: nephrotoxicity, ototoxicity, neuromuscular blockage. At higher dosage calves may develop diarrhea.
  - ✓ C/I: myasthenia gravis
  - ✓ D/I: calcium gluconate, heparin sodium, sodium bicarbonate, IV and tylosin
  - ✓ D/F: injection, 200 and 250mg/ml
  - ✓ W/P: meat 21 days; milk 2 days

##### *Alternative*

- Sulfadimidine sodium 107 mg/kg, IV or PO q 24 h
  - ✓ S/E: crystallization in urinary tract, cutaneous eruption, hypothyroidism and idiosyncratic toxicosis.
  - ✓ C/I: pregnant and lactating animals
  - ✓ D/I: thiopentone sodium and warfarin
  - ✓ D/F: bolus, 5 g; injection 330, 333 and 160 mg/ml; powder, 8, 10, 16, 20, 25 and 30%

*Precautions:* if supplied in powder form, it should be reconstituted everyday

- ✓ W/P: Meat 21 days; it should not be used in lactating cows

or

- Procaine penicillin G 22,000 IU/kg, aqueous suspension, IM or SC, q 24 h for 3 to 5 days or Benzathine penicillin or other repository preparations q 48-72 h. For S/E, C/I, D/I, D/F, W/P, *see* page 14

or

- Oxytetracycline 10-20 mg/kg (adult) and 20-40/ kg (calves)
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

for 3-5 days. For S/E, C/I, D/I, D/F and W/P: *see* page 14

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### *Others*

- Sodium iodide 1g/12kg, 10% solution, IV once or local injection at the tumorous masses.
    - ✓C/I: iodides should not be given to milking cows whose milk will enter the human food chain.
    - ✓D/F: powder in aqueous solution prepared before use (10%)
  - Potassium iodide 6-10g/day/animal, PO, for 7-10 days. For C/I and D/F are similar to sodium iodide (*see* above).
- 

*Note:* Treatment is effective only if it started during the early stage of infection.

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## **Actinomycosis**

Actinomycosis or lumpy jaw is a subacute or chronic bacterial disease of cattle caused by *Actinomyces bovis*. It is characterized by swelling of the mandible. The organism is introduced to underlying soft tissue via penetrating wounds of the oral mucosa from wire or coarse hay or sticks or sharp grasses and spreads to adjacent bone.

### ***Clinical Symptoms***

Swelling with draining tracts resulting from a chronic, progressive, indurated, granulomatous, suppurative abscess that most frequently involves the mandible, maxillae, or other bony tissues in the head. Involvement of adjacent bone frequently results in facial distortion, loose teeth (making chewing difficult), and dyspnea from swelling into the nasal cavity.

### ***Diagnosis***

Clinical signs in conjunction with the demonstration of Gram-positive rod shaped bacteria in yellowish “sulfur granules” from aspirated purulent material will help confirm the diagnosis.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### Treatment and Prevention

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#### Management

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Non-drug treatment

- Surgical debridment of the granules with antibiotic therapy for 2-4 weeks.

Drug treatment

Acute cases

*First line*

- Procaine penicillin G 22,000 IU/kg, aqueous suspension, IM or SC, q 24 h for 3 to 5 days or Benzathine penicillin or other repository preparations q 48-72 h. For C/I, S/E, D/I, D/F and W/P *see* page 14

*Alternative*

- Oxytetracyclines 10 mg/kg for 3-5 days. For C/I, S/E, D/I, D/F and W/P *see* page 14
- Erythromycin base 2-4 mg/kg, IM q 24 h for 3-5 days.
  - ✓ C/I: animals with impaired liver function
  - ✓ S/E: Allergic reaction in all species and gastrointestinal disturbance; irritating, deep IM soreness.
  - ✓ D/F: powder, 5, 20 and 30%
  - ✓ W/P: cattle slaughter not less than 14 days; milk 72 hours after IM administration
  - ✓ D/I: theophylline, warfarin and beta-adrenergic
  - ✓ *Precautions:* Administer by IM route only; not to be administered by SC route.

or

- Isoniazid 10-20 mg/kg, PO, for 30 days

or

- Iodine tincture topically, however, it is not recommended due to food safety reasons

or

- Sodium iodide 1 g/12kg, 10% solution in sterile distilled water IV or injected locally into the tumorous masses, stat. C/I and D/F *see* page 18

or

- Potassium iodide 6-10g/day/animal, PO, for 7-10 days
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

✓ C/I and D/F see page 18

*Precaution:* iodides are not recommended in food animal

*Note:* In chronic cases treatment is rarely successful;  
*Actinomyces* species are resistant to sulfa drugs.

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### **Anaplasmosis**

Anaplasmosis is a tick-borne bacterial disease of ruminants caused by obligate intraerythrocytic parasites of the genus *Anaplasma*. Clinical bovine anaplasmosis is usually caused by *Anaplasma marginale*. Cattle are also infected with *Anaplasma caudatum*, which may result in severe disease, and *Anaplasma centrale*, which generally results in mild disease. The tick vectors of anaplasmosis include Boophilus, Dermacentor, Rhipicephalus, Ixodes, Hyalomma, Argas, and Ornithodoros genera.

#### ***Clinical Symptoms***

Signs include fever, progressive anaemia and icterus and inapparent in endemic areas and young calves. Other signs evident in the later stage include drop in milk production, inappetence, loss of coordination, breathlessness when exerted, and a rapid bounding pulse which are usually evident in the late stages, fever, mucous membranes appear pale and then yellow. Pregnant cows may abort. Calves are much more resistant to disease (though not infection) than older cattle.

#### ***Diagnosis***

Microscopical examination of Giemsa-stained thin and thick blood films; other tests include complement fixation or card agglutination tests used for the diagnosis of anaplasmosis

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### Treatment and Prevention

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#### **Management**

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##### Non-drug treatment

- Supportive therapy may be necessary in dehydration or anaemic animals

##### Drug treatment

- Oxytetracycline (LA) 20 mg/kg, IM repeated after one week. Injection at the neck muscle is preferred to rump injection. S/E, C/I, D/F, D/I, W/P, *see* page 14.

or

- Chloramphenicol 20 to 50 mg/kg, PO, q 6 h; 10 mg/kg q 12 h IM or IV for 3-5 days.
  - ✓ S/E: depression and bonemarrow hypoplasia
  - ✓ C/I: impaired liver function and
  - ✓ D/F: 25% Powder, 250mg tablets, 25mg/ml suspension and 200mg/ml injecton.
  - ✓ D/I: barbiturates, phenytoin, sulphonylureas
  - ✓ W/P: meat 28days and for calves 10 days

or

- Imidocarb dipropionate at 3.0 mg/kg and high dose 5 mg/kg, IM or SC is required for elimination of the carrier state at 2 weeks apart
  - ✓ S/E: teratogenic and carcinogenic at high doses
  - ✓ C/I: decrease the dose in animals with hepatic dysfunction and cardiac disease

##### Prevention

- Tick control, *see* page 103/104.
- 

## **Anthrax**

Anthrax is an acute, febrile (42°C), septicemia, fatal bacterial disease of food animals caused by *Bacillus anthracis*. Anthrax outbreak occurs irregularly and is commonly associated with neutral or alkaline, calcareous soils where the spores revert to the vegetative form and multiply to infectious levels if

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

environmental conditions of soil, moisture, temperature, and nutrition are optimal.

### ***Clinical Symptoms***

In ruminant species, acute illness is characterized by abrupt onset of fever, signs of abdominal pain, trembling, hematuria, and blood-tinged diarrhea. Pregnant animals may abort, and milk production in lactating animals often decline or is tinged with blood. Ventral subcutaneous edema may be present followed by death. Chronic infection is rare in cattle and is manifested by localized edematous swelling on the ventral neck, thorax, and shoulders. Areas most frequently involved are the ventral neck, thorax, and shoulders.

### ***Diagnosis***

Anthrax should be suspected if an animal dies suddenly and further investigated by Methylene blue stained blood smears. Infection is confirmed by culture.

### ***Treatment and Prevention***

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#### **Management**

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Supportive therapy

- Hyperimmune serum *plus* antibiotics (see antibiotic below)

Drug treatment

*First line*

- Penicillin 22,000 IU/kg, IM, q 12 h for 2 days, then daily for 3 days or Benzathine penicillin or other repository preparations, q 48-72 h; the initial dose should be administered IV.

✓ C/I, S/E, D/F, D/I and W/P, *see* page 14

or

- Oxytetracycline 6-11 mg/kg, IM or IV, q 12-24 h. Initially, divide the daily dose into two doses.

✓ For C/I, S/E, D/F, D/I and W/P, *see* page 14

or

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## Standard Veterinary Treatment Guidelines for Veterinary Clinics

- Amoxicillin 5-10 mg/kg q 24 h for 3-5 days;
  - ✓ C/I, S/E, D/F, D/I and W/P, are similar to penicillins.  
*see page 14*

or

- Ciprofloxacin 2.8 mg/kg, IV or PO, q 8 h for 4 days.
  - ✓ S/E: lameness, and severe pain in some immature animals due to damage to weight-bearing joints when used at therapeutic doses in some immature animals.
  - ✓ D/F: Powder, 10%,

or

- Doxycycline, 20 mg/kg, IV
  - ✓ C/I, S/E, D/I: Doxycycline is one of the safest of the tetracyclines. Half-life shortens if administered with barbiturates or phenytoin.
  - ✓ D/F: powder 10%, 20%, 30%
  - ✓ W/P: are similar to oxytetracycline (*see page 14*).

*Note:* among the tetracyclines, doxycycline is highly lipophilic thus penetrates tissue with ease, is more completely absorbed & slowly excreted.

or

- Erythromycin 12.5 mg/kg (adult), IM, IV or SC; 15-30 mg/kg (calves), IM, IV, or SC. For C/I, S/E, D/I, D/F and W/P, *see page 19*

or

- Dihydrostreptomycin or streptomycin, 10 mg/kg, q 12h IM, SC; For C/I, S/E, D/I, D/F and W/P, *see page 17*

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### Prophylaxis

- Vaccination.

*Caution:* Animals that have died of anthrax should be burned in a closed incinerator.

*Note:* Animals should not be vaccinated within 2 months of anticipated slaughter; antibiotics should not be administered within 1 wk of vaccination.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

*Public health significance:* Anthrax is highly pathogenic to humans; thus care should be taken during handling of suspected cases.

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### **Aspergillosis**

Aspergillosis is caused by a number of *Aspergillus* spp, especially *A. fumigatus* and affects almost all domestic animals and birds. It causes abortion. Systemic mycotic diseases are a result of overgrowth of fungi in hay, grain or silage feeds.

#### ***Clinical Symptoms***

Most infections are asymptomatic, however, the following are common signs.

Mycotic pneumonia: pyrexia; rapid, shallow, stertorous respiration; nasal discharge; and a moist cough. The lungs are firm, heavy, and mottled and do not collapse when pressed. In subacute to chronic mycotic pneumonia, the lungs contain multiple discrete granulomas which resembles tuberculosis.

#### ***Diagnosis***

Culture *plus* agar-gel double-diffusion test.

#### ***Treatment and Prevention***

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##### **Management**

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##### Drug Treatment

- Natamycine 0.01% solution, topical, repeat after 4-5 days and again after 14 days if required.
  - ✓ *Warning:* do not expose treated animals to direct sunlight.
  - ✓ *Note:* Less irritating and poorly penetrate tissues

or

- Potassium iodide 10%, PO for 1-2 wks, *see* page 18
- 

##### Prophylaxis

- Hay should be prepared to ensure dry conditions throughout storage time; Precautions have also to be given to silage making and storage
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

*Public health significance:* Aspergilla are pathogenic to humans; thus aerosol transmission might occur.

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### **Babesiosis**

Babesiosis is a tick-borne disease of cattle caused by intraerythrocytic protozoan parasites of the genus *Babesia*. It is transmitted transovarially by *Boophilus* tick species or blood inoculation. The two important species in cattle *B. bigemina* and *B. bovis* are widespread in Ethiopia.

#### ***Clinical Symptoms***

*Babesia bigemina:* high fever (41°C) that lasts 4-12 days, icterus, and sunken eyes, accompanied by anorexia, weakness, trembling, dyspnea, and tachycardia are observed. Pneumonia, ruminal atony alternating with constipation, blackish diarrhea, abortion in pregnant cows and cutaneous photosensitization may occur. In the terminal stages, severe jaundice, and dark red urine that produce stable froth are observed.

*Babesia bovis:* rough hair coat, anorexia, abortion, ruminal atony and constipation, equilibrium disorders (ataxia, pedaling movements), encephalitic signs, grinding of teeth, and overt aggressivity (attaching) are observed. Calves have higher degree of immunity and animals that recover from babesia infections are immune for life.

#### ***Diagnosis***

The geographic region, the history and clinical signs of jaundice with hemoglobinuria and fever are suggestive; thick and thin Giemsa-stained blood smears is confirmatory.

Serological diagnosis (CFT, Indirect haemagglutination test, Agar gel diffusion test, rapid card or tube or latex agglutination tests).

**Standard Veterinary Treatment Guidelines for Veterinary Clinics**

***Treatment and prevention***

Table 3. Drug therapies for treatment and prophylaxis of babesiosis in cattle

Drug	Route	Toxic level mg/kg	Dosage (mg/kg)		Precautions
			<i>B. bigemina</i>	<i>B. bovis</i> , <i>B. divergens</i>	
<b>Quinuronium</b> (sulfate), 50%	SC	15	0.5-0.75	1	Low safety index; antidote in case of toxicity: adrenalin and Ca-borogluconate
<b>Amicarbalide 50%</b>	IM	60 mg/kg		10-15	
Treatment			4-8	Not possible	
Sterilization			8-12	10	For S/E and C/I see page 24
Premunition			4		
<b>Phenamidine, 40%</b>	IM	22.5 mg/kg	10-15	-	
<b>Diminazene</b>					Phenazone is commonly added to reduce side effects; C/I, S/E, D/I, D/F & W/P: see below <sup>1</sup> .
Treatment	IM	25	2-4	5-6	
Sterilization	IV	10	7-10	Not possible	
premunition			2	5	

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

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<b>Imidocarb</b>					The drug should be given at least 2 months before slaughter
Treatment	IM/SC	30	0.5-1	1-2	
Prophylaxis and premunition	2	2; every 12 weeks	2; every 6 weeks		
Sterilization			2	2-5	

---

### **Supportive treatment:**

Blood transfusions may be life saving in very anemic animals. Anti-inflammatory drugs, such as phenylbutazone, help relieve the inflammatory processes that occur, particularly with *B. bovis* infections, Vit B 12 could be given.

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<sup>1</sup>C/I: hypersensitivity to diminazene or phenazone, impaired renal or liver functions

S/E: Hypersensitivity reactions, salivation, swelling, tremors may occur; multiple therapeutic doses can produce prominent hemorrhagic lesions of the cerebellum and the thalamus.

D/F: Powder / granule, 1.1 g, 1.05 g, 495 mg and 444 mg; W/P: meat and milk 21 days.

*Precaution:* use the solution within 5 days of preparation (up to 14 days if refrigerated);

---

## **Bacillary Hemoglobinuria**

Bacillary hemoglobinuria is an acute, infectious, toxemic and highly fatal clostridial disease of primarily cattle and less commonly sheep and swine caused by *Clostridium haemolyticum*. It is transmitted by ingestion and inhalation. Disease is commonly associated with fasciolosis. It is rare in calves less than 1 year old and cattle with poor body condition. It causes severe hepatic necrosis and local thrombosis.

### ***Clinical Symptoms***

Affected animals are depressed, arched back, grunt when walking, fever (40-41°C), red dark urine, jaundice, and anemic. Other clinical signs include abdominal pain, dyspnoea, dysentery, and haemoglobinuria and oedema of the brisket.

### ***Diagnosis***

Exclusion of other diseases such as babesiosis, leptospirosis, postparturient haemoglobinuria and haemolytic anaemia caused by poisonous plants.

### ***Treatment and Prevention***

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#### **Management**

---

Non-drug treatment

- Blood transfusions, parenteral fluid, and electrolytes may help to control hemolytic anaemia and the dehydration. *see Appendix 2.*
  - Antitoxin 500-1000 ml per adult animal
- 

Drug treatment

- Procaine penicillin G, 22,000 IU/kg, IM or SC q 24 h for 3 to 5 days or Benzathine penicillin or similar repository preparations, q 48-72 h. For S/E, C/I, D/F, D/I, W/P *see page 14.*

or

- Tetracycline 10 mg/kg IV or IM q 24 h. For S/E, C/I, D/F, D/I, *see page 14*
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

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### Prophylaxis

- Vaccination.

*Note:* Early treatment should be given; bulls should not be allowed to mate within 3 weeks to avoid liver rupture.

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## **Besnoitiosis**

Besnoitiosis is a protozoan disease of the skin, subcutis, blood vessels, mucous membranes, and other tissues. Cutaneous disease in cattle is caused by *Besnoitia besnoiti*. Severely affected bulls can become permanently sterile. Affected animals remain carriers for life.

### ***Clinical symptoms***

Infected cattle often show no clinical signs other than a few cysts in the scleral conjunctiva. Illness begins with fever followed by warm, painful swellings ventrally (anasarca). Swollen lymph nodes, diarrhea, inappetence, photophobia, rhinitis, and orchitis also are seen. The skin becomes hard, thick, and wrinkled and develops cracks

### ***Diagnosis***

Cysts in the scleral conjunctiva and nasal mucosa are diagnostic.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Tetracycline 10 mg/kg IV or IM q 24 h. For S/E, C/I, D/F, D/I, *see* page 14

##### Prevention

- Affected animals should be isolated and treated symptomatically.
  - Reduction of biting insects and ticks also may reduce transmission.
-

## **Blackleg**

Black leg is an acute, febrile disease of cattle and sheep caused by *Clostridium chauvoei* characterized by emphysematous swelling of the heavy muscles and severe toxemia. Cattle between six months to two years old are mainly affected though at any age and condition may be affected. Black leg is common in Ethiopia during dry periods of the year.

### ***Clinical Symptoms***

Depression, anorexia, rumen stasis, high fever (41-42°C) and tachycardia are most common; marked lameness with pronounced muscle swelling of the upper part of the affected leg with crepitation may follow. At necropsy affected tissues are filled with rancid serosanguineous fluid and gas pockets, which crepitate when squeezed and the muscle appear dry.

### ***Diagnosis***

The clinical signs and postmortem findings are indicative; the epidemiology and bacterial isolation are confirmatory.

### ***Treatment and Prevention***

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#### **Management**

Non-drug treatment

- Drainage and slashing of affected tissue to allow oxygen into the tissue plus supportive treatment with parenteral fluids, analgesics, etc.

Drug treatment

- Procaine penicillin G, 22,000 IU/kg, IM or SC q 24 h for 3 to 5 days or Benzathine penicillin or similar repository preparations, q 48-72 h. For S/E, C/I, D/F, D/I, *see* page 14

*plus*

- Local antibiotic treatment eg. Oxytetracycline spray 5% at the site of the wound is helpful.

Prevention

- Vaccination with *C. chauvoei* bacterin.
-

## **Botulism**

This rapidly fatal motor paralysis is caused by ingestion of preformed toxin of *Clostridium botulinum* from decaying carcasses or vegetable materials such as decaying grass, hay, grain, or spoiled silage. Ingestion of botulism toxin from decaying tortoise carcasses has been reported in Bale zone, southern Ethiopia.

### ***Clinical symptoms***

Decreased tongue tone that protrudes out and problems associated with deglutition and prehension of food, followed by progressive muscular weakness until animals become recumbent in a parturient paresis-like posture, ataxia and stumbling gait affecting the hind legs are commonly observed.

### ***Diagnosis***

Commonly, the diagnosis is made by eliminating other causes of motor paralysis and look for potential sources of toxin.

### ***Treatment and Prevention***

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#### **Management**

---

##### **Drug treatment**

- Ruminant lavage, followed by 50-80 ml lactic acid in 5-10 L of water per stomach tube in adult cattle
- Polyvalent anti-C and anti-D antisera (if available)

##### **Control**

- Correction of dietary deficiencies and proper disposal of carcass. Removal of decaying grass or spoiled silage from cattle feed is indicated.
-

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### **Bovine Farcy**

It is a chronic infectious disease of zebu cattle caused by *Mycobacterium farcinogenes* and *M. senegalense*. It is characterized by purulent lymphangitis and lymphadenitis.

#### ***Clinical Symptoms***

Initially there is chronic, painless, localized subcutaneous cellulitis, which spreads along lymphatics to involve local lymph nodes. Further spread to the lungs may occur. The lesions are chronic indurated, sub-cutaneous swellings, and enlargement and thickening of local lymphatics and lymph nodes that may rupture and an odorless thick gray or yellow, often granular, or cheezy pus comes out. Ulcers will be formed.

#### ***Diagnosis***

It is based on microscopic examination of smears from pus or isolation of the agent and CFT.

#### ***Treatment and Prevention***

---

##### **Management**

---

Drug treatment

- Sodium iodide 1 g/14 kg, 10%, IV, every 7 days, for more than 5 weeks.
- ✓ S/E & DI *see* page 18.
- 

Preventions

- Early disinfection of cutaneous abrasions in cattle on affected farms is recommended
- 

### **Calf Diphtheria**

Calf diphtheria (Necrotic laryngitis, Laryngeal necrobacillosis) is a disease of young cattle characterized by fever, inspiratory dyspnea, and stertorous breathing. *Fusobacterium necrophorum* is usually isolated from lesions; however, its cause is yet uncertain. Inflammation of the laryngeal mucosa and cartilage,

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caused by invasion of *F. necrophorum* into laryngeal ulcers, is responsible for the clinical signs. Calf diphtheria primarily affects cattle between 3 and 18 months of age; however, it may sometimes occur in adult cattle.

### ***Clinical Symptoms***

Pyrexia (41.1°C), anorexia, depression, excessive salivation, respiratory distress hyperemia of the mucous membranes and foul smell from the mouth; untreated calves may develop necrotized pneumonia and die within 2-7 days from toxemia and upper air way obstruction. Long-term sequelae include aspiration pneumonia and permanent distortion of the larynx.

### ***Diagnosis***

Clinical signs are usually sufficient to establish a diagnosis.

### ***Treatment and Prevention***

---

#### **Management**

---

##### Non-drug treatment

- Tracheostomy is indicated in cattle with chronic and severe inspiratory dyspnea to drain abscess and fluid.

##### Drug treatment

- Sulfadimidine, *initial dose*: 140 mg/kg, IV; *maintenance dose*: 70 mg/kg, IV, q 24 h for 5-7 days. For S/E, C/I, D/F, D/I, WP are similar to other sulfonamides, *see page 17*.

or

- Procaine penicillin, G, 22,000 IU/kg, IM or SC q 24 h for 3 to 5 days or Benzathine penicillin or similar repository preparations, q 48-72 h. For S/E, C/I, D/F, D/I, WP, *see page 14*

---

##### Supportive treatment

- Acetylsalicylic acid 100 mg/kg, PO, q 12 h to decrease the degree of laryngeal inflammation and edema.
  - ✓ S/E: prolonged use may cause gastrointestinal lesions, disturbance in acid-base balance, and alterations in platelet and renal functions.

- 
- ✓ C/I: pregnant animals, gastrointestinal ulceration and hemorrhage
  - ✓ D/F: injection, 100 mg/ml; Bolus, 15.6 gm or 1.4gm
  - ✓ D/I: acetazolamide, antacid, diuretics, heparin, methotrexate, metoclorpramide, phenytoin and warfarin.

*Note:* The prognosis is good for early cases that are treated aggressively; chronic cases will require surgery under general anesthesia to remove necrotic or granulation tissue and to drain laryngeal abscesses.

---

### **Campylobacteriosis**

Campylobacteriosis is caused by *Campylobacter* species of bacteria. The disease is either intestinal presenting as diarrhea, or genital, causing infertility or abortion. In livestock, the species most important are *C. jejuni*, subspecies *venerealis*, *C. fetus* subspecies *fetus* and *C. fetus* subspecies *venerealis*. The organisms are transmitted via the fecal-oral spread and spreads via feed or water.

#### ***Clinical Symptoms***

Clinical manifestations may be more severe in younger animals. Diarrhea is mucoid and occasionally with blood flecks in the mucus. Abortion may occur.

#### ***Diagnosis***

Culture and using dark-field or phase-contrast microscopy

#### ***Treatment and Prevention***

---

#### **Management**

---

Drug treatment

*First line*

In uterine and bull infections:

- Streptomycin or dihydrostreptomycin, 1-2 g + 1 million IU Penicillin infusion, per animal for 3-5 days and locally it can be applied intrauterine. In bulls, it can be directly applied to
-

the prepuce. For S/E, C/I, D/F, D/I, WP *see* page 14

or

- Tylosin 5-10 mg/kg, IM or slow IV injection for not more than 5 days or in combination with sulfonamides
  - ✓ S/E: allergic reaction in all species and gastrointestinal disturbance.
  - ✓ C/I: animals with impaired liver function
  - ✓ D/F: powder, 10, 20 and 30%; injection, 50, 200 150 and 220mg/ml and tablet 200mg
  - ✓ W/P: adult, Meat 7 days, milk 4 days; Calves: meat 14 days.
  - ✓ D/I: theophylline, warfarin and beta-adrenergic drugs

or

- Erythromycin 15 mg/kg q 12-24 hr IM. For 3-5 days. For S/E, C/I, D/F, D/I, WP *see* page 19

or

- Tetracycline, 10 mg/kg q 12 PO; calves: 2 caps of 250 mg. for 3-5 days. For S/E, C/I, D/F, D/I, WP *see* page 14

or

- Ampicillin or Ampicillin + Clavulanic acid, Adult cattle: 15 mg/kg q 12 hr IM; calves, 25 mg/kg q 8-12 hr PO for 5 days. For S/E, C/I, D/F, D/I, WP, *see* page 14

### Enteritis

#### *First line*

- Erythromycin, *see* above.

#### *Alternative*

- Chloramphenicol 20 to 50 mg/kg q 6 h, PO; 10 mg/kg, q 12 h, IM or IV (slowly) for 3 days. For S/E, C/I, D/F, D/I, WP, *see* page 21

or

- Doxycycline 20 mg/kg, IV for 3 days. For S/E, C/I, D/F, D/I, WP, similar to tetracyclines, *see* page 23

or

- Gentamicin 5 mg/kg q 8 hr IV or IM for 3-5 days.
  - ✓ S/E: nephrotoxicity, ototoxicity, neuromuscular blockage in all species; in calves diarrhea, if dosage is higher

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- ✓ C/I: myasthenia gravis
  - ✓ D/F: injection; 40, 50 and 100 mg/ml and intra-mammary suspension, 100 and 170 mg/dose
  - ✓ W/P: meat 35 days,
  - ✓ D/I: calcium gluconate, heparin sodium, sodium bicarbonate, IV and tylosin, furosemide, and other nephrotoxic drugs (eg. Amphotericin B).
- 

*Note:* The organism might develop resistance to tetracyclines, sulfadimethoxine and its combinations, quinolone etc., therefore sensitivity tests should be done.

### Prevention

- Vaccination with bacterins in an oil emulsion adjuvant.

*Public health significance:* The disease is transmitted to human by consumption of animal products resulting in gastroenteritis and diarrhea.

---

## **Candidiasis**

Candida species particularly *C. albicans* is normally present on the mucous membranes, especially the alimentary tract. It is an opportunistic pathogen resulting in systemic or local candidia infections in cattle and calves secondary to prolonged antibiotic or corticosteroid therapy. Mastitis and abortion also occur in cattle.

### *Clinical Symptoms*

Calves with fore-stomach candidiasis have watery diarrhea, anorexia, and dehydration, with gradual progression to prostration and death.

### *Diagnosis*

Examination of scraping or biopsy from mucocutaneous lesions and culture .

## *Treatment and Prevention*

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### **Management**

---

#### Drug Treatment

- Nystatin 10% ointment or topical application of 1% iodine solution may be useful in the treatment of oral or cutaneous candidiasis.

or

- Ketoconazole 40 mg/kg q 8 h for two weeks.
    - ✓ C/I: hepatic impairment, pregnant and lactating animals, decreased appetite, GI disturbances, changes in the hair coat, cataracts, infertility
    - ✓ S/E: hepatotoxicity, anorexia, nausea, vomiting, pruritis, alopecia, gynecomastia and sexual impotence. Use not recommended in pregnant and lactating animals. Ketoconazole should not be used in animals with known hypersensitivity to the drug.
    - ✓ D/I: Drugs that reduce stomach acidity may reduce ketoconazole absorption, antimuscarinic drugs, cimetidine, ranitidine, phenytoin and warfarin. It has antagonistic effect with amphotericin B, thus should not be used in combination.
    - ✓ D/F: tablets, 200 mg; ointment (topical use), 10%
    - ✓ W/P: meat 5 days; Milk 2 days
- 

## **Coccidiosis**

Coccidiosis, a protozoan parasite of cattle, is caused by the genus *Eimeria*. The most common species affecting cattle include *E. bovis*, *E. zuernii*, and *E. auburnensis*. The disease is common in young cattle up to two years old.

### ***Clinical Symptoms***

Watery feces, with little or no blood and shreds of epithelium and mucus; calves may appear unthrifty and have soiled rear quarters. Animals may die from secondary bacterial complications or concurrent infections (e.g. corona virus

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infection) that develop fever; become anorectic, depressed, and dehydrated; and lose weight. *Eimeria zuernii* is highly pathogenic causing bloody diarrhea.

### *Diagnosis*

Demonstration of the parasite in feces of clinically affected animals.

### *Treatment and Prevention*

---

#### **Management**

---

##### Drug treatment

- Amprolium 10 mg/kg, q 24 h, PO for 5 days.
  - ✓ S /E: interferes with egg quality and production
  - ✓ D/F: powder, 20, 30 and 60 %; Oral solution, 38.4 mg/ml

or

- Sulfamethazine 50-110 mg/kg, q 24 h, PO for 4 days
  - ✓ D/F: bolus, 5 g; Injection 330, 333 and 160 mg/ml and Powder, 8, 10, 16, 20, 25 and 30%
  - ✓ W/P: meat 10 days
  - ✓ D/I: thiopentone sodium and warfarin

or

- Decoquinate 167g/10kg of feed for 28 days
  - ✓ D/I: do not mix with other anticoccidials
  - ✓ *Precautions*: avoid contact with the skin, inhaling dust, and wash hands after use.
  - ✓ W/P: Meat, at least one day; milk, avoid drinking milk from treated animals.

or

- Monensin 100-360 mg/head/day PO for 7 days.
  - ✓ C/E: high dose may result in reduced weight gain,
  - ✓ D/I: Do not mix with drugs having similar action; don't treat animals with tiamulin for at least 7 days
  - ✓ *Precautions*: Avoid direct contact with skin, wash thoroughly after handling the product.

---

##### Prophylaxis

- Amprolium 5-10 mg/kg q 24 h for 21 days, PO. For S/E, C/I,
-

D/F, D/I, WP, *see* above.

or

- Monensin 1 mg/kg in feed for 30 days, PO. For S/E, C/I, D/F, D/I, WP, *see* above.
  - Housing and ventilation deficiencies should be corrected
  - Don't mix different age groups of calves, avoid fecal contamination of feed.
- 

### **Colisepticemia**

Colisepticemia caused by *Escherichia coli* is a common disease of calves characterized by signs of acute septicemia (2-5 weeks age) or of a chronic bacteremia (calves less than 2 weeks age) with localization. Initial infection can occur from a contaminated environment followed by direct nose-to-nose contact, urinary and respiratory aerosols, or as the result of navel-sucking or fecal-oral contact. Failure of sufficient passive transfer of immunoglobulin predisposes to infection.

#### ***Clinical Symptoms***

Enteritis and septicemia are common.

#### ***Diagnosis***

History and clinical findings, demonstration of a severe deficiency of circulating IgG, and the organism in the blood or tissues.

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### *Treatment and Prevention*

Treatment is difficult because clinical signs are noticed in the advanced stage of the disease.

---

### **Management**

---

Drug treatment

#### *First line*

Fluid therapy (for endotoxic shock). *see* appendix 2

*plus*

Antibacterial therapy

- Gentamicin 5 mg/kg q 8 h IV or IM for 3-5 days. For S/E, C/I, D/F, D/I, W/P, *see* page 35

or

- Trimethoprim-sulfadiazine 30mg/kg IM, q 24 h for 3-5 days.
  - ✓ S/E: crystallization in urinary tract, hypersensitivity, and anaphylaxis for all species; local pain and swelling
  - ✓ D/F: bolus, 100+ 20, 250 + 50, 400+80 in mg; injection, 200+40 and 400 + 80 in mg/ml; powder, 10 + 2%; oral suspension, 50+10, and 400+80 mg/ml
  - ✓ W/P: meat 10 days; milk 4 days
  - ✓ D/I: detomidine and halothane
  - ✓ *Caution:* Animals should have a good water supply

or

- Chloramphenicol 20-40 mg/kg q 12 h if <1 month old; 10 mg/kg q 12 h or 25 mg/kg q 24 h IV (slowly) or IM if < 1 mo old; caps PO for 3-5 days. For S/E, C/I, D/F, D/I, W/P, *see* page 21
- 

Prophylaxis

- Give adequate colostrum to calves during the first 24 hours of life.
- To minimize transmission, calves reared indoors should be kept in separate pens (without contact) or reared in calf pens

*Note:* Treatment requires aggressive use of antibiotics; *E. coli* is increasingly becoming resistant to ampicillin, neomycin, kanamycin, spectinomycin, and tetracycline.

---

## **Dermatophytosis**

Dermatophytosis is a disease of cornified epidermis, hair, horn, and nails most frequently by the fungal genera *Microsporum* and *Trichophyton*. Transmission may occur between animals or by contact with soil. High humidity and temperature, trauma, poor nutrition and most importantly close confinement are the predisposing factors.

### ***Clinical Symptoms***

Infected hairs become brittle, dry, and lusterless and break off. Ring-shaped lesions develop which becomes alopecic.

### ***Diagnosis***

Clinical signs are indicative; direct microscopic examination and culture of skin scrapings and hairs from the periphery of lesions are necessary to confirm diagnosis.

### ***Treatment and Prevention***

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#### **Management**

---

Drug treatment

Topical

- Iodophores 3% spray q 24 h for several weeks depending on its response.

- ✓ S/E: Irritant to tissue

- ✓ C/I: Concurrent use of other antiseptics and detergents

or

- Sodium hypochlorite 0.5% irrigation q 24 h for several weeks

- ✓ D/I: Hard or alkaline water will precipitate the active ingredient necessary for disinfection

*plus*

Systemic therapy

- Sodium iodide 1 g/14 kg, as 10% IV, every 7days for several weeks depending on response. For S/E: *see* page 18

or

- Griseofulvin 5-7.5 mg/kg, q 24 h for 7 or more days (calves)
-

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- ✓ S/E: high doses cause hepatotoxicity, particularly in cats, leukopenia and hypoplasia
  - ✓ C/I: hepatic impairment and pregnant animals as it causes cleft palate and skeletal abnormalities
  - ✓ D/F: tablets, 125 mg
  - ✓ W/P: meat 5 days, Milk 2 days
  - ✓ D/I: phenobarbitone, phenylbutazone, prostogens and warfarin.
- 

### **Dermatophilosis**

Dermatophilosis is a skin disease cattle and other domestic livestock caused by the bacteria *Dermtophilus congolensis*. It is clinically characterized by superficial, pustular, crusting, and/or ulcerative dermatitis.

#### ***Clinical symptoms***

Papules , serous exudates causing matting of hairs to form a tufted appearance, scab formation may be severe and generalized.

#### ***Diagnosis***

Clinical appearance, microscopic examination of Geimsa or Gram stained smear and culture.

***Treatment and Prevention***

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**Management**

---

Drug treatment

Systemic

- Procaine penicillin G 70,000 IU/kg *plus* streptomycin 70 mg/kg, IM, single dose; if this fails continue treatment with respective dose of 5000IU and 5 mg/kg q 24 h for 5 days; S/E, C/I, D/I, W/P: *see* page 14

or

- Oxytetracycline (LA) 20 mg/kg, IM, stat; if required repeat after 3 to 5 days. S/E, C/I, D/I, W/P: *see* page 14

Topical, use anyone of the following

- Iodophores: 2-5% lime sulfur, 0.5% zinc sulfate, 0.2% copper sulfate, and 1% potassium aluminum sulfate (alum) as sprays or wash for 3 to 5 days, then weekly until the lesion heals.

- ✓ S/E, D/I & C/I: Iodides may stain and corrode, high concentrations are irritating, and tinctures may cause drying of the skin.

---

*Public health significance: Dermatophilus congolensis may cause local infection in humans.*

---

**Echinococcosis**

*Echinococcus granulosus* is a tapeworm found in the small intestine of the canid definitive host. The cyst in the intermediate host, for example in cattle, localizes in various organs (the liver and lungs) and occupies a large portion of functional tissue.

***Clinical Symptoms***

Clinical signs depend on the organs involved but usually no visible clinical symptoms are observed.

***Treatment and Control***

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**Management**

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Drug treatment

- There is no specific treatment of hydatid cyst.

Prevention

- Deworm dogs regularly

*Public health significance:* It can be transmitted to humans and cause serious problem.

---

**Ephemeral Fever**

Bovine ephemeral fever is a non-contagious vector-borne viral disease of cattle characterized by biphasic fever, stiffness or lameness and drop in milk production (in dairy).

***Clinical Symptoms***

Biphasic fever that occurs for 3-4 days, stiffness or lameness of more than one leg, sudden drop in milk production are observed. Other signs include shivering, nasal and ocular discharge, edema affecting the area around joints, and subcutaneous emphysema.

***Diagnosis***

Clinical findings, demonstration of viraemia or of rising levels of neutralizing antibody and isolations are confirmatory.

## *Treatment and Prevention*

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### **Management**

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#### Drug treatment

- No specific treatment

#### To reduce pain

- Acetylsalicylic acid 60 to 120 g/head, PO, q 12 h, *see* page 33

or

- Phenylbutazone 120 mg/ml *plus* isopyrin 240 mg/ml), 20 to 30 ml, IV slowly or IM .
  - ✓ S/E: Gastrointestinal ulceration & bleeding, ocular toxicity, renal failure, hepatitis, jaundice and hematuria.
  - ✓ C/I: Cardiac hepatic or renal impairment, anemia
  - ✓ D/F: Injection, 200 mg/ml; Bolus, 25, 100 and 200 mg
  - ✓ D/I: Methotrexate, phenytoin, sulphanylureas, thyroxine and warfarin

---

#### Control and prophylaxis

- Vaccination with live vaccine
- 

## **Eyeworms**

Eye worms or Theilezia worms affecting the eyes of cattle cause keratitis, including opacity, ulceration, perforation, and permanent fibrosis in severe cases, particularly with *T. rhodesii* infections. The worms localize in the conjunctival sac.

### ***Clinical Symptoms***

Conjunctivitis, photophobia, and keratitis are common signs. Characteristically there is chronic conjunctivitis with lymphoid hyperplasia and seromucoid exudates.

### ***Diagnosis***

Clinically, thelaziasis tends to cause a chronic conjunctivitis which does not spread.

***Treatment and Prevention***

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**Management**

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Non-drug treatment

- Instill local anaesthesia and remove the worms with forceps

Drug treatment

- Irrigation of the eyes with 50-75 ml aqueous solution of 0.5% iodine and 0.75% potassium iodide has been recommended for *T. gulosa* and *T. skrjabini*.

or

- Apply antibiotic-steroid ointment

or

- Levamisole 15 mg/kg, PO stat, maximum dose 4.5 g
  - ✓ C/I: with in 14 days of treatment of organophosphorus compound or diethylcarbamate
  - ✓ S/E: frothing, salivation, tremor, transient head shaking, licks of lip, urination, defecation, vomiting, ataxia, collapse and death due to respiratory failure
  - ✓ D/F: bolus, 200, 250, 300, 400, 600, 700, 1000, 1125, 1875 and 2190 mg; Suspension, 15, 30, 50, 75 and 100%; Powder or granule, 10 and 20%; Pour on, 20%; injection, 2, 75 and 100 mg/ml
  - ✓ W/P: meat 3 days; milk 3 days

or

- Fenbendazole 10 mg/kg, PO stat
  - ✓ C/I, S/E & D/I: should not be applied at early gestation; hypersensitivity may occur
  - ✓ D/F: bolus, 250 and 750 mg; suspension, 2.5, 5, 10, and 12.5%; powder or granule, 4, 20, 22 and 25%; paste, 20 gm
  - ✓ W/P: meat 30 days and milk 5 days

---

Prophylaxis: use insect repellants

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## **Foot and Mouth Disease**

Foot-and-mouth disease (FMD) is a highly communicable viral infection of cattle, pigs, sheep, goats, buffalo, and artiodactyl wildlife species characterized by fever, vesicles in the mouth, on the muzzle, gums, pharynx, teats, and interdigital cleft. It is caused by an *Aphthovirus* that is transmitted by contact and through milk. Recoverd animals remain carriers for up to 2 and a half years.

### ***Clinical Symptoms***

Drooling and vesicles on the nares, in the bucal cavity, and between the claws are most common. Dullness, inappetance, fever, and shivering followed by smacking of the lips, drooling saliva, and shaking or kicking of the feet are primary signs. Preganant animals may abort.

### ***Diagnosis***

Clinical signs are indicative and confirmed by FMD serology

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- No specific treatment however, supportive treatments against secondary bacterial infection are necessary.
- 

Control and prophylaxis:

- Vaccination, test and quarantine infected herds
- 

## **Fasciolosis**

Fasiolosis is a chronic parasitic disease of cattle caused by the liver parasites *Fasciola hepatica* and *F. gigantica*.

### *Clinical Symptoms*

Anaemia, hypoalbuminaemia and submandibular oedema are characteristic. The acute form that is common in sheep can sometimes occur in calves. Diarrhoea may occur if complicated by the presence of *Ostertagia* species.

### *Diagnosis*

Based on clinical findings, seasonality and weather conditions and previous history of the presence of the parasite is confirmed by microscopic examination of feces.

### *Treatment and Prevention*

---

#### **Management**

---

##### Drug treatment

##### *First line*

- Triclabendazole 9-12 mg/kg, PO stat (all stages of fasciola).
- ✓ S/E: Higher doses are associated with inappetence, increased blood urea nitrogen, transient weight loss, and slight effect on motor activities.

##### *Second line*

- Rafoxanide 7.5 mg/kg, PO, stat against flukes above 4 weeks old & most nematodes.
- ✓ S/E: At high dose inappetence, diarrhea and blindness may occur.
- ✓ D/F: Rafoxanide is available at 2.5%, 7.5 ml/50 kg
- ✓ W/P: meat 28 days; milking cows should not be treated with rafoxanide

or

- Albendazole 10 mg/kg, PO, stat
  - ✓ S/E: Generally it is well tolerated. It is embryotoxic at two times the recommended doses, limiting its use in pregnant animals particularly the first 45 days of gestation. Hypersensitivity to albendazole may occur.
  - ✓ D/F: bolus, 150, 200, 250, 300, 600, 1000, 1125, 1500, 1875 and 2500mg; suspension, 1.5, 2.5, 5, 10, and
-

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12.5%; powder, 20 and 30%; paste, 15gm

✓ W/P: meat 14 days; milk 3 days

or

• Oxyclozanide 15-mg/kg PO or 30 mg/kg in feed stat.

✓ S/E: Although oxyclozanide has wider margin of safety, inappetence, loss of body weight & milk yield, dullness, and loosening of feces and possibly diarrhea with increasing dose may occur.

✓ D/F: bolus, 340, 450, 1000 and 2700 mg; Suspension 34mg/ml, 3% with 1.5% levamisole

✓ W/P: meat 28 days; don't use in lactating animals for human use

or

• Closantel 10 mg/kg PO, stat

✓ S/E: may cause anorexia, labored breathing, recumbency, general weakness, decreased vision or blindness with prolonged use.

---

*Note:* Most of these drugs have long withdrawal periods, which may have health hazards due to consumption of milk or meat.

---

## **Mycoses**

Most agents of systemic mycoses exist as saprophytes in soil, in decaying vegetation and dung, and on keratinized animal tissues. Infection is acquired by inhalation, ingestion, or traumatic introduction. Mycotic diseases such as histoplasmosis, coccidioidomycosis, and blastomycosis are regarded as primary systemic mycoses. Opportunistic fungi usually require a host that is debilitated or immunosuppressed. Predisposing factors include stress, metabolic acidosis, long term antibiotic treatment etc.

### ***Diagnosis***

Direct microscopic examination and/or culture from exudates and biopsy material, serological tests for mycotic diseases such

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as histoplasmosis, blastomycosis, cryptococcosis, and coccidioidomycosis.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- Ketoconazole 40 mg/kg, q 8 h, for 7-14 days. For its S/E, C/I, D/F, D/I, W/P, *see* page 37

or

- Itraconazole 10-20 mg/kg, q 24-48 h for 7-14 days.  
✓ S/E & C/I: Hepatotoxic causing anorexia, vasculitis causing ulcerative dermatitis, and cardiotoxicity

---

*Note:* give with food to facilitate absorption

*Public health significance:* Fungi affecting cattle might be transmitted to humans and cause local or systemic infections.

---

### **Gastrointestinal Parasitism**

These are infestations of the gastrointestinal tract with nematodes, cestodes and trematodes. The common stomach worms of cattle are *Haemonchus placei*, *Ostertagia ostertagi* and *Trichostrongylus axei*.

#### ***Clinical Symptoms***

*Ostertagia* and *Trichostrongylus* infections are characterized by profuse, watery diarrhea that usually is persistent. Signs of anemia, hypoproteinemia and edema, particularly the lower jaw and sometimes along the ventral abdomen manifest these infections together with haemonchus infections.

#### ***Diagnosis***

Animals with poor body condition have anemia and diarrhoea are suggestive; confirmed by faecal examination.

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### *Treatment and Prevention*

Table 4. Treatment of gastrointestinal parasitism in cattle

Parasite genera	Treatment		Remark
	Type of drug	Dose	
<ul style="list-style-type: none"> <li>• <i>Bunostomum plebotomum</i></li> </ul>	Fenbendazole*	Cattle 7.5 mg/kg; sheep and other animals 5 mg/kg	<ul style="list-style-type: none"> <li>○ <i>Trichostrongylus axei</i> is not eliminated by these compounds.</li> <li>○ Migrating and inhibiting larvae are affected only by Fenbendazole, albendazole and oxfendazole</li> <li>○ All anthelmintics are administered only once</li> </ul>
<ul style="list-style-type: none"> <li>• <i>Chabertia ovina</i></li> <li>• Oesophagostomum spp.</li> </ul>	Oxfendazole**	Cattle 4.5 mg/kg; sheep 5 mg/kg; goats 7.5 mg/kg;	
<ul style="list-style-type: none"> <li>• Haemonchus spp.</li> <li>• Nematodiurus spp.</li> </ul>	Albendazole***	Cattle and sheep: 7.5 mg/kg and for adult liver fluke 15 mg/kg	
<ul style="list-style-type: none"> <li>• Cooperia spp.</li> </ul>	Tetramisole****	15 mg/kg PO or SC, but should not exceed 4.5 g for cattle in a single SC or oral dose	
<ul style="list-style-type: none"> <li>• <i>Trichostrongylus</i> spp.</li> </ul>	Levamisole*****	8 mg/kg SC for cattle, sheep & goat; 10 mg/kg pour on for cattle	
	Pyrantel pamoate	25 mg/kg	
	Ivermectin	200mcg/kg, SC	

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### **Anthelmintic choices, S/E, C/I, D/F, D/I, W/P**

#### **Oxybendazole**

- ✓ S/E: hypersensitivity
- ✓ C/I: early gestation
- ✓ D/F: bolus 450, 1000 and 2000 mg, powder or granule 5%
- ✓ W/P: meat 14 days; milk 48 hours

#### **Triclabendazole**

- ✓ S/E: D/F & W/P *see* page 48
- ✓ D/F: bolus, 200, 250, 300 900 and 1800 mg; suspension, 5, 10, and 20%
- ✓ W/P: meat 28 days; milk 7 days

#### **Levamisole**

- ✓ S/E, C/I, D/F & W/P *see* page 46

#### **Tetramisole**

- ✓ S/E: frothing, salivation, tremor, transient head shaking, licks of lip, urination, defecation, vomiting, ataxia, collapse and death due to respiratory failure
- ✓ C/I: with in 14 days of treatment of organophosphorus compound or diethylcarbamate. Don't exceed dose 4.5 gm per animal.
- ✓ D/F: bolus, 150, 600, 700, 1000, 1200, 1500 and 2000 mg; powder or granule, 10, 20 and 30%; Injection, 30 and 100 mg/ml.

#### **Ivermectin**

- ✓ S/E: Ataxia, depression, tremors, mydriasis, listlessness, musculoskeletal pains, oedema of the face or extremities, itching and popular rash.
- ✓ C/I: Calves less than 12 weeks of age and lactating animals
- ✓ D/F: Bolus, 1.72 gm and 5 gm; Suspension, 800 mcg/ml; Powder or granule, 0.2%; Pour on, 5 mg/ml; Injection, 10 mg/ml; Paste, 1.876, 0.2 and 8%.
- ✓ W/P: Meat 28 days and don't use in lactating animals.

#### **Praziquantel**

- ✓ S/E: Occasional vomiting and transient pain at injection site. In cattle don't exceed dose 4.5gm per animal.

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- ✓ C/I: Puppies less than 4 weeks of age and kitten less than 6 weeks of age.
- ✓ D/F: Tablets, 50 mg; Bolus, 3125mg; Injection, 56.8 mg/ml.

### Piperazine

- ✓ S/E: Occasional emesis and diarrhea
- ✓ C/I: Renal impairment
- ✓ D/F: Tablets, 50 and 500 mg; Powder, 65%; Syrup, 100 mg/ml

### Closantel or Pyrantel Pamoate

- ✓ S/E, D/F & W/P *see* page 49/53.

### Levamisole + Triclabendazole

- ✓ S/E, C/I, W/P *see* page 46/48
- ✓ D/F: oral suspension 37.5 + 50 mg/ml and 75 + 120 mg/ml.

### Levamisole + Oxyclozanide

- ✓ S/E, C/I & D/I *see* page 46/49
- ✓ D/F: oral suspension: 15 + 30 mg/ml and 30 + 60 mg/ml.  
bolus: 0.3 + 0.6 gm, 0.45 + 0.45 gm and 1 + 1.4 gm.

### Levamisole + Rafoxanide

- ✓ S/E, C/I & D/I *see* page 46/48
- ✓ D/F: oral suspension: 1.5 + 3%, 1.5 + 1.5% and 3 + 3 %

### Tetramisole + Oxyclozanide

- ✓ S/E, C/I, D/I & W/P *see* page 53/49
- ✓ D/F: Bolus: 150 + 300 mg, 450 + 450 mg, 450 + 420 mg.  
and 2 + 1.4 gm; Oral suspension: 3 + 3 %.

### Heartwater

Heartwater (cowdriosis) is an infectious, noncontagious tick-borne disease of ruminants caused by the rickettsiae spp. *Cowdria ruminantium*. Heavy losses were reported in exotic cattle breeds in Ethiopia. Acute form occurs mainly in cattle between 3 and 18 months old.

#### *Clinical Symptoms*

Acute cases: fever (40°C), cessation of rumination, inappetence, petechiae on the mucous membrane of the conjunctiva, lacrimation, convulsion, sudden death and/or nervous symptoms such as depression, a high-stepping stiff gait, exaggerated blinking of eyes, and chewing movement and terminate in convulsions and prostration.

Subacute cases: the signs are less marked, and CNS involvement is inconsistent.

#### *Diagnosis*

History or epidemiology, presence of Amblyoma ticks and clinical signs are suggestive; Giemsa stained brain impression smears are confirmatory.

#### *Treatment and Prevention*

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##### **Management**

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Drug treatment

##### *First line*

- Oxytetracycline 10 mg/kg IV, q 12-24 h; long acting formulation, q 48-72 h, 2 times; C/I, S/E, D/I, D/F and W/P, *see page 14*

or

- Doxycycline 2 mg/kg q 24 h, IV; C/I, S/E, D/I, D/F and W/P area similar to tetracyclines. *see page 14*
- 

Prophylaxis: Tick control but maintain enzootic stability.

*Note:* Treatment is effective if administered early.

---

### **Hemorrhagic Septicemia**

Hemorrhagic septicemia (HS) is an acute pasteurellosis caused by particular serotypes of *Pasteurella multocida* and manifested by an acute and highly fatal septicemia principally in cattle and water buffaloes.

#### ***Clinical Symptoms***

Initial fever and inappetence are followed by respiratory distress with profuse salivation and nasal discharge; a characteristic swelling of the head, throat, and brisket, swollen hemorrhagic lymph nodes, and numerous mucosal and subserosal petechial hemorrhages.

#### ***Diagnosis***

The season of the year, rapid course, and high herd incidence, with fever and edematous swellings indicate typical HS. Characteristic necropsy lesions support the clinical diagnosis. Definitive diagnosis depends on identifying *Pasteurella multocida* serotype E:2. Hemagglutination could be confirmatory.

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### Treatment and Prevention

#### Management

##### Drug treatment

- Sulphadimidine 33% , IV, q 24 h for 3-5 days.  
✓ For C/I, S/E, D/I, D/F and W/P: *see* page 17.

or

- Oxytetracycline 5-10 mg/kg IM or IV, q 12-24 h; Long-acting 20 mg/kg SC, IM or IV, q 2-4 days  
✓ C/I, S/E, D/I, D/F, *Precautions* and W/P, *see* page 14.

or

- Penicillin-streptomycin 200,000 IU + 250 mg, 1ml/25kg, IM; C/I, S/E, D/I, D/F and W/P: *see* page 14/17.

##### Prophylaxis

- Careful movement of cattle by avoiding stressful journeys; provide adequate parasitic control.

### **Infectious Keratoconjunctivitis**

Infectious keratoconjunctivitis (pink eye) is a disease of the eyes of cattle caused by the bacteria *Moraxella bovis*. It is precipitated by factors including environmental irritants (dust, wind, tall grass, weeds, pollens), concurrent infections (IBR, *Mycoplasma* spp.), shipping stress, bright sunlight, exposure of susceptible calves to infected or carrier animals, close confinement, and breeds or strains of cattle with increased susceptibility. In Ethiopia, the disease is more serious in exotic cattle breeds and particularly calves were found more susceptible.

#### ***Clinical Symptoms***

IBR is characterized by blepharospasm, conjunctivitis with or without keratitis, lacrimation, and varying degrees of focal corneal opacity, central corneal ulceration, mucopurulent ocular discharge, and extensive corneal necrosis, corneal

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neovascularization, dense granulation tissue, and corneal fibrosis.

### ***Diagnosis***

Seasonality of the disease, characteristic clinical signs and high incidence of ocular lesions in young animals are indicative of IBK. Microbial culture is confirmatory.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

###### *Topical*

- Gentamicin 0.3%, triple antibiotic (neomycin, bacitracin, and polymyxin B), Chloramphenicol 0.5%, oxytetracycline 1% and nitrofurazone ointments q 8 h for several days on both eyes as indicated on the accompanying insert.

###### *Systemic*

- Oxytetracycline 20 mg/kg, IM, q 24 h for 2 days; long-acting formulation, stat. For C/I, S/E, D/I, D/F and W/P, *see* page 14.

or

- Sulphadimidine 100 mg/kg, IM; other sulfonamides can be used. For C/I, S/E, D/I, D/F and W/P: *see* page 17

###### *Subconjunctival*

- Penicillin-streptomycin, *see* page 14/17

###### *plus*

- Dexamethasone 1mg, IM. For C/I, S/E, D/I, D/F and W/P *see* page 7
-

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### **Leptospirosis**

Leptospirosis is a contagious disease of animals, including man, caused by *Leptospira interrogans* serovars. Serological evidence shows wide distribution of infection in irrigated areas of Ethiopia. It is transmitted by contact to skin or mucous membrane and intake of urine contaminated feed and water.

#### ***Clinical Symptoms***

Acute form: occurs in calves, signs include fever, hemolytic anaemia, hemoglobinuria, jaundice, pulmonary congestion, occasionally meningitis, and high mortality; agalactiae and blood tinged milk may occur in milking cows. Chronic form: occurs in adult cattle; signs include abortion, stillbirth or premature birth and weak infected calves and renal failure.

#### ***Diagnosis***

Darkfield microscopy of fetal fluids, microscopic agglutination test (MAT) ELISA and demonstration of leptospire in urine or tissues are commonly used. Isolation is difficult.

#### ***Treatment and Prevention***

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##### **Management**

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###### **Drug treatment**

- Tetracycline 10-15 mg/kg, IM, q 12 h, for 3-5 days. For C/I, S/E, D/I, D/F and W/P *see* page 14

or

- Streptomycin 12.5 mg/kg, IM q 12 h, for 3 days. For C/I, S/E, D/I, D/F and W/P: *see* page 17

or

- Streptomycin can be combined with ampicillin or large doses of procaine penicillin G, IM. For C/I, S/E, D/I, D/F and W/P, *see* pages 14/17
- 

###### **Control & Prophylaxis**

- Direct contact with carriers or rodents should be avoided.
  - Vaccination for the most endemic serovar.
-

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*Public health significance:* Leptospira are zoonotic and transmitted to humans by contact.

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### **Listeriosis**

Listeriosis is a sporadic bacterial infection that affects a wide range of animals, including man and birds. It is principally caused by *Listeria monocytogenes*, and occasionally by *L. ivanovii*. The natural habitat is soil and the mammalian intestinal tract and vegetation and silage become contaminated with soil and/or feces. Humans acquire infection by consuming not well cooked animal products.

#### ***Clinical Symptoms***

The characteristic symptoms are encephalitis or meningoencephalitis, and abortion in adult cattle; perinatal mortality, septicemia and fever in neonatal ruminants. Animals with encephalitis propel themselves into corners, lean against stationary objects, or circle toward the affected side. Facial paralysis, and inability to control balance are also observed.

#### ***Diagnosis***

Isolation of *L. monocytogenes* from brain and aborted placenta and fetus; occasionally from the spinal fluid, nasal discharge, urine, feces, and milk of clinically ill ruminants.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

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#### Management

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Supportive treatment

- *Fluids and electrolytes*

Drug treatment

*First line*

- Procaine penicillin G, initially 44,000 IU/kg, IM or SC q 12 h for 7-14 days, then 22,000 IU/kg for 7 to 14 days, *see page 14.*
- Ampicillin 5-10 mg/kg, IM, or IV, SC, q 8-12 h; W/P 10 days, *see page 14*

or

- Amoxicillin 4-7 mg/kg, IM q 12-24 h, W/P 30 days. For C/I, S/E, D/I, D/F and W/P, *see page 14*

*Secondary*

- Erythromycin 2.2-4.4mg/kg, IM, C/I, S/E, D/I, D/F and W/P, *see page 19*

or

- Trimethoprim-sulfadoxine 2.7mg/kg + 13.3mg/kg q 24 h for 5 days. For C/I, S/E, D/I, D/F *see page 17*; W/P: meat 10 days; milk 4 days.

---

*Note:* High doses are required because of the difficulty in achieving minimum bactericidal concentrations in the brain.

*Public health significance:* All suspected material should be handled with caution because of its high zoonotic risk. The organism is excreted intermittently but may persist for many months making it hazardous to human health.

---

### **Lumpy Skin Disease**

Lumpy skin disease (LSD) is a highly infectious viral disease of cattle and buffalo characterized by poxlike intracutaneous firm nodules, edema of the limbs, superficial lymphnodes swelling, and lymphangitis. The disease is widely distributed in Ethiopia imposing severe economic loss due to damage of hides.

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### ***Clinical Symptoms***

Painfull swelling, fever, lacrimation, nasal discharge, and hypersalivation followed by characteristic eruptions on the skin and other parts of the body are characteristic; the nodules are circumscribed, round, slightly raised, firm, painfull and involve the entire cutis and mucosa of the gastrointestinal, respiratory and genital tract. The regional lymphnodes are swollen and edema develops in the udder, brisket, and legs. Secodary infections may cause extensive suppuration and sloughing lesions.

### ***Diagnosis***

The widespread nodular lesions of the skin and mucous membranes and biphasic fever are indicative.

### ***Treatment and Prevention***

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#### **Management**

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##### **Drug Treatment**

- There is no effective treatment but secondary bacterial infections are prevented by administration of broad-spectrum antibiotics (*See page 15*).
- 

##### **Prevention**

- Vaccination with sheep/goat poxvirus or LSD strain.
- 

## **Malignant Catarrhal Fever**

Malignant catarrhal fever is an acute, highly fatal viral disease of cattle and other ruminants caused by a lymphotropic herpesvirus. Wild beasts may become sources of infection to cattle.

### ***Clinical Symptoms***

*Peracute form*: generalized disease affecting intestine, head and eye; *Catarrhe form*: mild symptoms of catarrh. The specific signs include high fever, (41-41.6°C), an encrusted muzzle, a

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mucopurulent catarrh, inflammatory and degenerative lesion of erosions of the alimentary tract, swallowing movements are painful with smacking sound, excessive salivation and the respiratory tract associated with bronchopneumonia, ophthalmia with corneal opacity commencing at the limbus with eventual blindness, enlargement of lymph nodes, and diarrhea. Nervous signs include weakness in one leg, incoordination, a demented appearance and muscle tremor (early stage); nystagmus and other nervous signs (late stage).

### ***Diagnosis***

Characteristic pathologic findings, ability to transmit disease by inoculation of blood into susceptible species, serologic conversion, and histopathologic evidence of a necrotizing vasculitis.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- No specific treatment but antibiotic therapy to prevent secondary bacterial invasion (*See page 14*).
  - ✓ *Precautions:* Corticosteroids are contraindicated.
- 

### **Neonatal Diarrhoea**

Diarrhea (Calf Scours) is common in newborn calves characterized by progressive dehydration and death, sometimes in as few as 12 hr. It is caused by a multitude of bacterial, viral and non-infectious agents as summarized in Table 5 below.

### ***Clinical Symptoms***

*Subacute form:* diarrhea may persist for several days and result in malnutrition and emaciation. It is common in dairy calves.

*Acute form:* the major signs are diarrhea, dehydration, profound weakness, and death within one to several days of onset. The signs depend on the etiology.

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### *Diagnosis*

Differential diagnosis of calf scores caused by infectious agents are given in Table 5.

### *Treatment and Prevention*

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#### Management

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Non-drug treatment

Less severe cases (6% body weight loss)

*Electrolyte therapy*

- Fluids should contain sodium, glucose, glycine or alanine, potassium, and either bicarbonate or citrate or acetate as a bicarbonate precursor by stomach tube or nipple.
- Milk should not be withheld for >24 hours

Water loss  $\geq 8\%$  of their body (dehydrated animals)

IV fluid and electrolyte therapy.

*Initial*

- Sodium bicarbonate 13% in isotonic solution, at 100 ml/kg over 4-6 hr; 25-50 g of dextrose may be added to the solution; for C/I, S/E *see* page 5.

*Maintenance*

- A combination of sodium bicarbonate solution and physiological BES, 5-8 ml/kg/hr IV for the next 20 hr. For S/E *see* page 5.

*plus*

- Alterations of the diet

Drug treatment

Antibiotic treatment of diarrhoea caused by *E.coli* is not advisable but should be indicated if there is bacteraemia, navel infections, or infectious arthritis. Combined treatment with antimicrobials *plus* immunoglobulin, and antidiarrheal adsorbent drugs such as activated charcoal.

*Firstline*

- Erythromycin 2.2-4.4mg/kg, IM; For C/I, S/E, D/I, D/F and W/P, *see* page 19

*plus*

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- Dexamethasone 20-200mcg/kg, IM, or 10-30mg/animal, PO *plus* antibiotics; For S/E, C/I, D/I & D/F *see* page 7.

or

- Trimethoprim-sulfadoxine 2.7mg/kg + 13.3mg/kg q 24 h for 5 days; For C/I, S/E, D/I, D/F *see* page 17 and W/P, Meat 10 days.

*plus*

- Dexamethasone, *see* above.

### Prophylaxis

- Isolate diseased animals or move calving and calf rearing to a separate area; provide good general hygiene; provide the dam and neonate with good nutrition and that newborn calves consume  $\geq 5\%$  of their body wt of high-quality colostrum within 6 hr of birth, followed by equivalent amounts q 12 h for 2 days
- Vaccinate the dam 6 and 3 weeks before parturition.

*Note:* The use of antimicrobials is not supported by most clinical trials and not indicated in diarrhea induced by viruses or protozoa.

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Table 5 Differential diagnosis of diseases of calves characterized by diarrhoea.

<b>Aetiology</b>	<b>Age</b>	<b>Clinical signs</b>	<b>Prognosis</b>
Enterotoxigenic <i>E.coli</i>	<3-5 months old, rarely up to 3 weeks	Sudden onset, profuse amount of liquid faeces (pale yellow to white), cold clammy skin, pale mucosa, wet mouth	Poor
<i>Salmonella</i> spp.,	At least 4 days old	Foul smelling feces & contain blood, fibrin, and copious amounts of feces, septicemia, high fever (40.5-41.5°C), depression, coma	
Hemorrhagic enterotoxemia due to <i>C. perfringens</i> type B and C	Few days old that have voracious appetite	Acute onset of depression, weakness, bloody diarrhea, abdominal pain	The calf dies within hours if not detected early
Rota & corona virus, & other viral infection	5-15 days old and even several months old calves	Large volume of feces containing mucus	
	5-35 d old calves, commonly 2 <sup>nd</sup> week	Persistent diarrhea that does not respond to therapy	
Dietary diarrhea	<3 weeks old	Voluminous feces of pasty gelatinous consistency, emaciation at later stages	

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### **Rabies**

Rabies is a fatal viral infection of all warm-blooded animals and transmitted by a bite of infected animals. It is caused by a Rhabdovirus and manifested by motor irritation with clinical signs of mania and an attack complex, and by an ascending paralysis.

#### ***Clinical Symptoms***

Behavioral changes and paralysis with associated symptoms are similar to dogs and cats (*see page* ). Other signs observed in cattle include: cattle attack animate or inanimate objects; lactation ceases abruptly in dairy cattle and instead of the usual placid expression, there is one of alertness. The eyes and ears follow sounds and movement and show characteristic abnormal bellowing, which may continue intermittently until shortly before death.

#### ***Diagnosis***

Clinical diagnosis is difficult, and confused with other diseases. Immunofluorescence microscopy on fresh brain tissue smears stained with Sellers stain is test of choice. The mouse inoculation test or tissue culture techniques using mouse neuroblastoma cells or both are also used.

#### ***Treatment and Prevention***

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##### **Management**

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Drug treatment

- There is no effective treatment.

---

Prevention

- Control of rabies in carnivores.

*Public health significance:* Rabies is the most fatal infectious zoonotic disease transmitted by contact.

---

### **Rift Valley Fever**

Rift Valley fever (RVF) is a peracute or acute zoonotic disease of domestic ruminants caused by RVF virus. The disease is more severe in sheep than in other animals. Though less severe, the epidemiology of RVF in cattle is similar to sheep (*see page*). *Public health significance:* Rift valley fever is a fatal, zoonotic disease transmitted to humans.

### **Rinderpest**

Rinderpest or cattle plague, is a highly contagious, usually fatal, acute or subacute viral disease of ruminants caused by morbilli virus. Ethiopia is declared free of infection since 2005.

#### ***Clinical Symptoms***

Fever, lacrimation, nasal discharge, profuse diarrhea, and necrotic erosions of the epithelium of the mouth and other mucosa of the digestive tract.

#### ***Diagnosis***

Provisional diagnosis is based on history, clinical signs, and pathologic lesions. Infection is confirmed by serologic tests and culture.

#### ***Treatment and Prevention***

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##### **Management**

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###### Drug treatment

- There is no specific treatment available.
- 

###### Prophylaxis

- Maintain disease free status by importation of animals from RP-free countries only; ring vaccination if reintroduced and proper disposal and hygiene of infected animals.
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Salmonellosis**

Salmonellosis is a bacterial disease caused by many species of salmonellae and characterized clinically by one or more of three major syndromes septicemia, acute enteritis and chronic enteritis in young calves. Stress factors precipitate clinical disease.

#### ***Clinical Symptoms***

The clinical signs include acute illness with depression, fever; cessation of milk flow, severe diarrhea and the feces is fetid and watery containing mucus; fibrinous casts and sometimes blood. Persistent diarrhea and unthriftiness characterize chronic cases.

#### ***Diagnosis***

The clinical syndromes usually are characteristic. Serological tests and isolation are confirmatory.

#### ***Treatment and Prevention***

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##### **Management**

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Non drug treatment

- Good nursing care, good hygiene, and if possible, separation of the sick from healthy animals.

Drug treatment

- Gentamicin, 3.5 mg/kg, IM, q 8 h for 3-5 days. For C/I, S/E, D/I, D/F and W/P, *see* page 35

or

- Trimethoprim-sulfadiazine 30 mg/kg, PO for 3-5 days. For C/I, S/E, D/I, D/F and W/P, *see* page 17

or

- Ampicillin 15 mg/kg q12 h, IM or 25 mg/kg PO (calves) for 3-5 days. For C/I, S/E, D/I, D/F and W/P are similar to penicillin, *see* page 14

or

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- Enrofloxacin 5mg/kg , SC, q 24 h for 3-5 days.
    - ✓ S/E: arthropathy in young animals.
    - ✓ C/I: in pregnant animals, hypersensitivity to enrofloxacin, serious liver impairment and renal function.
    - ✓ D/F: tablets, 50mg; oral suspension, 2.5, 10 and 25%; injection 5, 10 and 20%.
    - ✓ W/P: meat 8 days.
    - ✓ D/I: tetracyclines, chloramphenicol, macrolides and lincosamides.
- 

### Prophylaxis

- Carrier animals should be isolated and culled or treated vigorously. Recheck animals several times, clean contaminated buildings, dispose contaminated materials and minimize stress in outbreaks.

*Note:* Early treatment is essential for septicemic salmonellosis.

*Precautions:* Antibiotic resistance development is common; therefore, routine antibiotics sensitivity tests are required

*Public health significance:* Antibiotic-resistant strains of salmonellae may also subsequently infect man.

---

## **Tetanus**

Tetanus toxemia is caused by a specific neurotoxin produced by *Clostridium tetani* growing in necrotic tissue. Almost all mammals are susceptible to this disease.

### ***Clinical Symptoms***

The signs progress from stiff gait, prolapse of the third eyelid, and trismus (lockjaw) extending to the head, neck and all four extremities, and the tail. Other signs include exaggerated response external stimuli, erection of the ears, and drooling of saliva. As the disease progresses, titanic convulsions, accompanied by opisthotonos occur following external stimuli.

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### *Diagnosis*

It is usually made by its typical signs.

### *Treatment and Prevention*

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#### **Management**

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Non drug treatment

- Wound debridment
- Keep animals in the dark, quiet place
- Observe if bloat occurs and treat accordingly, *see* page 3

Drug treatment

- Procaine penicillin G 40,000 IU/kg, q 24 h, IM or 25,000IU/kg q 12 h, for 3-5 days followed by q 24 h for another 5 days. For C/I, S/E, D/I, D/F, and W/P, *see* page 14

or

- Tetanus antitoxin 1500 IU, SC, q 24 h for 3-5 days

*plus*

- Acetylpromazine 0.05 mg/kg, IM, q 12 h
  - ✓ S/E and C/I: at higher dose, profound cardiovascular effects occur; contra-indicated in pregnant animals.
  - ✓ D/F: injection, 2 and 10 mg/ml; Tablet, 10 mg or 25 mg
  - ✓ D/I: anti-epileptic drugs, antimuscarinic drugs, metoclorpramide, combination with any other CNS depressant drugs, may potentiate toxicity of organophosphates.

or

- Xylazine 0.05-1 mg/kg, IM or 0.016 to 0.034 mg/k IV q 12 h until severe signs subside (10-12 days)
  - ✓ S/E: bradycardia, arrhythmia and reduced respiratory rate. use with caution with other CNS depressants.
  - ✓ C/I: late pregnancy in animals
  - ✓ D/F: injection, 20 and 100 mg/ml

---

Prophylaxis

- Clean wound with with antiseptics; if contamination is minimal, open wound healing is preferred.
-

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### **Theileriosis**

Theileriosis is a devastating protozoan disease of cattle prevalent in East Africa caused by *Theileria parva*. The parasite is transmitted by the tick species, *Rhipicephalus appendiculatus*. The disease and its vector do not exist in Ethiopia; however its presence in other East African nations such as Kenya and Uganda similar clinical manifestations have to be investigated thoroughly.

#### ***Clinical Symptoms***

High fever (41-42°C) for up to 3 weeks, generalized adenitis, epistaxis and lacrimation, leukopenia, anemia are common. Other signs include pulmonary edema, ruminal atony, and alternate constipation and diarrhea. Abortion and agalactiae may appear early in pregnancy or in lactating cows.

#### ***Diagnosis***

History and clinical symptoms are indicative. Lymph node and blood smear examination are needed as confirmatory.

#### ***Treatment and Prevention***

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##### **Management**

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##### Drug treatment

- Imidocarb 2.5 mg/kg, 12% IM or SC, stat  
C/I, S/E, D/I, D/F and W/P: *see* page 27

or

- Parvaquone 10 mg/kg, IM, q 48 h, two treatments  
C/I, S/E, D/I, D/F and W/P: *see* page 33

or

- Buparvaquone 2.5 mg/kg, IM, single dose.  
C/I, S/E, D/I, D/F and W/P: *see* page 33
- 

##### Prophylaxis

- Tick control

*Note:* These drugs do not sterilize infection and recovered animals remain carriers.

---

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Trypanosomosis**

Trypanosomosis is a chronic disease of cattle caused by protozoa of the genus *Trypanosoma*. Depending on the species of parasite, the organisms are transmitted cyclically by Tsetse flies of the genus *Glossina* or mechanically by tsetse or other biting flies. The disease is the most economically damaging and widely distributed in most parts of Ethiopia.

#### ***Clinical Symptoms***

Intermittent fever, anemia, and weight loss; high mortality, especially if there is poor nutrition or other stress factors.

#### ***Diagnosis***

In an endemic area, anemic animal in poor condition is suggestive. Confirmation depends on demonstrating trypanosomes in stained blood smears or wet mounts.

#### ***Treatment and Prevention***

Chemotherapy of trypanosomosis is given in page 77.

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Table 6. Treatment and prophylaxis of bovine trypanosomosis using drugs

Drug	Preparation	Trypanosoma	Main Action
Diminazene aceturate	1.05 g sachet dissolved in 10 ml of sterile distilled water	<i>T.vivax, T.congolense,</i> <i>T.brucei</i>	Curative (with the possible exception of brucei)
Homidium bromide (Ethidium bromide)	250 mg tablets	<i>vivax, congolense, brucei</i>	Curative
Homidium chloride (Novidium chloride)	250 mg tablets	As for the bromide salt	
Isometamidium (samorin)	1 g or 125mg sachet	<i>vivax, congolense</i>	Curative and prophylactic
Prothidium		<i>vivax, congolense</i>	Curative and prophylactic
Quinapyramine sulfate (Antrycide sulfate)	1 g powder	<i>vivax, congolense,</i> <i>brucei, evansi</i>	Curative
Quinapyramine (Antrycide prosalt)	1g powder	<i>vivax, congolense, simiae</i>	Prophylactic

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Dosage forms, side effects, contraindications, drug interactions and precautions of babesicidal and trypanocidal drugs listed above are given as follows.

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1. Diminazene aceturate +/-phenazone
    - ✓ S /E: reaction may occur at the site of injection
    - ✓ D/F: powder / granule, 1.1 g, 1.05 g, 495 mg and 444 mg; injection solution (aqueous), 35 mg/ml
    - ✓ *Caution:* It should be used within 5 days from date of solution preparation and 14 days if kept in refrigerator.
  2. Homidium
    - ✓ S /E: local swelling at injection site and transient lameness.
    - ✓ D/F: tablet for injection, 250mg
  3. Isomethamidium
    - ✓ S /E: local transient reaction at injection site
    - ✓ D/F: powder for injection, 125 mg and 1 gm
  4. Quinapyramine
    - ✓ S/E: trembling, sweating, salivation, increased respiration and heart rate, collapse and death.
    - ✓ D/F: powder for injection, 1 gm
- 

### ***Control***

Control of tsetse flies includes

- Frequent spraying and dipping of animals (mobile targets).
- Spraying insecticides on fly-breeding areas.
- Bush clearing and other methods.
- Insecticides-impregnated screens (fixed targets).
- Spray mobile target ( eg. Pour-on on cattle).

*Precautions:* The problem of drug resistance must be carefully monitored by frequent blood examinations for trypanosomes in treated animals.

---

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Tuberculosis**

Tuberculosis (TB) is an infectious, granulomatous disease animals and man caused by acid-fast bacilli of the genus *Mycobacterium*. The main tubercle bacillus in cattle is *M. bovis*, though *M. tuberculosis* and *M. avium* are also involved. *Mycobacterium bovis* can cause progressive disease in most warm-blooded vertebrates, including man.

#### ***Clinical Symptoms***

Tuberculosis has two clinical forms: pulmonary or extrapulmonary. In the latter form, generalized signs including progressive emaciation, lethargy, weakness, anorexia, and a low-grade, fluctuating fever are observed. The respiratory form of the disease causes a chronic, intermittent, moist cough with later signs of dyspnea and tachypnea.

#### ***Diagnosis***

Single or comparative intradermal tuberculin test; confirmation of diagnosis requires isolation and identification of the organism, which may take 4 to 8 weeks.

#### ***Treatment and Prevaltion***

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##### **Management**

---

###### **Drug treatment**

Treatment of bovine tuberculosis is not recommended because it is not economical. However, in valuable animals:

- Isonicotinic acid hydrazine/isoniazid (INH), 20 mg/kg, PO q 24 h for 8 weeks, maximum is 12g for bulls and 10g/day for cows.
  - ✓ S/E: hepatotoxic, cause peripheral neuropathy and is also both enzyme inducer and inhibitor.

---

###### **Prevention**

- Keep herds free by test and slaughter of reactors.
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

*Public health significance:* the disease is transmitted to humans mainly via consumption of raw milk. Thus, milk should be boiled or pasteurized before consumption.

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### **Diseases of the Respiratory System**

#### **Aspiration Pneumonia**

Aspiration pneumonia is a common type of pneumonia caused by aspiration of foreign material into the lungs. The most common causes of aspiration pneumonia are faulty administration of medicines or other supplement and especially if the tongue is pulled out, and the head is held high, or during coughing or bellowing. Other predisposing causes include aspiration of vomitus, anaesthetized or comatose animals, vagal paralysis, acute pharyngitis, abscesses or tumors of pharyngeal region and cleft palate. It is most common in Ethiopia because most cattle owners attempt to drench traditional medicines before consulting an animal health professional.

#### ***Clinical Symptoms***

Fluid sounds over one or both sides of the chest, followed by wheezing sounds, pleuritic friction rubs, and sometimes crackling sounds of subcutaneous emphysema; toxæmia may occur if ruminal fluid is aspirated.

#### ***Diagnosis***

History of the animals within the last 2-3 days, auscultation and clinical signs are indicative.

#### ***Treatment and Prevention***

---

##### **Management**

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Non drug treatment

- Keep the animal quiet.
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### Drug treatment

- Administer with broad-spectrum antibiotics (*see* page 77/78).
- 

## **Bovine Respiratory Disease Complex**

Bovine respiratory disease complex (BRD) is a multifactorial disease due to interactions between viruses, bacteria and physical, psychologic, physiologic, and environmental stress factors. In uncomplicated viral infections, the signs are subclinical, and in severe cases, a bacterial bronchopneumonia and/or fibrinous pneumonia are always present.

### ***Clinical Symptoms***

High fever (42.2°C), especially when the ambient temperature is high, dry muzzle, nasal discharge, and as the disease progresses inappetence, dyspnea with extended head and opening mouth breathing are observed. The distribution of the lesion is usually anteroventral.

### ***Treatment and Prevention***

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#### **Management**

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### Drug treatment

- Procaine penicillin G, 22,000 IU/kg, IM or SC q 24 h for 3 to 5 days or benzathine penicillin or other repository preparations q 48-72 h. For S/E, C/I, D/I, D/F and W/P, *see* page 14

or

- Amoxicillin trihydrate 11 mg/kg, IM, SC q 24 h, for 5 days.
  - ✓ S/E: in calves diarrhea and malabsorption.
  - ✓ C/I: hypersensitivity reaction to penicillins and cephalosporins; disrupts rumen flora.
  - ✓ D/F: powder; 0.1, 0.15, 0.2, 0.5, 20, 70 and 75%
  - ✓ W/P: meat 25 hrs; milk 96 hrs

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

or

- Oxytetracycline hydrochloride 11 mg/kg, SC q 24h for 3 days; LA formulations, 20 mg/kg, IM, q 48 h continued for at least 2 days after the rectal temperature has returned to the normal range. S/E, C/I, D /F, D/I, *see* page 14.
- W/P: meat 16 days; milk 84 hours

or

- Sulfadimethoxine

*Initial dose:* 60 mg/kg; *maintenance dose:* 30 mg/kg, IM, q 24 h for 3-4 days.

✓ W/P: milk 5 days

✓ *Precautions:* maintain an adequate water intake.

or

- Spectinomycin dihydrochloride pentahydrate, 33 mg/kg, SC, q 8 h for 5 days. S/E,C/I, D/I, D/F, & W/P *see* page 20

or

- Tylosin 44 mg/kg, IM, q 24 h for 5-7 days. For S/E, C/I, D/I, D/F & W/P *see* page 35

or

- Ceftiofur sodium 2.2 mg/kg IM, SC q 12 h
- ✓ S/E: Hypersensitivity reactions, potential nephrotoxicity
- ✓ W/P, meat nil; milk 72 h

*Note:* Early treatment is usually effective; it should be continued 2 days after the clinical signs subside. Broncho- and fibrous-pneumonia due to *Pasteurella* and *A. pyogenes* is usually resistance to dihydrostreptomycin and erythromycin, and always resistant to tylosin.

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## **Contagious Bovine Pleuropneumonia (CBPP)**

This highly contagious pneumonia of cattle is caused by *Mycoplasma mycoides* subspecies *mycoides* (small colony type) and transmitted to susceptible cattle by aerosol. The disease is prevalent mainly in pastoralist areas of Ethiopia with up to 10% prevalence.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Fever (41.5°C), anorexia, difficult breathing, grunt at expiration, cough when forced to move, standing with the elbows apart, and arched back and the head extended. A quarter of the animals may recover but remain carriers, and 50% die of infection. Subclinical cases occur and may be important sources of infection.

### ***Diagnosis***

Clinical signs, the complement fixation test and its characteristic marble appearance of the lung in dead animals.

### ***Treatment and Prevention***

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#### **Management**

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Non drug treatment

- Culling sick animals is preferred; however, treatment may be indicated if this option is not worth.

Drug treatment

Treatment is not recommended, because animals remain carriers after treatment; however, treatment could be attempted in valuable animals.

- Tylosin 10 mg/kg, IM, q 12 h for 3-5 days. For S/E, C/I, D/F, D/I, W/P, *see* page 35

or

- Oxytetracycline 10 mg/kg, IM, for 5 days. For S/E, C/I, D/I, D/F and W/P: *see* page 14
- 

Prophylaxis

- Vaccination
- 

### **Enzootic Pneumonia**

Enzootic pneumonia is primarily a problem in calves <6 months old but may be seen in calves up to 1 year of age. It is more common in housed dairy calves than those raised outside. Peak incidence of disease may coincide with decline of passively acquired immunity. Morbidity rates may approach 100%; case

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

fatality rates are variable but can reach 20%. The etiology is similar to Bovine Respiratory Disease complex (*See Diseases of Cattle: Bovine Respiratory Disease Complex* above).

### ***Clinical Symptoms and Diagnosis***

Depend on individual viral and bacterial etiologies.

### ***Treatment and Prevention***

---

#### **Management**

---

Drug treatment

- There is not effective drug treatment

Control and Prophylaxis

- Vaccinate cows against specific respiratory viruses and bacteria 3-4 weeks prepartum to improve the quality of colostrum antibodies.
  - Vaccination against respiratory viruses 3-4 weeks before the first grouping. Passive immunity should be considered.
  - The severity of the pneumonia may be decreased by improved husbandry, proper housing, adequate ventilation, and good nursing care.
  - Calves should receive quality colostrum at 8-10% of body weight in the first 12 h after birth.
  - Group calves of similar age with all-in all-out management system.
- 

## **Mycotic Pneumonia**

The fungi *Cryptococcus*, *Histoplasma*, *Coccidioides*, *Blastomyces*, and *Aspergillus* spp, as well as other fungi, have been identified as causative agents of chronic pneumonia in domestic animals.

### ***Clinical Symptoms***

The disease is manifested by a short, moist cough, thick, mucoid nasal discharge, dyspnea, emaciation, and generalized weakness, on auscultation, harsh respiratory sounds are heard

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

and in advanced cases, breath sounds are decreased or almost inaudible.

### ***Diagnosis***

A tentative diagnosis is based on clinical signs and absence of response to antibiotic therapy. Definitive diagnosis requires laboratory confirmation by appropriate microbiology and histopathology.

### ***Treatment and Prevention***

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#### **Management**

---

##### Drug treatment

There is no satisfactory method of treating systemic mycotic infections with some responding to

- Ketoconazole 10-30 mg/kg, in splitted doses. S/E, C/I, D/I, D/F & W/P *see page 37*
- 

### **Pneumonia**

Pneumonia is inflammation of the pulmonary parenchyma usually accompanied by inflammation of the bronchioles and often by pleurisy. Important pathogens associated with pneumonia in cattle are *Mannheimia haemolytica* serotype A, *Haemophilus somnus*, *P. multocida*, *Mycobacterium bovis*, *Mycoplasma mycoides* subspecies *mycoides* small colony type, parainfluenza virus 3, bovine respiratory syncytial virus, bovine herpes virus 1 and bovine viral diarrhoea.

### ***Clinical Symptoms***

It is manifested clinically by an increase in respiratory rate, cough, abnormal breath sounds on auscultation and, in most bacterial pneumonias, by evidence of toxemia. Bronchopneumonia is usually accompanied by a moist, painful cough; interstitial pneumonia is characterized by frequent, hacking coughs, often in paroxysms. The presence of nasal discharge

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

depends on accompanying inflammation of the upper respiratory tract. Aetiologic based pneumonia are discussed in each section.

### ***Diagnosis***

The clinician has to decide whether there is pneumonia and if there is, then determine the nature and cause of the pneumonia.

### ***Treatment and Prevention***

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#### **Management**

---

##### Non-drug treatment

- The treatment of pneumonia depends on the etiology
- Nursing: sick animals should be provided with shelter; animals should be given good quality long-stem pasture

##### Drug treatment

- Sulfamethazine: *initial* 220 mg/kg; *maintenance* 110 mg/kg q 24 h, PO for 5-7 days. For S/E, C/I, D/I, D/F and W/P (similar to other sulfa drugs) *see* page 17

or

- Procaine penicillin G, 22,000 IU/kg, aqueous suspension, IM or SC q 24 h for 3 to 5 days or benzathine penicillin G or a similar repository preparation, q 48-72 h. S/E, C/I, D/F, D/I, W/P, *see* page 14

or

- Ampicillin trihydrate 22 mg/kg, IM, SC, q 24 h for 3-6 days. S/E, C/I, D/F, D/I, W/P, *see* page 14

or

- Amoxicillin trihydrate 11 mg/kg, IM, SC, q 24 h for 3-7 days. S/E, C/I, D/F, D/I, W/P, *see* page 77

or

- Oxytetracycline hydrochloride 11 mg/kg, SC, q 24 h or long acting formulation, 20 mg/kg, IM, q 48 h for 3-5 days. S/E, C/I, D/I, D/F & W/P *see* page 14

or

- Tylosin 44 mg/kg, IM, q 24 h for 3-5 days. S/E, C/I, D/F, D/I, W/P, *see* page 35
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics** **Pneumonic Pasteurellosis (Shipping Fever)**

Shipping fever pneumonia is a respiratory disease of cattle of multifactorial etiology. It is associated with infection by *Mannheimia [Pasteurella] haemolytica*, *Pasteurella trehalosi* and, less commonly, *P. multocida* or *Haemophilus somnus* and in chronic pneumonia with pulmonary abscessation *Arcanobacterium pyogenes* is frequently isolated. Multiple stress factors that precipitate the disease include transportation over long distances in association with starvation, exhaustion, dehydration, chilling and overheating depending on weather conditions, and exposure to vehicle exhaust fumes. The disease is clinically characterized by depression, loss of appetite, and fever, increased respiratory rate and shallow respiration.

### ***Clinical Symptoms***

Depression, toxemia, pyrexia (40-41°C), serous to mucopurulent nasal discharge, moist cough, and a rapid, shallow respiratory rate, increased bronchial sounds, crackles, and wheezes. In severe cases, pleurisy may develop, which is characterized by an irregular breathing pattern and grunting on expiration, mucoid or purulent nasal discharge. The animal may become unthrifty in chronic cases.

### ***Diagnosis***

Microbiological culture from the lower respiratory tract by tracheal swab, transtracheal wash, or bronchoalveolar lavage.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics** ***Treatment and Prevention***

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### **Management**

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#### Drug treatment

- It is similar to bovine respiratory diseases.

#### Prophylaxis

- Mass prophylactic medication with antibiotics before stress with:

- Oxytetracycline (LA) 20 mg/kg, IM q 72 h, *see* page 14.

or

- Tilmicosin 10 mg/kg, SC q 72 h for 3 days.

*Note:* Early recognition and treatment with antibiotics is essential for successful therapy. If one treatment fails continue with other drugs.

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## **Verminous Pneumonia**

Verminous pneumonia (lungworm infection, parasitic pneumonia) is an infection of the lower respiratory tract of cattle by a nematode parasite, *Dictyocaulus viviparous*. It is characterized by bronchitis or pneumonia, which may be aggravated by secondary bacterial pneumonia.

### ***Clinical Symptoms***

In acute verminous pneumonia, frequent bronchial cough that may be persistent, slight nasal discharge, fever (40-41°C), increased vesicular murmur and bronchial tones, dyspnea, expiratory grunt, cyanosis and death are common signs. In adult dairy cattle, milk yield drops severely, and abnormal lung sounds are heard over the caudal lobes.

### ***Diagnosis***

Clinical signs, epidemiology, presence of first-stage larvae in feces using the Baerman technique.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics** ***Treatment and Prevention***

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### **Management**

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#### Drug treatment

- Levamisole 15mg/kg, PO, stat. S/E, C/I, D/F, D/I, W/P, *see* page 46
- or
- Fenbendazole 5-15 mg/kg q 24 h, PO for 3 days. S/E, C/I, D/F, D/I, W/P, *see* page 46
- or
- Oxfendazole 4.5 mg/kg, PO, stat. S/E, C/I, D/F, D/I, W/P, *see* page 52
- or
- Albendazole 7.5 mg/kg, PO, stat. S/E, C/I, D/F, D/I, W/P, *see* page 48
- or
- Ivermectin 200 mcg/kg, SC, stat acts against all stages of *D.viviparous*. S/E, C/I, D/F, D/I, W/P, *see* page 52
- 

## **Diseases of the Reproductive System**

### **Abortion**

Abortion is the termination of pregnancy after organogenesis is complete but before the expelled fetus can survive. If pregnancy ends before organogenesis, it may be called early embryonic death. A dead full-term fetus is a stillbirth (its lungs are not inflated). The causes of abortion could be infectious or non-infectious. Non-infectious causes of abortion include heat stress, hypoxia, and acidosis. Severe trauma may rarely result in abortion. The most important infectious causes of abortion are listed in Table 7. In additions, any disease causing high fever may also cause abortion.

### ***Diagnosis***

Diagnosis requires examination of fetus and placenta and serological tests.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Prevention and control***

- A balanced nutritional program
- Genetic selection and a functional record keeping system
- Adequate facilities for housing, handling, and environmental control.
- A positive working condition between cattlemen and the veterinarian need to be established.
- Regular immunizations against diseases that cause abortion.

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Table 7. Infectious causes of abortion in cow.

<b>Disease</b>	<b>Period of abortion</b>	<b>Clinical signs or lesions</b>	<b>Diagnosis</b>	<b>Control</b>
Bovine Viral Diarrhea (BVD)	42 and 125 days of gestation	Fetal death and abortion or resorption, or fetal immunotolerance and persistent infection; fetal mummification or deformity.	<ul style="list-style-type: none"> <li>• Diagnosis is difficult because BVD does not cause specific fetal lesions</li> <li>• Serological methods could be used.</li> </ul>	Vaccination
Infectious Bovine Rhinotracheitis (IBR, Bovine Herpesvirus 1)	≥4 months	Placentitis, infected fetus dies within 24 hr; placentitis with blanched, necrotic cotyledons and edematous, yellow intercotyledonary areas; fetus autolysed.	Fluorescent antibody on kidney, histopathology of liver and adrenal, and serology.	vaccination
Leptospirosis	Last trimester, 2-6 wk after an outbreak occurred	Placentitis with avascular, light tan cotyledons and edematous, yellowish intercotyledonary areas fetus autolysed.	Darkfield or phase-contrast microscopy and fluorescent antibody, Microbiological culture of the dam's urine.	Identify the source of infection & control

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

Table 7 Infectious causes of abortion in a cow. ....cont'd

<b>Disease</b>	<b>Period of abortion</b>	<b>Clinical signs or lesions</b>	<b>Diagnosis</b>	<b>Control</b>
Brucellosis	Second half of gestation (usually around 7 <sup>th</sup> month ),	Cotyledons may be normal to necrotic, and red or yellow: The intercotyledonary area is focally thickened with a wet, leathery fetus may be autolysed with broncho-pneumonia.	Maternal serology	Artificial insemination and maternity hygiene
Mycotic Abortion	≥ 4 months	Cotyledons are enlarged and necrotic with turned-in margins. The intercotyledonary area is thickened and leathery. Adventitious placentation fetus seldom is autolyzed	hyphae associated with fetal dermatitis (especially eyelids), bronchopneumonia, abomasal contents, and placental lesions.	Moldy feed should be avoided

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

Table 7. Infectious causes of abortion in a cow. ....cont'd

<b>Disease</b>	<b>Period of abortion</b>	<b>Clinical signs or lesions</b>	<b>Diagnosis principle</b>	<b>Control</b>
Campylobacteriosis	5 and 8 months (rare)	Mild fibrinous pleuritis and peritonitis , bronchopneumonia; mild placentitis with hemorrhagic cotyledons and an edematous intercotyledonary area, infertility	Darkfield microscopy of abomasal contents or culture of placenta or abomasal contents; histopathology is also helpful. Abortion is sporadic.	Artificial insemination and vaccination
Listeriosis	At any stage of gestation	Sporadic abortion. The fetal liver is shrunken and gray and contains pinpoint microabscesses. Necrosis of the cotyledons and intercotyledonary area	Culture of Listeria from fetus or placenta	
Chlamydiosis	Sporadic abortion $\geq$ 4 months	Placentitis, fetal pneumonia, and hepatitis	Stained smears of cotyledons tissues, culture in embryonating chicken eggs	Ovine chlamydial vaccine

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### **Bovine Mastitis**

Mastitis, an inflammation of the mammary gland, is almost always due infection by bacterial or mycotic pathogens. Although over 135 microorganisms have been reported to cause the disease, *Staphylococcus aureus*, *Streptococcus agalactiae*, *Str. uberis*, *Str. dysgalactiae*, other streptococci, *Arcanobacterium pyogenes*, *Mycoplasma* spp, *Nocardia asteroides* and coliforms are the most common agents.

#### ***Clinical Symptoms***

Clinical mastitis is manifested by inflammation of the udder and often accompanied by abnormal milk secretions. The signs depend on the organisms involved. Systemic signs could also be observed. Subclinical mastitis is the most common.

The clinical signs are usually non-specific, but the following gives a clue for the type of agent involved.

Microorganism	Clinical findings
<i>Staphylococcus aureus</i>	Severe swelling, purulent milk with clots.
<i>Mycoplasma</i> species	Drop in milk production, infection of all quarters simultaneously.
<i>Arcanobacterium pyogenes</i>	Profuse, foul-smelling, purulent discharge.
<i>Mycoplasma bovis</i>	Rapid onset.

#### ***Diagnosis***

It is based on clinical signs, and identification of the pathogen. Tests to detect subclinical mastitis include California Mastitis Test, or direct somatic cell count.

***Treatment and Prevention***

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**Management**

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Drug treatment

Treatment depends on the type of infecting organism and the stage of mammary gland damage

*Subclinical infections*

- Intramammary infusion, q 48 h for 3 times, applied separately into every quarter.

*Peracute or acute staphylococcal mastitis:*

*Systemic treatment*

- Procaine penicillin G 22,000 IU/kg, aqueous suspension, IM or SC q 24 h for 3 to 5 days or benzathine penicillin G or a similar repository preparation, q 48-72 h. For S/E, C/I, D/F, D/I, W/P, *see* page 14

or

- Amoxicillin or Ampicillin 10 mg/kg, q 24 h, IM
  - ✓ W/P: meat 6 days; milk 96 hr
  - ✓ Long acting penicillin preparation before drying the cow C/I, S/E, D/I: *see* page/s 14 & 77

or

- Erythromycin 12.5 mg/kg, q 24 h, IM
  - ✓ W/P: milk 96 h; meat 28 days
  - ✓ C/I, S/E, D/I: *see* page 19

or

- Oxytetracycline 10 mg/kg, q 24 h, IV
    - ✓ W/P: milk 96 hr; meat 14-28 days; for C/I, S/E, D/I: *see* page 14
- 

Or

- Sulfonamides 200 mg/kg, q 24 h, PO
  - ✓ W/P: milk 72 hr; meat 10 days; for C/I, S/E, D/I: are similar to other sulfa drugs, *see* page 17

or

- Potentiated Sulfonamides 48 mg/kg, q 48 hr, IM
    - ✓ W/P: milk 72 hr; meat 12 days; for C/I, S/E, D/I *see* page 17
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### *Intramammary infusion*

Each tube of intramammary infusion should contain one of the following:

- Benzathine Cloxacillin, 500mg for 3 days
  - ✓ S/E: like benzathine or procaine penicillin (*see* page 14).
  - ✓ C/I: hypersensitivity and not recommended to food producing animals
  - ✓ D/F: intramammary suspension, 500, 625 mg/dose

or

- Erythromycin 300 mg/quarter intramammary for 3-5 days. For S/E, C/I, D/F *see* page 19
  - ✓ W/P: milk 36 hours (intramammary infusion), or 72 hours (after IM).

or

- Streptomycin *plus* penicillin (1 g + 100,000 IU per quarter for 3-5 days. S/E, D/I, D/F, C/I, *see* page 14/17.
- Neomycin 500 mg per quarter for 3 days. S/E, C/I, D/I, D/F & W/P *see* page 65

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### Prevention

- Disinfection of the teat before and after milking.
  - Dry cow therapy with long acting penicillin preparation should be applied before drying the cow.
- 

## **Dystocia**

Difficult birth may result from myometrial defects, metabolic abnormalities such as hypocalcemia, inadequate pelvic diameter, insufficient dilation of the birth canal, fetal hormone (corticosteroid) deficiency, fetal oversize, fetal death, or abnormal fetal presentation and posture. Dystocia is considered if the animal had previous history of the condition and parturition does not occur within 24 hr after the drop in rectal temperature (to  $<37.7^{\circ}\text{C}$ ) or if gestation is prolonged.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Treatment and Prevention***

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#### **Management**

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##### Non-drug treatment

- Determine the cause of dystocia and the condition of the animal before treatment commences.
  - Manual correction of abnormal position of the fetus
  - Surgical removal or fetotomy
- 

##### Prevention

- Cull heifers with narrow pelvic area
- 

### **Follicular Cystic Ovary Disease**

Cystic ovary disease (Follicular cysts, Cystic follicles, Nymphomania, “Bulling”) primarily affects dairy cattle, and occurs within 3-8 wk of parturition. In animals developing cystic ovary disease, ovulation fails to occur and the dominant follicle continues to enlarge. The cause is not completely known; however, insufficient release of Luteinizing hormone (LH) occurs at the time of ovulation.

#### ***Clinical Symptoms***

Cows may show signs ranging from constant estrus activity to nearly complete anestrus. Behavioural change ranges from frequent, intermittent estrus with exaggerated monosexual drives to bull like behaviour, including mounting, pawing the ground, and bellowing. Relaxation of the vulva, perineum, and the large pelvic ligaments, which causes the tail head to be elevated, is common in chronic cases.

#### ***Diagnosis***

Rectal palpation and history, conformation, and uterine changes, when present and ultrasound per rectum could be beneficial.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### Treatment and Prevention

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#### Management

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##### Non-drug treatment

- Manual rupture with moderate pressure on the ovary with the finger pads against the palm of the hand; estrus is expected after 4-7 or 15-25 days.

---

##### Drug treatment

- Gonadotropin-releasing hormone (Gn-RH) 100mcg, IM; Cows come in estrus within 5-30 days (peak 19-23 days); few may require second or even third treatment.
  - ✓ D/F: Injection, 4 mcg/ml

or

- Luteinizing hormone (LH) 500 mcg/ animal, IM
  - ✓ S/E: Gastrointestina disturbances, transient cardiovascular symptoms and rarely convulsion.
  - ✓ D/I: Sequential administration with oxiotoxic drugs causes marked hypertension, vomiting, and severe dysnoea
  - ✓ S/E: It can be absorbed through skin and care should be taken in handling.
  - ✓ C/I: Concurrent use with non-steroidal anti-inflammatory drugs; pregnant animals abort.
  - ✓ W/P: Meat 1 day; milk nil
  - ✓ D/F: Injection, 250mcg/ml, 0.075mg/ml

or

- Human chorionic gonadotropic (HCG), 10,000 units IM or 2,500 to 5,000 units IV or by intrafollicular injection of 500 to 2500 units; may be repeated in 14 days if necessary.
  - ✓ *Precaution:* Prior to reconstitution, keep at 15-30°C; after reconstitution, keep refrigerated for not more than 30 days
  - ✓ *Antidote:* Epinephrine hydrochloride and parenteral antihistamine.
  - ✓ S/E: anaphylactic reaction may occur
  - ✓ D/F: Powder for injection, 500 units, 1000 units.
- Prostaglandins can be administered 9-10 days after HCG or Gn-RH to hasten onset of estrus.

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*Note:* Many cows can recover spontaneously without treatment.

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## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### **Luteal Cystic Ovary Disease**

Luteal cystic ovary disease (luteal cysts) is characterized by enlarged ovaries with one or more cysts, the walls of which are thicker than those of follicular cysts. Luteal cysts are an extension of follicular cysts such that the nonovulatory follicle is partially luteinized spontaneously or in response to hormonal therapy. Luteal cysts are accompanied by normal conformation and anestrus behavior. They are recognized as smooth, fluctuant domes protruding above the surface of the ovary. Usually, they are single structures.

#### ***Clinical Symptoms and Diagnosis***

It is accompanied by normal conformation and anestrus behaviour. Follicular cysts explode under minimal pressure while luteal cysts can be ruptured with considerable pressure.

#### ***Treatment and Prevention***

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##### **Management**

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###### Drug treatment

- Luteolytic doses of PGF<sub>2</sub> $\alpha$  like synthetic Cloprostenol, 500 mcg per animal, IM. For S/E, C/I, D/F & W/P, *see* page 94
- or
- HCG and Gn-RH, 10,000 units IM or 2,500 to 5,000 units IV or by intrafollicular injection of 500 to 2500 units but the next estrus could occur from 5 to 21 days after treatment. For S/E, D/F, *see* Page 94

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###### Prophylaxis

- The same procedures applied for follicular cystic ovary (as above) are effective.

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*Note:* Manual rupture of luteal cysts is not recommended.

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics** **Metritis and Endometritis**

It is the inflammation of the muscular and endometrial layers of the uterus. Retained fetal membranes, dystocia, trauma to the reproductive tract, abortion, concurrent systemic disease, emphysematous fetus and unsanitary conditions at parturition can all predispose to metritis.

*Arcanobacterium pyogenes*, alone or in association with *Fusobacterium necrophorum* or other Gram-negative anaerobic organisms is the most common causes of metritis. Other infections include streptococci, staphylococci, *Pasteurella* spp., *Bacillus* spp., *Pseudomonas* spp., may cause endometrial damage or infertility.

### ***Clinical Symptoms***

Fetid uterine discharge is common; systemic signs include fever, anorexia, depression and swollen and friable uterus.

### ***Diagnosis***

Examination of the uterus with a speculum combined with history, visual inspection of the perineum, examination of the tail for evidence of vaginal discharge and transrectal examination of the reproductive tract.

**Standard Veterinary Treatment Guidelines for Veterinary Clinics**  
***Treatment and Prevention***

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**Management**

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Non drug treatment

- Infusion of the uterus with warm water or saline (1 L) at early postpartum; siphon it and repeat the procedure.

Drug treatment

- Procaine penicillin G 22,000 IU/kg, aqueous suspension, IM or SC q 24 h for 3 to 5 days or benzathine penicillin G or a similar repository preparation, q 48-72 h. S/E, C/I, D/F, D/I, W/P, *see* page 14

or

- Sodium Penicillin G, 10 million IU, intrauterine infusion stat during the postovulatory period. C/I, S/E, D/F, D/I, and W/P, *see* page 14

or

- Oxytetracycline 11 mg/kg, IV q 12 h for 3-5 days. C/I, S/E, D/F, D/I, and W/P, *see* page 14

or

- Tetracycline 2 to 6 g, intrauterine daily for 3 days. *see* page 14

or

- Prostaglandin PGF<sub>2</sub> $\alpha$  or its analogs like cloprostenol, at usual luteolytic doses, for the management of endometritis. For dosage, D/F, S/E, C/I, W/P, *see* page 94

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*Note:* Antiseptics and many antibiotics inhibit phagocytosis, thus microorganisms that are resistant to antibiotics could get favourable condition.

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## **Pyometra**

Pyometra is the accumulation of purulent exudates in the uterus accompanied by the persistence of an active corpus luteum and anestrus. It is common 15-60 days post partum and commonly a sequel to dystocia, retained fetal membranes, or acute septic metritis.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

The uterus is distended with fluid, persistent corpus luteum occurs on one of the ovaries, vulval discharge may be yellow, creamy white, grayish white, greenish gray, or reddish brown or the cervix may be closed.

### ***Diagnosis***

Absence of any positive signs of pregnancy i.e. amniotic vesicle, fetal membranes, placentomes, and the fetus in the fluid filled uterus are diagnostic.

### ***Treatment and Prevention***

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#### **Management**

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##### Non drug treatment

- Lavage of the uterus using large volumes of fluid is recommended, but the condition frequently recurs.
  - Hysterectomy
  - Manual removal of the corpus luteum;
    - ✓ *Precautions:* Excessive haemorrhage and adhesion of the ovary may occur.
- 

##### Drug treatment

- PGF<sub>2</sub> $\alpha$  or its analogs like cloprostenol at normal luteolytic doses. *see* page 94 application and S/E
- 

### **Retained Fetal Membranes**

Retention of fetal membranes usually is defined as failure to expel fetal membranes within 24 hours after parturition; most field veterinarians however, agree that if retention is above 12 hours, it must be considered as pathologic. The incidence is increased by abortion, dystocia, hypocalcemia, twin birth, and high environmental temperature, advancing age of the cow, premature birth or induction of parturition, placentitis, duct infection and nutritional disturbances.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Macerating and discolored membranes are seen hanging from the vulva after 24 hours. Occasionally there is foul smelling discharge, inappetence and decreased milk yield. Systemic infection is not common .

### ***Diagnosis***

Degenerating, discolored, ultimately fetid membranes are seen hanging from the vulva >24 hours after parturition. Toxemia may occur if it is systemic.

### ***Treatment and Prevention***

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#### **Management**

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##### Non-drug treatment

- Untreated cows expel the membranes in 2-11 days. Daily gentle traction of the membrane is recommended to *see* if detachment has occurred.

##### Drug treatment

- Intrauterine antimicrobials (*see* Metritis and endometritis); however, the cost of treatment and milk withhold time should be considered.
- If systemic signs are observed, treat with systemic antimicrobials (*See* page ).

##### *Precautions:*

- Manual removal of the retained membranes is no longer recommended and is potentially harmful.
  - Trimming of excess tissue is permissible; however, it is not accepted by owners & gross contamination of the genital tract may occur.
- 

## **Trichomoniasis**

Trichomoniasis is a venereal disease of cattle caused by the protozoa *Trichomonas fetus* characterized primarily by early embryonic death, prolonged breeding and infertility; The estrus

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

cycle becomes irregular resulting in extended calving interval. Pyometra occasionally develops after breeding.

### ***Clinical Symptoms***

Infertility caused by death of the fetus, usually 50-100 days of conception and marked by repeat breeding and irregular estrous cycle.

### ***Diagnosis***

History and clinical signs are indicative. Isolation of *T. fetus* from the preputial fornix, or dark field microscopical examination of aspirates with saline or ringer's doching or from vaginal pus or vaginal mucus are diagnostic.

### ***Treatment and Prevention***

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#### **Management**

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- No effective treatment is available for cattle. Therefore, animals with genital abnormalities should be culled from the herd.
  - Use artificial insemination.
  - For heifers, use young bulls for breeding.
- 

## **Uterine Prolapse and Uterine Eversion**

Prolapse of the uterus is common in dairy cows. Recumbency with the hindquarters lower than the forequarters, invagination of the tip of the uterus, excessive traction to relieve dystocia or retained fetal membranes, uterine atony, hypocalcemia, and lack of exercise have all been incriminated as contributory causes. Prolapse of the uterus invariably occurs immediately after or within several hours of parturition.

### ***Treatment and Prevention***

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#### **Management**

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Non-drug treatment

- Apply epidural analgesia; Lidocaine 5-8 ml or 8-15 ml of

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

2% procaine.

✓ D/F: Injection, 600 mcg/ml or 1mg/ml.

✓ D/I: Ketoconazole, methoclorpramide and phenothiazine derivatives.

- Remove the placenta (if still attached), clean the endometrial surface thoroughly, and repair any lacerations.
- Rubbing the surface of the uterus with glycerol & return to its normal position.
- Instillation of warm, sterile saline solution
- Elevate the hindquarters when replacing the uterus

### **Surgical**

- Amputate severely traumatized or necrotic uterus.

---

### **Drug treatment**

- Apply antibiotics (*See page 77/78*).
- 

## **Vaginal and Cervical Prolapse**

Eversion and prolapse of the vagina, with or without prolapse of the cervix, occurs most commonly in mature cows during the last trimester of pregnancy. Predisposing factors include increased intra-abdominal pressure associated with increased size of the pregnant uterus, intra-abdominal fat, or rumen distention superimposed upon relaxation and softening of the pelvic girdle and associated soft-tissue structures in the pelvic canal, and perineum mediated by increased circulating concentrations of estrogens and relaxin during late pregnancy. Intra-abdominal pressure is increased in the recumbent animal.

### ***Clinical Symptoms and Diagnosis***

The floor of the vagina prolapses first and repeated eversions may result in a diverticulum of one or both sides of the vagina. The cervix occasionally prolapses through the vulva.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics Treatment and Prevention

### **Management**

- Apply epidural anaesthesia (*see* Diseases of cattle: Uterine prolapse)
- Wash the vagina, empty the bladder lubricate the vagina with glycerol and replace it to its original position.
- Retention is achieved by insertion of a Buhner suture.

### **Ectoparasites**

#### **Ticks**

Ticks are obligatory parasites that feed on blood. They transmit a large number of pathogens while others may directly cause disease due to the salivary toxins and fluids (tick paralysis). More than 40 species of ticks are reported in Ethiopia.

Table 8. Some important tick genera and the main livestock diseases they transmit.

<b>Tick genus</b>	<b>Disease transmitted by the ticks</b>
<i>Amblyoma</i>	Heartwater,
<i>Boophilus</i>	Babesia, Anaplasma marginale
<i>Hyalomma</i>	Tick toxicosis, many other babesial, theilerial and rickettsial infections
<i>Rhipicephalus</i>	Babesia infections in domestic animals; East Coast Fever in cattle; Nairobi sheep Disease, Tick toxicosis; many other babesial, theilerial and rickettsial infections of domestic animals
<i>Dermacentur</i>	Babesia infections in horses, cattle & sheep; Anaplasma marginale in cattle; tick paralysis,
<i>Ornithodoros</i>	African swine fever, Relapsing fever

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

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#### **Management**

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##### *Soft ticks*

- All niches and crevices in affected building should be sprayed with acaricides. For acaricide choice, D/F, S/E, C/I, W/P, D/I, *see* below.
- 

##### *Hard ticks*

Control of one host-ticks:

- Acaricide spray or dip every 21 days; however, to control all nymphs, treat every 12 days during tick season.

Control of two-host and three-ticks:

- Weekly dipping during the tick season.

Other control options include:

- Cultivation of land, improved drainage, vaccines (recently developed)
- 

### **Acaricides**

All acaricide/insecticide preparation are required to label the working dilutions. Therefore, refer as directed by the manufacturer's label.

- Chlorfenvinphos spray
  - ✓ D/F: liquid, 10% w/v Emulcifiable Concentrate (EC)
  - ✓ W/P: meat 14 days,
  - ✓ D/I: combination of two or more organophosphorus compounds or drugs with anticholinestrase activity
- Diazinon spray or dip
  - ✓ D/F: liquid 15% w/v, 16.2%, 20% and 60% w/v EC
  - ✓ W/P: meat 14 days.
  - ✓ D/I: similar to chlorfenvinphos
  - ✓ *Cautions:* Provide adequate ventilation for operator
- Cypermethrin spray or dip.
  - ✓ D/F: EC, 5%, 10% w/v; Powder, 25%; Pour-on solution, 1%, 1.25%, 2%
  - ✓ C/I: treatment of lambs less than 1 week of age or during hot weather

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

- ✓ *Cautions:* Wash udder of sprayed animals before milking  
apply only on unbroken lesions
- Deltamethrin spray or dip
  - ✓ S/E: minor signs and discomfort with some cattle up to 8 hrs after treatment.
  - ✓ D/F: pour-on solution, 1% ; EC, 5%, 12.5%
  - ✓ W/P: meat 3 days; milk nil; mutton 7 days; pork 21 days.
  - ✓ *Caution:* Wash udder of sprayed animals before milking and administration.
- Fenvalerate
  - ✓ D/F: EC, 10%, 20%
  - ✓ W/P: meat 1 days; milk nil
  - ✓ *Caution:* Avoid direct contact of milk and milking machine
- Permethrin
  - ✓ W/P: meat 3 days; milk nil.
  - ✓ D/F: dusting powder, 1.05%; Emulsified concentrate 0.5%;  
Pour-on solution, 4 %; Shampoo, 1.05%
- Flumethrine spray as directed by the manufacturer
  - ✓ D/F: EC, 1% and 6%
  - ✓ W/P: mutton nil; milk nil
  - ✓ *Caution:* not for control of bowl fly larvae
- Amitraz as recommended by the manufacturer
  - ✓ C/I: horses, dogs or cats
  - ✓ D/F: powder/Granule, 12.5%, 25% ; Pour on, 2% w/v ;  
Liquid, 12.5%
  - ✓ W/P: meat 1 day, milk 2 days;

## **Mites**

### **Sarcoptes**

The fertilized female burrow tunnel in the upper epidermis, feeding on liquid oozing from the damaged tissues. Eggs are laid in the tunnel, hatch in 3-5 days, larvae emerge which can also burrow. It is common in medium altitudes of Ethiopia.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Mild infections show scaly skin with little hair loss but in severe cases, there is marked loss of hair, and form crusts. Intense pruritis leads to loss of meat, milk production and to hides.

### ***Diagnosis***

skin scrapings and examined under stereomicroscope.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- Ivermectin 1%, 200 mcg/kg, SC, single injection  
✓ S/E, C/I, D/I, D/F & W/P, *see* page 53

or

- Organophosphates such as phosmet, that is repeated after 14, if needed. For acaricide of choice *see* page 103/104

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*Public health significance:* Sarcoptic manges are zoonotic and care should be exercised to avoid human infection.

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### **Demodex**

In bovine, demodex mange causes pea-sized nodules on the skin each containing caseous material and several thousand mites. It damages the skin extensively. Transmission occurs during suckling. The muzzle, neck, withers and back are common sites.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- Pour-on organophosphates; for acaricide choice, D/F, S/E, C/I, W/P, D/I, *see* page 103/104

or

- Ivermectin 200 mcg/kg, stat

For acaricide of choice, dosage, D/F, S/E, C/I, W/P, D/I, *see* page 103/104

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Psoroptes**

Psoroptic mange is a typical non-burrowing mite. Diagnosis and treatment are similar to treatment of sarcoptes.

### **Cutaneous Myiasis**

It is caused by infestation of the skin by blowfly maggots of *Lucilia*, *Phormia*, *Calliphora*, *Chrysomya* etc. species. The incidence fly strike is common during humid months of the year and usually associated with fleece rot, mycotic dermatitis, diarrhea, urine staining and foot rot.

#### ***Clinical signs***

The sheep becomes restless, tends to bite or kick at the struck area, wriggle their tails, the wool might be lifted off, ulceration may occur. The serous fluid may be followed by pus.

#### ***Diagnosis***

Predisposing diseases such as footrot, wound infections and diarrhea due to parasitic gastroenteritis are usually easily detected and fleece rot is indicated is indicated by matting of the wool and discoloration.

### ***Treatment and Prevention***

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#### **Management**

---

Drug treatment

- Application of larvicidals, BTH dressing (Boric acid, tar oil, bentonite mixture)

or

- Organophosphate insecticides
    - ✓ D/F, S/E, C/I, W/P, D/I, *see* page 103/104
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Leech**

Leech is an external parasite characterized by a cylindrical or slightly flattened body with suckers at either end for attaching to prey. Some are permanent parasites of man, horses, cattle, fish, and mollusks, but most are merely predatory. The salivary secretions of the leech contain hirudin, an anticoagulant. Leeches may lodge as parasites in animals and humans while drinking water.

### ***Treatment and prevention***

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#### **Management**

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Non drug treatment

- Manual removal

Drug treatment

- Organophosphorus compounds. *see* page 103/104
- 

*Precaution:* Rubber gloves and protective clothing should be worn.

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### **Lice**

Pediculosis in cattle infests the head, neck, shoulders, back, and rump and occasionally the tail switch. *Damalina* species are biting lice; *Linognathus* and *Solenopotes* are suckling lice. In heavier infestations, pruritis, with rubbing and licking of the body, anemia & weakness occur.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- Organophosphate insecticides. *see* page 103/104

or

- Ivermectin 200 mcg/kg, SC. For dosage, D/F, S/E, C/I, W/P, D/I, *see* page 53
-

## **DISEASES OF SHEEP AND GOATS**

### **Non-infectious Diseases**

#### **Bloat**

Bloat or ruminal tympany is an overdistention of the rumenoreticulum with the gases of fermentation. It occurs less commonly in goats than sheep and cattle. The aetiology, clinical signs and diagnosis are similar to that of cattle (*see* Diseases of Cattle: bloat).

#### ***Treatment and Prevention***

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##### **Management**

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##### Non-drug treatment

- Passage of a stomach tube to remove free gas bloat
- Cooking oils at a dose of 100 to 200 ml/ head coupled with forced exercise.
- In advanced cases, trocharization of the rumen at the left paralumbar fossa

##### Drug treatment

- Poloxalene 100 mg/kg PO; S/E, D/F, D/I, C/I, W/P, *see* page 4

or

- Dioctyl sodium sulfonuccinate, 15-30 ml/head.
- 

##### Prophylaxis

- Animals should be gradually adapted to lush pastures.
- Grain feeding should be supplied with sufficient hay.
- Concentrate feeds should not be too finely ground.

*Note:* when drenching the oils, care should be taken to avoid Aspiration Pneumonia

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics** **Enzootic Ataxia and Swayback**

Enzootic ataxia and swayback result in progressive paresis of young lambs and kids caused by neuronal degeneration, secondary demyelination in the central nervous system associated with copper deficiency. Sway back is congenital; Enzootic ataxia occurs after birth. It occurs due to abnormal maturation and subsequent degeneration of neurons and myelin in the developing fetus and the lamb post nately. In Ethiopia this condition was reported in sheep in the rift valley region.

### ***Clinical Symptoms***

Weakness, fatigue, tremors, difficulty in rising, and incoordination, symmetrical paralysis are observed; kids in the forelimb involvement may drop onto their knees, while kids with hindlimb involvement adopt a dog-sitting position and pull themselves along with the forelimbs. They may remain recumbent followed by death.

### ***Diagnosis***

Low tissue copper level and clinical signs are diagnostic.

### ***Treatment and Prevention***

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#### **Management**

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Treatment is effective in mild cases

- Copper glycinate, 60 mg/ head, IM, q 24 h until it signs subside.
- 

Prophylaxis

- Copper supplement, 5 ppm in feed for sheep
- 

### **Grain Overload**

Grain overload (Lactic acidosis, Carbohydrate engorgement, Rumen impaction) is an acute disease of ruminants characterized by indigestion, rumen stasis, dehydration, acidosis, toxemia, incoordination, collapse, and frequently death. The etiology, clinical signs, diagnosis and treatment

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

methods are similar to those for cattle (*see* Diseases of Cattle: Grain overload).

### **Parturient Paresis**

Parturient paresis in pregnant and lactating ewes is a disturbance of metabolism characterized by acute hypocalcemia and rapid development of hyperexcitability, ataxia, paresis, coma, and death. The disease occurs at any time from 6 wk before lambing to 10 wks after lambing, principally in highly conditioned older ewes at pasture. The onset is sudden and almost invariably follows within 24 hours an abrupt change of feed, a sudden change in weather, or short periods of fasting imposed by circumstances such as shearing, crutching, or transportation.

#### ***Clinical Symptoms***

The earliest signs are slight hyperexcitability, muscle tremors, and a stilted gait. These are soon followed by dullness, sternal decubitus (often with the hindlegs extended backward), mild ruminal tympany and regurgitation of food through the nostrils, staring eyes, shallow respiration, coma, and death within 6-36 hr.

#### ***Diagnosis***

History and clinical signs are indicative but dramatic response to calcium therapy is confirmatory.

#### ***Treatment and Prevention***

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##### **Management**

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##### Drug treatment

- Calcium borogluconate 25%: 100 mL IV or SC
- Magnesium might be added; *see* page 9.
- 

##### Prophylaxis

- Affected sheep should be handled with care; to avoid sudden death due to heart failure.
  - Prevention: avoid predisposing factors.
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Pregnancy toxemia**

Pregnancy toxemia is primarily a metabolic disorder of ewes during the last 6 weeks of pregnancy characterized by hypoglycemia and hyperketonemia and clinically by nervous signs and recumbency. Though it occurs in ewes carrying single fetus, those carrying multiple fetuses are most susceptible. Inadequate nutrition arises when ewes are placed on low-quality fibrous diets such as crop stubbles or on pastures or due to absence of voluntary intake or feed intake due to foot problems or overfat ewed.

#### ***Clinical Symptoms***

Muscular disturbances with abnormal posture, loss of muscle tone, balance, and locomotion (staggering), papillary reflex is diminished; fine tremors of the muscles of the head with twitching of the ears and lips, and some ewes show convulsions; and then finally grinding of teeth, recumbency, coma and death.

#### ***Diagnosis***

Clinical signs associated with undernutrition or error of management and ewes are affected during the last weeks of pregnancy.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

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#### **Management**

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Drug treatment:

- Glycerol (50%), 120ml, PO, q 12 h from 1-3 times depending on its response.

or

- Propylene glycol (50%), 120 ml q 12 h, PO from 1-3 times depending on its response. For S/E, D/F *see* page 7.

✓ C/I: Overdose may be fatal in goats

*plus*

- Glucose 5-10% mixed with vitamins

*plus*

- Dexamethasone 20 to 25 mg, PO, for S/E, C/I, D/I and D/F *see* page 7.

Prophylaxis

- Feed obese sheep and goats with roughage and 500 g concentrate per head
  - Propylene glycol 60 ml/adult as prophylactic
- 

### **Infectious Diseases**

#### **Actinobacillosis**

*Arcanobacterium* [former genus names: *Actinomyces*, *Corynebacterium*] *pyogenes* is the etiologic agent associated with a number of disease entities, primarily in cattle but also in goats, sheep, and pigs. The disease entities and treatment options of actinobacillosis in sheep and goats are similar to the bovine (*see* Diseases of Cattle: Actinobacillosis).

#### **Anthrax**

Anthrax is an acute, febrile disease (41.5°C) of animals caused by *Bacillus anthracis*. It also affects sheep and goats. The

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

clinical signs are similar to other animals (*see* Diseases of Cattle: Anthrax).

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Penicillin G 11,000 to 66,000 IU/kg, IM, q 24 h for 3-5days; for severely affected animals, administer sodium penicillin, IV, S/E, C/I, D/F, W/P, D/I, *see* page 14

or

- Oxytetracycline, LA, 20 mg/kg, IM, q 48 h for 1-3days , S/E, C/I, D/F, W/P, D/I, *see* page 14

or

- Broad-spectrum antibiotics can also be used, *see* page 21.
- 

##### Prophylaxis:

- Vaccination.

*Note:* Early antibiotic treatment is essential

---

## **Babesiosis**

Babesiosis is a tick-borne protozoal disease affecting domestic animals. In sheep and goats it is caused by *B. motasi* and *B. ovis*, the former being the primary cause in goats.

### ***Clinical Symptoms***

Fever (41.7°C), anorexia, weakness, anaemia including dyspnoea and tachycardia are common. Sheep show icterus and haemoglobinuria with coffee colored urine.

### ***Diagnosis***

Clinical signs are indicative and blood smear stained with Giemsa and serological tests are confirmatory.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics** ***Treatment and Prevention***

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### **Management**

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Drug treatment:

- Diminazene aceturate, 3 mg/kg, IM; (S/E, C/I, D/F, D/I, W/P, *see page 73/74*)

or

- Imidocarb, 1-2 mg/kg, IM; S/E, C/I, D/F, D/I, W/P, *see 73/74*
- 

### **Bacillary Haemoglobinuria**

It is an acute, toxemic, and highly fatal clostridial disease, with the liver being the main target organ. It is less common in sheep and pigs than in cattle. The clinical signs, diagnosis and treatment in sheep are similar to that of cattle (*see Diseases of Cattle: Bacillary Haemoglobinuria*).

### **Blackleg**

This acute, febrile disease of cattle and sheep caused by *Clostridium chauvoei* is characterized by emphysematous swelling, usually in the heavy muscles. In Ethiopia, it is reported in cattle and sheep during the dry season. Clinical signs, diagnosis and treatment are similar with cattle (*see Diseases of Cattle: Blackleg*).

### **Bluetongue**

Bluetongue is an arthropod-borne, noncontagious viral disease of sheep, wild ruminants, and rarely cattle, goats, and carnivores. Serological surveys have shown that blue tongue is prevalent in central and North West Ethiopia.

### ***Clinical Symptoms***

Dyspnea with panting; hyperemia of the lips, muzzle, and ears, pyrexia [42°C]; depression, and inflammation, erosions, and ulceration of the oral mucous membranes, particularly the dental

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

pad are observed, Other signs include swollen cyanotic tongue, lameness due to coronitis and widespread muscle necrosis, torticollis, vomiting, pneumonia, conjunctivitis, and alopecia.

### ***Diagnosis***

Clinical signs are presumptive, and confirmation is based on identification of the virus by isolation in embryonated chicken eggs, susceptible sheep, or cell cultures. Serologic tests include ELISA, agar gel immunodiffusion, complement fixation, and virus neutralization tests.

### ***Treatment and Prevention***

There is no specific treatment. Bluetongue is difficult to handle because of a wide variety of culicoid vectors of the disease. Monovalent vaccine is available in the USA only.

## **Campylobacteriosis**

Gastrointestinal campylobacteriosis, caused by *Campylobacter jejuni* or *C. coli*, causes diarrhea in various large and small animals, pets and humans. Transmission is through fecal-oral spread and food- or water-borne transmission appears to be the principal avenues for infection.

### ***Clinical Symptoms***

Clinical manifestations of campylobacteriosis in young sheep may be more severe; in goats there are only occasional reports. Signs and diagnosis are almost similar to cattle. In adults it causes abortion (*see Diseases of Sheep and Goats: abortion*).

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics** ***Treatment and Prevention***

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### **Management**

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#### Drug treatment

- Enteric form is self-limiting, thus treatment is not usually indicated.

#### Outbreaks of abortion

- Streptomycin 70 mg/kg, IM, 2-5 days, S/E, C/I, D/I, D/F *see* page 17; W/P meat, 21 days

or

- Tetracycline in feed for 5 days followed by 100 mg/head q 24 h for the rest of the lambing period. S/E, C/I, D/F, D/I, W/P, *see* page 14
- 

#### Prophylaxis

- Vaccination of replacement ewes only

*Public health significance:* transmitted to humans via consumption of contaminated meat.

---

## **Caseous Lymphadenitis**

Caseous lymphadenitis is a chronic bacterial disease caused by *Corynebacterium pseudotuberculosis* affecting sheep and goats. The organism affects the lymph nodes of the head and neck but abscesses may form in the lung parenchyma. The organisms enter the body through small breaks of the skin or mucous membranes and eventually localizes in the lymph nodes.

### ***Clinical Symptoms***

Enlargement and abscessation of the peripheral lymph nodes which may form white, yellowish or greenish pus. In chronic lung involvement, the clinical signs include: dyspnea, exercise intolerance and weight loss resemble the signs of maedi visna.

### ***Diagnosis***

Isolation and identification of the agent is essential.

**Standard Veterinary Treatment Guidelines for Veterinary Clinics**  
***Treatment and Prevention***

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**Management**

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Non-drug treatment

- Draining or surgically removing the abscessed nodes at the ventral position and flushing with dilute disinfectant
- 

Drug treatment

- Rifampin, 10-20 mg/kg, q 24 h
  - ✓ C/I: Hypersensitivity, d, in hepatic dysfunction patients
  - ✓ S/E: Rashes, GI distress, increase in liver enzymes shouldn't be used alone as resistance develops rapidly, if given on empty stomach and it may cause red or orange urine, tears and sweat
  - ✓ D/I: Propranolol, chloramphenicol, corticosteroids, anticoagulants, benzodiazepines, barbiturates and ketoconazole.

or

- Erythromycin, 4 mg/kg, IM or SC for 4 to 6 weeks
    - ✓ S/E, C/I, D/I, D/F & W/P *see* page 19
- 

Prophylaxis

Clean an environment contaminated with pus.

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**Coccidiosis**

Coccidiosis is an acute invasion and destruction of intestinal mucosa by protozoa of the genera *Eimeria* or *Isospora*. Lambs 1-6 months old in lambing pens, intensive grazing areas, and feedlots are at greatest risk as a result of shipping, ration change, crowding stress, severe weather, and contamination of the environment with oocysts from ewes or other lambs.

***Clinical Symptoms***

Diarrhea, fever, inappetence, weight loss, emaciation, and sometimes death.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Diagnosis***

Intestinal coccidiosis is based on finding of oocysts of the pathogenic species in diarrheal feces, usually at tens of thousands to millions per gram of feces.

### ***Treatment and prevention***

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#### **Management**

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##### Drug treatment

- Sulfaquinoxaline 0.015% in drinking water for 3-5 days
    - ✓ S/E: Crystallization in urinary tract, hypersensitivity, and anaphylaxis
    - ✓ C/I: Intrauterine administration
    - ✓ D/F: Granules, 50%+16.5%
    - ✓ D/I: Detomidine and halothane
- 

##### Prophylaxis

- Monensin, 20 g/ton of feed for 28 days, after lambs are introduced into the environment. S/E, C/I, D/F, D/I, W/P, *see* page 38.

*Note:* Treatment of affected sheep with anticoccidials once coccidiosis has been diagnosed is not effective, but severity can be reduced if treatment is begun early.

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## **Coenurosis**

*Taenia multiceps* is an intestinal parasite of canids and man. The larval stage known as *Coenuros cerebralis* causes disease in intermediate host characterized by circling. Sheep and goats are commonly affected.

### ***Clinical Symptoms***

Hypermetria, blindness, head deviation, stumbling, and paralysis.

### ***Diagnosis***

Clinical signs are indicative.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Treatment and Control***

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#### **Management**

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Non-drug treatment

- Surgical removal of the cyst in valuable animals

Prevention

- Dogs associated with sheep should be dewormed with anthelmintics regularly.
- 

### **Contagious Ecthyma**

Contagious ecthyma (orf, contagious pustular dermatitis, sore mouth) is an infectious dermatitis of sheep and goats caused by a Poxvirus that affects primarily the lips of young animals. The disease is usually more severe in goats than in sheep.

#### ***Clinical Symptoms***

The lesions develop as papules and progress through vesicular and pustular stages before encrusting. Discrete large scabs, a verrucose mass underneath which are distributed primarily on the skin of the lips extending to the mouth, interdigital region, around the coronet and udder. Lambs fail to eat normally and lose condition, shows lameness and in ewes mastitis may occur.

#### ***Diagnosis***

The lesions are characteristic. A positive differentiation may be obtained by inoculating susceptible and ecthyma-immunized sheep.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- Antibacterials may help combat secondary infection.
  - In endemic areas, appropriate repellents and larvicides should be applied to the lesions.
- 

Prophylaxis

- Sheep that have recovered from natural infection are highly
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

resistant to reinfection.

- Vaccinations is possible, however, the vaccine has not been used in Ethiopia.

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*Public health significance:* The virus is zoonotic and thus use protective gloves during handling of clinical cases.

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### **Dermatophilosis**

Dermatophilosis (strawberry foot rot, lumpy wool) in sheep and goats is a skin disease caused by the bacteria *Dermtophilus congolensis*. The epidemiology is similar to cattle (*see* Diseases of Cattle: Dermatophilosis). It is clinically characterized by superficial, pustular, crusting, and/or ulcerative dermatitis of sheep, goats, cattle and other domestic livestock.

#### ***Clinical Symptoms***

In goats the lesions of dermatophilosis are commonly seen on the pinna and tail of kids and the muzzle, dorsal midline, and scortum of adults; it may extend to the distal limbs.

In sheep crust occurs from the coronary bands to the tarsi and carpi with underlying bleeding, fleshy masses of tissue (strawberry foot rot); pyramidal crusts over the topline and flanks and on ears, nose, and face of lambs.

#### ***Diagnosis***

Presumptive diagnosis depends largely on the appearance of lesions and demonstration of *D. congolensis* in stained smears or histologic sections from scabs. A definitive diagnosis is made by culture and identification.

#### ***Treatment and Preventions***

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##### **Management**

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Drug treatment

*Systemic*

- Procaine penicillin 70,000 IU/kg plus streptomycin 70 mg/kg, IM, stat; if this fails continue treatment with

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

respective dose of 5000 IU and 5 mg/kg for 5 days. S/E, C/I, D/F, D/I, W/P, *see* page 14

or

- Oxytetracycline LA, 20 mg/kg, IM, single dose; if required repeat after 3 to 5 days. S/E, C/I, D/F, D/I, W/P, *see* page 14

### *Topical*

- Iodophores; 2-5% lime sulfur; 0.5% zinc sulfate, 0.2% copper sulfate, and 1% potassium aluminum sulfate (alum) as sprays or wash for 3 to 5 days, then weekly until the lesion heals. S/E, C/I, D/F, D/I, W/P, *see* page 18

### Prophylaxis

- Dusting the fleece of sheep with potash alum or aluminum sulfate during wet periods. Protect the skin from damage during shearing and dip in 0.5% zinc sulfate after shearing
- 

## **Fasciolosis**

Fasciolosis, a parasitic disease of sheep and cattle is caused by the ingestion of metacercariae of *Fasciola hepatica* or *F. gigantica*. It is common in water logged areas which favour the breeding of the snail, intermediate host.

### *Clinical Symptoms*

In the acute form; sudden death is common; subacute form rapid and severe haemorrhagic anaemia, rapid loss of condition, a marked pallor of the mucous membranes and an enlarged and palpable liver, submandibular edema or facial oedema and ascites; Chronic form; progressive loss of condition, anaemia, resulting in submandibular oedema and ascites.

### *Diagnosis*

The diagnosis of fasciolosis is based on clinical signs, seasonal occurrence, prevailing weather patterns, and a previous history of fasciolosis on the farm or the identification of the snail habitats.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

Faecal microscopic examination reveals the oval, operculated, golden brown eggs.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

##### *Acute and subacute fasciolosis*

- Triclabendazole 12 mg/kg lambs, 7.5 mg/kg, PO stat; S/E, C/I, D/F, D/I, W/P, *see* page 48

or

- Rafoxanide, 7.5 mg/kg, PO stat; S/E, C/I, D/F, D/I, W/P, *see* page 48

or

- Closantel, (for flukes above 8 weeks old) 10 mg/kg, PO, stat; S/E, C/I, D/F, D/I, W/P, *see* page 49

##### *Subacute fascioliasis*

- The same as above, but repeat treatment four and eight weeks later.

##### *Chronic fasciolosis*

- Rafoxanide, as above

or

- Closantel, as above

or

- Oxyclozanide, 1 mg/kg, PO stat. S/E, C/I, D/F, D/I, W/P, *see* page 49

or

- Albendazole, 7.5 mg/kg, PO stat; S/E, C/I, D/F, D/I, W/P, *see* page 48
- 

##### Prophylaxis

The sheep should be removed from the source, if that is not possible treat at 3 weeks interval until six weeks after death have began.

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Foot and Mouth Disease**

Foot-and-mouth disease (FMD) is a highly contagious viral infection transmitted by direct or indirect contact. The epidemiology is similar to that of cattle ( *see* Disease of cattle FMD)

#### ***Clinical Symptoms***

In small ruminants, clinical disease is milder than in cattle, thus it is frequently overlooked. The characteristic clinical signs include fever (41-43°C), which persists for 3-4 days; lassitude and inappetence followed by vesicles in the mouth and foot. Other signs include lameness, increased breathing, prostration that may end up in death.

#### ***Diagnosis***

On the bases of clinical signs and laboratory findings (ELISA, CFT) and isolation of the virus

#### ***Treatment and Prevention***

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#### **Management**

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##### **Drug treatment**

- There is no specific treatment except supportive therapy including avoiding confinement, provision of easy medication, high quality feed and water and broad-spectrum antibiotics to prevent from secondary bacterial infection, *see* 49.

---

##### **Prophylaxis**

- Quarantine of farms
  - Vaccination
- 

#### **Foot rot**

Foot rot is a disease of sheep and goats caused mainly by virulent strains of *Bacteriodes nodosus*. The bacterium affects the interdigital epidermis extending to the horny and lamellar

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

structures. Other anaerobic bacteria are also involved. Goats are more prone to exposure than sheep.

### ***Clinical Symptoms***

The clinical signs are lameness, erythema or swelling of the interdigital epidermis with little or not odor followed by underrunning of the horn.

### ***Diagnosis***

Usually based on clinical signs.

### ***Treatment and Prevention***

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#### **Management**

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Non-drug treatment

- There is no effective treatment
- Drain abscess and expose to oxygen

Drug treatment

- Zinc sulphate or copper sulphate, 10% footbath  
✓ D/I: Iron salt, tetracycline and penicillamine

or

- Formalin, 5% footbath

or

- Topical antimicrobial sprays including oxytetracycline /gentian violet (4%/0.4%) sprays. S/E, C/I, D/F, D/I, W/P, *see page 14*

or

- Chloramphenicol or penicillin as dust or sprays. S/E, C/I, D/F, D/I, W/P, *see page 21*

or

- Penicillin 40,000 IU, IM, q 24 h for 3 days. S/E, C/I, D/F, D/I, W/P, *see page 14*
- Kerosene applied topically

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Control & prophylaxis

- Inspect newly introduced animals for lesions of the foot and run them on footbath as above
  - Avoid excessive growth of feet
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Gastrointestinal Parasitism**

Parasitic gastritis and enteritis of sheep and goats are caused by nematodes and cestodes. The common stomach worms of shoat are *Haemonchus contortus*, *Ostertagia circumcincta*, and *Trichostrongylus axei* and intestinal worms include *Nematodirus* species, *Bunostomum trigonocephalum*, *Oesophagostomum colombianum*, *Cooperia curticei*, *Strogloides papillosus*, *Trichuris ovis*, *Chabertia ovina* and *Moniezia expansa*.

#### ***Clinical Symptoms***

Stomach worm infections are characterized by anorexia, loss in body weight, dehydration, profuse and watery diarrhea that usually is persistent. However, *Haemonchus* infections are characterized by severe anaemia accompanied by generalized edema and progressive weight loss, which is caused by chronic infection and low burden, otherwise, it is fatal and acute. In the case of *Oesophagostomum* infections feces may have excessive mucus and streaks of blood.

#### ***Diagnosis***

Clinical diagnosis of gastrointestinal parasites is difficult, however, poor body condition, anemic and diarrheic signs should be suspected of infestation. Therefore, laboratory diagnosis of fecal examination is confirmatory.

#### ***Treatment and prevention***

Treatment and prevention are similar to cattle. *see* Table 4. Diseases of cattle: Gastrointestinal parasitism.

### **Heartwater**

Heartwater (Cowdriosis) is an infectious, noncontagious, rickettsial disease of ruminants caused by *Cowdria ruminantium*

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

and transmitted by tick belonging to the genus *Amblyomma*. The disease affects ruminants.

### ***Clinical Symptoms***

The peracute form is common in exotic breeds of goats; the acute form is seen most frequently in sheep. The specific clinical signs are similar to cattle (*see Diseases of Cattle: Hearwater*).

### ***Treatment and Prevention***

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#### **Management**

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##### Supportive treatment

- Furosemide, 2-5mg/kg, IM, or IV to reduce edema
  - ✓ S/E: Hypokalemia, ototoxicity, hyponatraemia
  - ✓ C/I: Renal failure with unuria, acute glomerulonephritis.
  - ✓ D/F: Injectable, 50 mg/ml
  - ✓ D/I: Acetazolamide, aminoglycosides, beta-blockers, cephalothin, cephalosporins, corticosteroids, lignocaine, estrogen.

or

- Dexamethasone, 20-200 mcg/kg, to stabilize membrane and reduce the effect of vasoactive agents
  - ✓ S/E, C/I, D/I, D/F & W/, *see page 7*

##### Drug treatment

- Oxytetracycline, 10 mg/kg, IV, q 24 h repeated until the febrile reaction is reduced; long acting oxytetracycline is given at 20 mg/kg stat. At the early phase of infection, 5 mg/kg IV is sufficient. S/E, C/I, D/F, D/I, W/P, *see page 14*

or

- Doxycycline 2 mg/kg, q 24 h for 3-5 days. S/E, C/I, D/F, D/I, W/P, *see page 14*

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##### Control and Prophylaxis

- Tick control using acaricides but allow sufficient ticks for an enzootic stability situation.
  - Vaccination
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics** **Infectious Keratoconjunctivitis**

Infectious keratoconjunctivitis (pinkeye, infectious ophthalmia) in sheep and goats is characterized by blepharospasm, conjunctivitis, lacrimation, and varying degrees of corneal opacity and ulceration. In sheep, infection with *Chlamydia psittaci* is most common cause. In goats, it is mainly caused by *Mycoplasma agalactiae* and *M. conjunctivae*.

### ***Clinical Symptoms***

In sheep and goats, apart from signs observed in cattle (*see* Diseases of cattle: Infectious Keratoconjunctivitis) concurrent polyarthritis may be present. In goats, mammary gland and uterine infection may also occur simultaneously with keratoconjunctivitis.

### ***Diagnosis***

Clinical signs and culture of eye swabs are important to diagnose.

### ***Treatment and Prevention***

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#### **Management**

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##### Non-drug treatment

- Provide animals with shade
- Irrigate the eyes with sterile physiological saline solution

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##### Drug treatment

###### *First line*

- Topical tetracycline, or oxytetracycline *plus* polymyxin B, ointment for 3-4 times per day for 3 days. S/E, C/I, D/F, D/I, W/P, *see* page 14

or

- Erythromycin ointment 3-4 times per day for 3 days. S/E, C/I, D/F, D/I, W/P, *see* page 19

###### *plus*

- If animals have substantial uveitis, Atropine 1% ointment topically or IM, 1-3 times daily for 3-5days.
-

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### *Alternative*

If topical therapy is not practical

- Oxytetracycline, LA, 10-20 mg/kg, IM, stat prevents relapse. S/E, C/I, D/F, D/I, W/P, *see* page 14.

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### Prophylaxis

- Temporary isolation and preventive treatment of animals newly introduced to the flock may be helpful.

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*Caution:* Corticosteroids are contraindicated if ulcer is present

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## **Listeriosis**

Listeriosis is caused by *L. monocytogenes*. It is characterized by encephalitis or abortion in adults and by septicaemia in fetuses and neonates. The clinical signs and diagnosis are similar to cattle (*see* Diseases of Cattle: Listeriosis).

### ***Treatment and Prevention***

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#### **Management**

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##### Drug Treatment

- Similar drugs that are used in cattle are also applied here; however, treatment of listeriosis in sheep is less effective.
- Initially, treat animals IV with very high dose of penicillin sodium, 44,000 IU/kg and then IM 7-14 days. S/E, C/I, D/F, D/I, W/P, *see* page 14

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##### Prophylaxis

- Long acting Penicillin may be effective.

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*Public health significance:* Listeriosis is zoonotic.

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## **Malignant Oedema**

Malignant oedema is often a fatal wound infection caused by infection in one of the clostridia species mainly of *Cl. Septicum*.

### ***Clinical Symptoms***

It is characterized by acute inflammation at the site of infection and by systemic signs including oedema of the cutis of the skin

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and muscle, regional lymphadenopathy, fever (40-42°C), depression, anorexia, weakness, and tachycarida.

### ***Diagnosis***

History of surgery, obstetric complications, injection, or wounds preceding its onset .

### ***Treatment and Prevention***

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#### **Management**

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Non-drug treatment

- Surgical incision, drainage and local application with 3% H<sub>2</sub>O<sub>2</sub>

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Drug treatment

- Penicillin, 11,000 - 66,000 IU/kg, IM for 3-5 days. S/E, C/I, D/F, D/I, W/P, *see page 14*
- 

### **Nairobi Sheep Disease**

Nairobi sheep disease (NSD) is a noncontagious, tick-borne, viral infection of sheep and goats characterized by hemorrhagic gastroenteritis and high mortality. The disease has been reported most frequently in Kenya as well as in Uganda, Tanzania, and Somalia. It has not been confirmed in Ethiopia. The virus is transmitted primarily by the brown tick, *Rhipicephalus appendiculatus*.

### ***Clinical symptoms***

Acute hemorrhagic gastroenteritis, fever (40-41°C), followed by a temperature decline and diarrhea; mucopurulent nasal discharge, and breathing may become rapid and painful, diarrhea may become watery, then contains mucus and blood.

### ***Diagnosis***

History of movement of susceptible animals into an endemic area where *R. appendiculatus* is abundant and clinical signs are presumptive. Serological tests are confirmatory.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics** ***Treatment and Prevention***

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### **Management**

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#### Drug treatment

- There is no specific treatment for NSD.

#### Supportive treatment

- Electrolyte supplement, protection from climatic adversities, and supply with good quality feed.
- 

#### Prevention

- Protect sheep and goats from the vector by weekly acaricide dipping and spraying.
  - Movement of animals into endemic areas must be controlled
- 

## **Peste Des Petits Ruminants**

Peste des petits ruminants (PPR) is an acute or subacute viral disease of goats and sheep. Sheep are less susceptible than goats. The disease was introduced to Ethiopia in the 1980's. It is widely distributed in goat rearing areas of the country.

### ***Clinical Symptoms***

Fever (40-41°C), dull coat, dry muzzle, congested mucous membrane, necrotic stomatitis, gastroenteritis, and pneumonia; diarrhea may be profuse and is accompanied by dehydration and emaciation; hypothermia and death follow, usually after 5-10 days. In goats the major clinical signs are stomatitis, enteritis and pneumonia.

### ***Diagnosis***

A presumptive diagnosis, based on clinical, pathologic, and epidemiologic findings, may be confirmed by virus isolation and identification or detection of virus- neutralization antibodies.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics** ***Treatment and Prevention***

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### **Management**

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#### Drug treatment

- No specific treatment
- 

#### Control and Prophylaxis

- There is no specific treatment; however, treatment against bacterial and parasitic complications decreases mortality in affected herds.
  - Vaccination with an attenuated PPR viral vaccine or with rinderpest vaccine.
- 

### **Rabies**

Rabies is an acute and often fatal viral encephalomyelitis that principally affects carnivores and insectivorous bats, although it can affect any mammal. The clinical signs, diagnosis and prophylaxis (control) in sheep and goats are, like in other species of animals (*see* Diseases of Dogs and Cats: Rabies).

### **Rift Valley Fever**

Rift Valley fever (RVF) is a peracute or acute, arthropod-borne zoonotic disease of domestic ruminants in Africa caused by a virus of the genus phlebovirus. Lambs and kids are the most susceptible. The characteristic signs during an outbreak are numerous abortions in pregnant animals and deaths among young animals, together with an influenza-like disease in man. Outbreaks occur after a heavy and unusual rainfall. Clinical disease has not been reported in Ethiopia.

#### ***Clinical Symptoms***

In lambs; biphasic fever (41°C); listless and disinclined to move or feed and may have signs of abdominal pain. Lambs usually die within 2 days. Older animals may die acutely or develop an inapparent infection. Sick animals may regurgitate and develop a bad-smelling diarrhea and icterus. Sometimes, abortion may

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be the only sign of infection. In pregnant ewes, the mortality and abortion rates vary from 5 to almost 100% in different outbreaks and on different farms.

### ***Diagnosis***

Abnormally heavy rains, followed by the widespread occurrence of abortions and mortality among newborn animals and clinical signs are suggestive.

Virus isolation from aborted fetus, acutely infected animals and serological tests are confirmatory.

### ***Treatment and Prevention***

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#### **Management**

---

Drug treatment

- There is no effective treatment
- 

Control and prophylaxis

- Control of mosquitoes by applying phosphoric acid esters powder in sheep during the rainy season.
  - Movement of stock from low-lying areas to well drained and wind-swept pastures.
  - Vaccination with Smithburn vaccine.
- 

*Public health significance:* Rift valley fever is zoonotic and transmitted through contact with infected animals and their tissues and aerosol.

---

## **Salmonellosis**

Salmonellosis is caused by many species of salmonellae and characterized clinically by one or more of three major syndromes septicemia, acute enteritis, and chronic enteritis. Transmission occurs after ingestion of contaminated feed. The most common *Salmonella* serotypes in sheep and goats are *S. Typhimurium*, *S. Dublin*, *S. Anatum*, and *S. Montevideo*.

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### ***Clinical Symptoms***

In septicemic sheep illness is acute, depression is marked, fever (40.5-41.5°C), and death occurs in 24-48 hr. Acute enteritis is the common form in adults as well as in calves, usually  $\geq 1$  wk old. Initially, there is fever (40.5-41.5°C), followed by severe watery diarrhea, sometimes dysentery, and often tenesmus. Subacute enteritis may occur in adult sheep on farms where the disease is endemic. The signs include mild fever (39-40°C), soft feces, inappetence, and some dehydration. There may be a high incidence of abortion in cows and ewes, some deaths in ewes after abortion, and a high mortality rate due to enteritis in lambs under a few weeks of age.

### ***Diagnosis***

Clinical signs, cultural examination of feces, tissues from affected animals, feed, water supplies, and feces from wild rodents and birds that may inhabit the premises.

### ***Treatment and Prevention***

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#### **Management**

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- Treatment is recommended only in clinical cases.

#### Drug treatment

- Ampicillin, 4-10 mg/kg, IM, q 24 h for 5 days. S/E, C/I, D/F, D/I, W/P, *see* page 42

or

- Norfloxacin 5 ml/37-75 kg, for 3-5 days. S/E, C/I, D/F, W/P and D/I *see* page 69

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#### Supportive therapy

- Dexamethasone 20-200 mcg/kg may be used to reduce the effects of endotoxemia. S/E, C/I, D/F, W/P, D/I, *see* page 7.

*Note:* Oral antibiotics may deleteriously alter the intestinal microflora, interfere with competitive antagonism, and prolong shedding of the organism.

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*Public health significance:* Except few species-specific *Salmonella* serovars, most serovars are zoonotic.

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Sheeppox and Goatpox**

Sheep and goatpox are serious, often fatal, diseases characterized by widespread skin eruption. Both forms are widely distributed in Ethiopia.

#### ***Clinical Symptoms***

Fever, swollen eyelids, and mucopurulent discharge crusts on the nostrils. Widespread dermal eruptions appear as local inflammation, edema, and epithelial hyperplasia and are observed most readily on the muzzle, ears, and areas free of wool or long hair. When scabs are removed, a star-shaped scar, free of hair or wool, remains. Pregnant ewes may abort. In severe cases, lesions can occur in the lungs. In some sheep and in certain breeds, the disease may be mild or the infection is inapparent.

#### ***Diagnosis***

Clinical signs are suggestive; virus isolation and virus neutralization tests are employed for confirmation.

#### ***Treatment and Prevention***

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##### **Management**

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Drug treatment

There is no effective treatment for pox.

Control and Prophylaxis

- Prevent secondary bacterial infection by application of antibiotic ointment (*see* Diseases of sheep and goats: Foot and Mouth Disease).
  - Vaccination
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Septicaemic Pasteurellosis**

Septaemic or systemic pasteurellosis is caused by *P. trehalosi*. Septicemia or localization of the infection in one or more tissue such as the joints, udder, meninges, or lungs may occur. It is most common in young, weaned sheep (~6 months old) after transport or a sudden feed change, but it can occur in sheep of any age throughout the year.

#### ***Clinical Symptoms***

They are not specific showing pyrexia, dullness or coma, recumbency, dyspnea, and a frothy discharge from the mouth before death.

#### ***Diagnosis***

The clinical signs or sudden death may be indicative. Isolation of *P. trehalosi* from a range of tissues, and gross and histopathologic findings are confirmatory.

#### ***Treatment and Prevention***

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##### **Management**

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###### Drug treatment

- Oxytetracycline LA, 20 mg/kg, IM, q 3-4 days. S/E, C/I, D/F, W/P, D/I, *see* page 14

or

- Other antibiotics, *see* page 55/56.
  - Supportive therapy: Fluid therapy
- 

###### Prophylaxis

- Oxytetracycline LA, 20 mg/kg, IM, stat for shoat in contact with clinical infected animals. S/E, C/I, D/I and D/F *see* page 14.
  - Gradual change of feed and minimize transport stressors.
  - Preventive vaccination may be beneficial.
-

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### **Tetanus**

Tetanus is a sporadic disease of domestic animals characterized by a generalized, or occasionally localized, hypertonia of the skeletal muscles, frequently accompanied by clonic praxysmal muscular spasms. Sheep and goats are less susceptible than cattle.

The clinical signs, diagnosis and treatment methods are similar to cattle (*see Diseases of Cattle: Tetanus*).

### **Toxoplasmosis**

*Toxoplasma gondii* infection causes abortion and stillbirth in sheep and sometimes in goats.

#### ***Clinical Symptoms***

The fetus may be mummified, macerated, aborted or stillborn or may be born weak and die within a week. Adult sheep do not show clinical signs but goats may die.

#### ***Diagnosis***

Serologic testing may be useful. Available tests include the Sabin-Feldman dye test, complement fixation, direct and indirect hemagglutination, latex agglutination, modified agglutination, ELISA, and indirect fluorescent antibody testing.

#### ***Treatment and Prevention***

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##### **Management**

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##### **Drug treatment**

- Monensin at 30 mg/ewe q 24 h. S/E, C/I, D/F, W/P, D/I, *see page 38.*
- 

*Public health significance:* Toxoplasmosis is zoonotic and transmitted by consumption of raw meat and contact with infected cat faeces. Thus pregnant women should particularly be protected from sources of infection to avoid abortion.

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### **Tuberculosis**

Tuberculosis (TB) is an infectious, granulomatous disease caused by acid-fast bacilli of the genus *Mycobacterium*. It affects cattle, sheep and goats, swine etc. The epidemiology, clinical signs, diagnosis, treatment methods and public health significance are similar to that of cattle (*see* Diseases of cattle: Tuberculosis).

### **Respiratory Diseases**

#### **Aspiration Pneumonia**

Aspiration pneumonia (inhalation pneumonia) is characterized by pulmonary necrosis due to inhalation of foreign material. The clinical signs, diagnosis and treatment are similar to that of cattle (*See* Diseases of cattle: Aspiration pneumonia).

#### **Contagious Caprine Pleuropneumonia (CCPP)**

Contagious caprine pleuropneumonia (CCPP) is a highly fatal disease of goats caused by *Mycoplasma capricolum* sub species *capripneumoniae* (formerly *Mycoplasma* F38) However, other species including *M. mycoides* ssp. *capri*, *M. mycoides* ssp. *mycoides* large colony type may also cause pneumonia in goats. Since its first appearance in Ethiopia in the 1980's, its distribution has become cosmopolitan.

#### ***Clinical Symptoms***

Weakness, anorexia, cough, hyperpnea with grunting, and nasal discharge accompanied by fever (41°C), exercise intolerance and eventually respiratory distress develop. A septicemic form of the disease without specific respiratory tract involvement has been described. The thorax contains an excess of straw-colored fluid, and there is acute fibrinous pneumonia with overlying fibrinous pleurisy.

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### ***Diagnosis***

The clinical signs, epidemiology, and necropsy findings are used to establish a diagnosis. Culture on special media & serologic tests such as complement fixation, passive hemagglutination, ELISA, and latex slide agglutination may be used.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Tylosin 11 mg/kg, IM, q 8 h for 3 days. S/E, C/I, D/F, W/P, D/I, *see* page 35

or

- Oxytetracycline 15 mg/kg, IM, q 12 h, for 3-5 days. S/E, C/I, D/F, W/P, D/I, *see* page 14

or

- Chloramphenicol, 22 mg/kg, IM, q 12 h, for 3-5 days. S/E, C/I, D/F, W/P, D/I, *see* page 21
- 

##### Prophylaxis

- Vaccination
- 

*Note:* Treated animals may remain carriers.

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### **Enzootic Pneumonia**

Enzootic pneumonia (chlamydial pneumonia) is caused by *Chlamydia psittaci*. Stressed lambs under these conditions are frequently subject to various secondary bacterial infections, which can result in higher mortality and morbidity rates than are seen in uncomplicated chlamydial respiratory infections.

### ***Clinical Symptoms***

Fever, pneumonia, lethargy, and dyspnea, and with a serous and later mucopurulent nasal discharge and a dry hacking cough.

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### ***Diagnosis***

Isolation of chlamydiae from affected tissues in a tissue culture or chick embryo. It may be supported by ELISA acute and convalescent sera samples.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Oxytetracycline 25-50 mg/kg, q 24 h for 5-7 days. S/E, C/I, D/F, W/P, D/I, *see page 14*

or

- Penicillin 20,000 to 40,000 IU/kg, q 24 h for 4-5 days. S/E, C/I, D/F, W/P, D/I, *see page 14*

or

- Ampicillin 4-10 mg/kg, q 12 h, for 4-5 days. S/E, C/I, D/F, W/P, D/I, *see page 14/77*

or

- Tylosin 11 mg/kg, IM, q 8 h for 3 days. S/E, C/I, D/F, W/P, D/I, *see page 35*
- 

### **Maedi-Visna**

Maedi-visna or Ovine Progressive Pneumonia (OPP) is a chronic, progressive, viral disease of sheep caused by a lentivirus. In sheep, the disease is most common in animals >4 years old.

#### ***Clinical Symptoms***

Coughing, bronchial exudates, depression, fever, mastitis, and progressive wasting with increasing respiratory distress are common. All are low-grade, progressive infections. In the encephalitic form (visna), ataxia, muscle tremors, or circling progresses to paresis and eventually to complete paralysis. A similar disease in goats caused by a closely related lentivirus usually involves the nervous system and joints and less commonly the lungs. The disease has been recently introduced

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

to Ethiopia possibly with the importation of exotic sheep from Europe.

### ***Diagnosis***

In flocks experiencing progressive pneumonia for the first time, the diagnosis should be confirmed by histopathology, serology, or isolation of the virus.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- There is no effective treatment

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##### Prophylaxis

- Separation of all seropositive animals from seronegative ones.
  - Separate newborn lambs from their mothers and rear with milk from healthy ewes.
- 

## **Pneumonic Pasteurellosis**

Pneumonic pasteurellosis is a cranioventral fibrous bronchopneumonia caused by *Pasteurella* & *Mannheimia* spp particularly *Pasteurella multocida*, *Mannheimia haemolytica* and *P. trehalosi*, the disease affects sheep and goats of all ages. It can be particularly devastating in lambs and kids. Predisposing factors that expose to pasteurella infection include inadequate colostrum intake, stress due to transportation, weaning, or commingling with animals from unrelated farms and primary infections with respiratory viruses such as parainfluenza-type 3, adenovirus, and respiratory syncytial virus, or *Mycoplasma* spp (including *Mycoplasma ovipneumoniae*).

### ***Clinical symptoms***

Fever of 40-41.1°C, serous to mucopurulent ocular and nasal discharges, anorexia, coughing, dyspnea, and lethargy are noted.

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Harsh lung sounds, especially in the cranioventral portions of the lung field, may be auscultated. Morbidity and mortality rates are variable.

### ***Diagnosis***

In acute cases, diagnostic cultures may be obtained from tracheal washes or from necropsy specimens. In chronic cases, bacterial cultures may be less rewarding.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Penicillin 20,000 to 40,000 IU/kg, q 24 h for 4-5 days. S/E, C/I, D/F, W/P, D/I, *see page 14*

or

- Ampicillin 4-10 mg/kg, q 12 h, for 4-5 days. S/E, C/I, D/F, W/P, D/I, *see page 14/77*

or

- Tetracycline 5 mg/kg, q 12-24 h, for 4-5 days. S/E, C/I, D/F, W/P, D/I, *see page 14*

or

- Tylosin 10-20 mg/kg, q 12-24 h, for 4-5 days. S/E, C/I, D/F, W/P, D/I, *see page 35*

or

- Ceftiofur 2.2 mg/kg, q 12 h, for 4-5 days. S/E, C/I, D/F, W/P, D/I, *see page 78*

or

- Oxytetracycline, 10 mg/kg, q 12 h for 3 days. S/E, C/I, D/F, W/P, D/I, *see page 14*
- 

##### Prophylaxis

- In sheep, vaccination with homologous strain is important. In goats, there is no proven effective vaccine.
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Nasal Bot**

The sheep nose botfly, *Oestrus ovis*, in its larval stages, inhabits the nasal passages and sinuses of sheep and goats, which migrates to the nasal cavity. Infestation is less common in goats than sheep.

#### ***Clinical Symptoms***

Profuse nasal discharge, which may become mucopurulent and frequently tinged with fine streaks of blood emanating from minute hemorrhages produced by the hooks and spines of the larvae, thickening of the nasal mucosa, impairment of respiration, paroxysms of sneezing accompany migrations of the larger larvae. To avoid the fly's attempts at larval deposition, a sheep may run from place to place, keeping its nose close to the ground, and sneeze and stamp its feet or shake its head and gather in small groups facing the center.

#### ***Diagnosis***

It is based on clinical signs and isolation of the larvae.

#### ***Treatment and Prevention***

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##### **Management**

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###### Drug treatment

- Rafoxanide, 7.5 mg/kg PO, S/E, C/I, D/F, W/P, D/I, *see* page 48
- or
- Trichlorfon, 75 mg/kg PO, S/E, C/I, D/F, W/P, D/I, *see* page 61
- or
- Nitroxylinil 20 mg/kg, PO, S/E, C/I, D/F, W/P, D/I, *see* page 61
- or
- Ivermectin 0.2 mg/kg, PO or SC, S/E, C/I, D/F, W/P, D/I, *see* page 52

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### Verminous Pneumonia

Verminous or parasitic pneumonia of sheep and goats most commonly are caused by infection with *Dictyocaulus filaria*, *Muellerius capillaris*, or *Protostrongylus rufescens*. The clinical signs and diagnosis are similar to cattle (*See Diseases of Cattle: Verminous Pneumonia*).

### *Treatment and Prevention*

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#### Management

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##### Drug treatment

##### *Firstline*

- Levamisole 8 mg/kg, SC or PO. S/E, C/I, D/F, W/P, D/I, *see page 46*

or

- Ivermectin 0.2 mg/kg, SC or PO. S/E, C/I, D/F, W/P, D/I, *see page 52*

or

- Fenbendazole 5-10 mg/kg, PO. S/E, C/I, D/F, W/P, D/I, *see page 46*

##### *Alternative*

- Ivermectin, 0.3 mg/kg, SC or PO. S/E, C/I, D/F, W/P, D/I, *see page 52*

or

- Fenbendazole, 15 mg/kg, PO, q 12 h 3 weeks apart. S/E, C/I, D/F, W/P, D/I, *see page 46*

or

- Albendazole, 10 mg/kg, PO. For S/E, C/I, D/F, W/P, D/I, *see page 48*
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Reproductive System**

#### **Abortion**

Abortion in the ewe is caused by infectious or non-infectious causes. The major infectious agents causing abortions are *Campylobacter*, *Chlamydia*, *Toxoplasma*, *Listeria*, *Brucella*, and *Salmonella* (*see* Diseases of Cattle: Abortion).

#### **Brucellosis**

*Brucella ovis* and *B. melitensis* rarely cause abortion in sheep; the latter is the principal organism in goats. *Brucella abortus* occasionally causes abortion in sheep and goats (*See* Diseases of cattle: Brucellosis). In goats, abortion may be accompanied by mastitis and lameness and it is most common in the fourth month. *Brucella ovis* causes epididymitis and orchitis that impair fertility in rams. Susceptibility in rams increases markedly with age.

#### **Diagnosis**

Swelling of the scrotum in rams, abortion in ewes and does are indication and confirmed by culture. Serological tests could also be used to test infection.

#### ***Treatment and Prevention:***

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#### **Management**

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##### Drug treatment

- Chlortetracycline 6 to 10 mg/kg, IM; 10-20 mg/kg, PO
- Treatment is not economical except in especially valuable rams, and even if infection is eliminated, fertility may remain impaired.

---

##### Prophylaxis

- Test animals before introduction to a flock
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Enzootic Abortion**

Enzootic abortion (EA) or Chlamydial abortion is a disease of sheep caused by *Chlamydia psittaci* characterized by late abortions, stillbirths, or weak lambs. The fetus is usually non-necrotic, but there is placentitis with necrotic, reddish brown cotyledons and thickened intercotyledonary areas covered with exudate. Ewes and does that contract enzootic chlamydia during early gestation abort late in that gestation; those contract chlamydia late in gestation abort toward the end of the next gestation; congenitally infected ewes abort at the end of their first pregnancy. Ewes seldom abort from EA more than once during their life time.

#### ***Diagnosis***

Demonstration of elementary bodies in cotyledenary smears or vaginal discharge that is stained with Giemsa is sufficient. Complement fixation may be used as well.

#### ***Treatment and Prevention***

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##### **Management**

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##### Drug treatment

- Oxytetracycline 11 mg/kg, IM, q 24 h, for 5-7 days. S/E, C/I, D/F, W/P, D/I, *see* page 14

or

- Penicillin G 66,000 IU/kg, IM or SC, q 24 h, for 5-7 days. S/E, C/I, D/F, W/P, D/I, *see* page 14

or

- Ceftiofur sodium 2.2 mg/kg, IM, SC, q 12 h, 5-7 days. S/E, C/I, D/F, W/P, D/I, *see* page 78

or

- Trimethoprim-Sulfadiazine 80:400, 48 mg/kg, PO, q 12 h for 5 to 7 days. S/E, C/I, D/F, W/P, D/I, *see* page 38
- 

##### Prevention and prophylaxis

- During an outbreak, isolate does that abort
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

- Vaccination of sheep; however, the vaccine is not effective in goats.
- 

### **Leptospirosis**

The most common serovar of *Leptospira interrogans* involved in caprine abortion is *grippotyphosa*. Sheep are relatively resistant to leptospirosis and *Leptospira interrogans hardjo* is the major serovar. Goats are susceptible with abortions occurring at the time of leptospiremia. Some does have anemia, icterus, and hemoglobinemia; others are afebrile and are not icteric. Diagnosis is by serology or darkfield examination of urine or fetal kidney and for clinical signs (*See Diseases of Cattle: Leptospirosis*).

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Tetracycline 10-15 mg/kg, q 12 h, for 3-5 days. S/E, C/I, D/F, W/P, D/I, *see page 14*

or

- Streptomycin 12.5 mg/kg, q 12 h, for 3 days. S/E, C/I, D/F, W/P, D/I, *see page 17*

or

- Streptomycin can be combined with ampicillin or large doses of penicillin G. S/E, C/I, D/F, W/P, D/I, *see page/s 17/14*
- 

##### Prevention and prophylaxis

- Avoid direct or indirect contact with carriers and rodents
  - Vaccination with the most endemic serovars
- 

*Public health significance:* Leptospirosis is zoonotic disease and thus care should be taken to avoid infection of humans

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Listeriosis**

*Listeria monocytogenes* is a common pathogen in goats and causes sporadic abortions in does. Predisposing factors are similar to listeriosis in cattle (*see* Diseases of Cattle: Listeriosis).

#### ***Clinical Symptoms***

There are no specific fetal lesions, and the fetus is often autolyzed. The doe usually shows no signs before abortion but may develop severe metritis after abortion.

#### ***Diagnosis***

It is based on clinical signs and isolation of bacteria.

#### ***Treatment and Prevention***

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##### **Management**

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Drug treatment:

##### ***In septicaemic form***

- Penicillin-streptomycin 20000IU/250mg/100ml at 0.04ml/kg , IM, q 24 h, for 3 days. S/E, C/I, D/F, W/P, D/I, *see* page 14/17

##### ***Encephalic form***

- Treatment should commence early before irreversible damage occurs

##### ***Initial***

- Penicillin 40,000 IU/kg IM, q 6 h, until signs subside. S/E, C/I, D/F, W/P, D/I, *see* page 14

##### ***Maintenance***

- Penicillin 20,000 IU/kg, IM, q 12 h for 7 days. S/E, C/I, D/F, W/P, D/I, *see* page 14

##### ***plus***

- Oxytetracycline, 10 mg/kg, IM, q 12 h for 3 days. S/E, C/I, D/F, W/P, D/I, *see* page 14

or

- Dexamethasone 0.1 mg/kg, IV, q 24 h S/E, C/I, D/F, W/P, D/I, *see* page 7
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### Supportive therapy

- Fluid, electrolyte and supplemental feeding for severe cases.

### Prophylaxis

- Isolate aborting animals, handle fetuses, placenta and discharges with gloves
- Feed clean and quality silage

*Public health significance:* The organism could be transmitted to human via consumption of raw milk and contact with contaminated objects.

## **Mastitis in Goats**

The organisms infecting the udder of goats are similar to those in cows. Coagulase-negative staphylococci are prevalent and appear to cause persistent infections cause subclinical mastitis. The level of infection and incidence of mastitis due to *Staphylococcus aureus* and *Streptococcus agalactiae* and other streptococci tend to be low, but major differences between flocks may occur.

Mycoplasma infections, primarily *M. mycoides* (large colony type) and *M. putrefaciens*, sometimes cause serious outbreaks of mastitis in goats. The latter also causes septicemia, polyarthritis, pneumonia, and encephalitis, together with serious disease and mortality in suckling kids. *Mycoplasma capricolum* has also been reported to cause severe mastitis in goats and infection in kids. They do then recover within 4 weeks time.

As with cows, Gram-negative organisms cause intermittent infections that may be severe but are usually self-limiting. *Actinomyces pyogenes* sometimes produces multiple, nodular abscesses.

The diagnosis, control, and treatment of bacterial mastitis in goats are similar to those in cows with the exception of drug doses which are half to that of cows. Proper milking procedures

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

and good environmental sanitation are needed to reduce the prevalence and spread of infection. Chronically infected goats should be culled.

### **Puerperal Metritis**

Acute puerperal metritis, a postpartum complication from bacterial contamination of the reproductive tract at parturition, is characterized by fetid, watery uterine discharge. For clinical signs and diagnosis *see* Metritis in cattle.

#### ***Treatment and Prevention:***

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#### **Management**

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##### Non-drug treatment

- Drainage of the uterine content but handle with care so that the uterus should not be damaged
- 

##### Drug treatment

- Procaine Penicillin 11,000-66,000 IU/kg, IM, q 24 h, or if Sodium Penicillin q 12 h for 3-5 days. S/E, C/I, D/F, W/P, D/I, *see* page 14

or

Oxytetracycline 11 mg/kg, IM, q 12 h for 5 days. S/E, C/I, D/F and W/P *see* page 14

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##### Prevention and prophylaxis

- Sanitation in delivery pens and assistance during delivery.
- 

### **Retained Fetal Membranes**

For description, clinical signs, diagnosis and treatment *see* page 98.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### **Ectoparasites**

#### **Mites**

##### **Sarcoptes**

The sarcoptic mange that causes scabies in sheep and goat are *S.rupicaprae* or *S. scabei*. These mites tunnel through the epidermis and feeds on tissue fluids.

##### ***Clinical Symptoms***

The signs are small pruritic nodules, especially on the heads, dermatitis, and keratosis thickened and wrinkled skin.

##### ***Diagnosis***

Microscopic examination of deep skin scraping.

##### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

##### ***Lactating shoats***

- Lime Sulfur solution or 0.05% Amitraz, 5-10 applications, every 5 to 7 days.
  - ✓ S/E: amitraz- transient sedation, lowered`rectal temperature, increased blood glucose levels, and seizures

##### ***Non-lactating shoats***

- Ivermectin 1%, 1ml/adult sheep or goat, once per week for two weeks. S/E, C/I, D/F, W/P, D/I, *see page 52*

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***Public health significance:*** sarcoptic manges are zoonotic and care should be exercised to avoid human infection.

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##### **Chorioptes (in goats)**

*Chorioptes caprae* is fairly common in goats. Papules and crusts are seen on the feet and legs.

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### ***Clinical Symptoms***

The lesions are non-nodular papules, crusts, alopecia, erythema and ulcerative mainly in limbs, udder, scrotum and peri-anal region. Pruritis is common.

### ***Diagnosis***

It is similar to sarcoptic mange

### ***Treatment***

See sarcoptic mange above.

### **Psoroptes (in sheep)**

The sheep mite *Psoroptes ovis* causes large, scaly, crusted lesions almost exclusively on wooly parts of the body.

### ***Clinical Symptoms***

Clinically animals show intense pruritus manifested by biting and scratching. Untreated sheep often become emaciated and anemic. Mites are sometimes found in the ears.

### ***Diagnosis***

Clinical signs and identification of mites is important.

### ***Treatment and Prevention***

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#### **Management**

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- Ivermectin 1%, 1 ml/40 kg, SC every 7 days for 3 times S/E, C/I, D/F, W/P, D/I, see page 52
- Coumaphos 0.3% spray q 7 days. S/E, C/I, D/F, W/P, D/I, see page/s 103/104
- Phosmet 0.15-0.25% every 7 days. For 3 times S/E, C/I, D/F, W/P, D/I, see page/s 103/104
- Diazinon 0.03-0.1% every 7 days. for 3 times S/E, C/I, D/F, W/P, D/I, see pages 103/104

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Psoroptes (in goats)**

In goats the psoroptic mange (ear mange) is *Psoroptes cunicul*.

#### ***Clinical Symptoms***

It usually affects the ears but can spread to the head, neck, and body and cause severe irritation, head shaking and alopecia. The course is chronic, but the prognosis is good.

#### ***Diagnosis***

It is similar to sarcoptic or chorioptic mange.

#### ***Treatment and Prevention***

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#### **Management**

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Drug treatment:

- Chrotoxyphos or Coumaphos, 0.25%, spray q 7 days  
or
- Trichlorphon 0.2%, spray q 7 days, *see* page 103/104  
or
- Amitraz, 0.05%, spray animals with these acaricides 2 times at 10-14days interval. S/E, C/I, D/F, W/P, D/I, *see* page/s 103/104

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*Note:* Lactating dairy goats should be treated only with lime-sulfur solution.

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#### **Demodex**

Demodectic mange of sheep (*Demodex ovis*) and goats (*Demodex caprae*) cause lesions similar to those in cattle (*see* Diseases of Cattle: external parasites). These parasites inhabit the hair follicles and sebaceous glands.

#### ***Clinical Symptoms***

In goats, nonpruritic papules and nodules develop, especially over the face, neck, shoulders, and sides. The nodules contain a thick, waxy, grayish material that can be easily expressed; mites can be found in this exudate. The disease can become chronic.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Treatment and Prevention:***

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#### **Management**

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##### Non-drug treatment

- Incise nodules, and infuse with Lugol's iodine or rotenone in alcohol (1:3).

##### Drug treatment

##### *Generalized cases in goats*

- Ronnel in propylene glycol, 180 mL of 33% ronnel in 1 L of propylene glycol, applied to one-third of the body daily until cured

or

- Rotenone in alcohol (1:3) applied to one-fourth of the body daily until cured.

##### In sheep:

- Trichlorfon 2% spray or dipping, *see* page 103/104
- 

### **Psorergate**

*Psorergates ovis* is a common skin mite of sheep characterized by intense generalized pruritus and scaliness, with matting and loss of wool.

### ***Diagnosis***

The mites are difficult to find in skin scrapings.

### ***Treatment and Prevention***

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#### **Management**

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- Lime sulphur as in sarcoptes treatment.
- Malathion 0.2%, dipping or spraying. S/E, C/I, D/F, W/P, D/I, *see* page 103/104

or

- Coumaphos 0.3%: two treatments with a 14-day interval. S/E, C/I, D/F, W/P, D/I, *see* page 103/104

or

- Ivermectin 1%, SC. S/E, C/I, D/F, W/P, D/I, *see* page 52
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Tick Infestation**

For the species involved, diagnosis, and treatment, *see* on ticks page 102.

### **Cutaneous Myiasis**

It is caused by infestation of the skin by blowfly maggots of *Lucilia*, *Phormia*, *Calliphora*, *Chrysomya* etc. species. Infestation causes serious wool loss. The incidence of fly strike is common during humid months of the year and usually associated with fleece rot, mycotic dermatitis, diarrhea, urine staining and foot rot. Once the larva strike to decomposing tissue or fleece, it may spread to normal skin and give way to other secondary flies that may invade and extend the lesion.

#### ***Clinical signs***

The sheep become restless, tend to bite or kick at the struck area, wriggle their tails, the wool might be lifted off, ulceration may occur and serous fluid oozes out followed by pus.

#### ***Diagnosis***

Predisposing diseases such as footrot, wound infections and diarrhea due to parasitic gastroenteritis are usually easily detected and fleece rot is indicated by matting of the wool and discoloration.

#### ***Treatment and Prevention***

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##### **Management**

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Drug treatment

- Application of larvicidals, BTH dressing (Boric acid, tar oil, bentonite mixture)

or

- Organophosphate insecticides. D/F, S/E, C/I, W/P, D/I, *see* page 103/104
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### DISEASES OF PIGS

#### **Infectious Diseases**

##### **African Swine Fever**

It is a peracute highly contagious and highly fatal disease of pig caused by African swine fever virus. The transmission occurs by Argasid ticks, Once established, the disease spread rapidly by direct contact or ingestion of contaminated feed.

##### *Clinical Symptoms*

Fever that subside after four days and development of cyanotic skin, anorexia, huddling together, disinclination to move, incoordination of hind quarter, and move on front legs dragging the hind legs, naso-ocular discharge, dyspnea and cough.

##### *Diagnosis*

Clinical sign and serological tests are indicated for diagnosis.

##### *Treatment and Prevention*

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#### **Management**

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##### Drug treatment

- No specific treatment but treat with antibiotics for secondary bacterial infection.

##### *First line*

- Lincomycin hydrochloride 10-15 mg/kg, IM, q 12 h and with hydrogen peroxide 8.3 mg/kg q 24 h, PO for 3-5 days.
    - ✓ S/E: May produce occasional vomiting and diarrhea.
    - ✓ C/I: Hepatic impairment,
    - ✓ D/F: Injection, 113.4 mg/ml
    - ✓ D/I: Kaolin mixture, muscle relaxants, neostigmine
- 

or

- Oxytetracycline 0.5g/kg of feed for 7 days, and 10-20 mg/kg IV or IM q 6 h for 7 days.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

- ✓ S/E: diarrhea, gastric upset
- ✓ C/I: Renal impairment, last 2-3 weeks of gestation in pregnant animals and up to 4 weeks of age in neonates
- ✓ D/F: Powder: 5, 10, 20, 25 and 50%.
- ✓ W/P: meat 10 days,
- ✓ D/I: Antiacids, dairy products, calcium salts, iron salts, magnesium salts, zinc salts and warfarin

### *Alternative*

- Trimethoprim-sulphadiazine, 15 mg/kg, PO, q 12 h for 3-5 days. or 48 mg/kg, q 24 h, IM
- ✓ D/F: Powder, 500+50mg/g, 400+80mg/g and 33.3g+6.67mg/100gm; Oral suspension, 50+10, and 400+80 mg/ml
- ✓ W/P: meat 28 days;
- ✓ D/I: Detomidine and halothane

---

### Prevention:

- ◆ Maintain disease free status by restriction of pig movement and serological monitoring and prevention of contact between domestic pigs and warthogs.
  - ◆ Prohibition of importation of pigs and pig products
  - ◆ Tick control
- 

## **Brucellosis**

Brucellosis in pigs is caused by *B. suis*. The disease often self-limiting, however, it may persist for years in some herds. It is usually spread mainly by ingestion of infected tissues or wastes. Infected boars may transmit the disease during service. Suckling pigs may become infected from sows, but most reach weaning age without becoming infected.

### *Clinical Symptoms*

Common manifestations are abortion, temporary or permanent sterility, orchitis which may be unilateral, lameness, posterior paralysis, spondylitis, and occasionally metritis and abscess

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

formation in extremities or other areas of the body and sterility.

### ***Diagnosis***

The Rose Bengal agglutination test and ELISA

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- No practical recommendation for pig treatment.
- 

Prevention and control

- No vaccine for pig brucellosis. segregation, and slaughter of infected breeding stock.
  - Test and replace with health animals
- 

*Public health significance:* Brucellosis is transmitted to humans via contact with infected materials and consumption of raw infected milk.

---

### **Coccidiosis**

Eight species of *Eimeria* and one of *Isospora* are responsible to infect pigs. *Isospora suis* is prevalent in neonatal pigs.

### ***Clinical Symptoms***

Watery or greasy diarrhea, usually yellowish to white and foul smelling. Piglets may appear weak, dehydrated, weight gains are depressed, and sometimes they die.

### ***Diagnosis***

Isolation of the parasite from impression smear or histological section of small intestine. In severely affected piglets, histological lesions are confined to the jejunum.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Treatment and Prevention***

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#### **Management**

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- Sulfamethazine 0.1%, q 24 h for 2-4 days in drinking water
    - ✓ S/E: cutaneous eruption, hypothyroidism
    - ✓ D/F: Powder, 8, 10, 16, 20, 25 and 30%
    - ✓ W/P: Meat 15 days;
    - ✓ D/I: Thiopentone sodium and warfarin

or

  - Amprolium 0.012-0.024%, q 24 h for 5 days in drinking water
    - ✓ D/F: Powder, 20, 30 and 60 % and Oral solution, 38.4 mg/ml
- 

#### Prophylaxis and control

*Premix:* Decoquinate 60 gm/kg feed and 200mg/kg feed through out the risk period.

*Note:* Removal of feces and disinfection of farrowing facilities between litters greatly decreases infection.

---

## **Foot and Mouth Disease**

It is a highly contagious infectious viral disease. There are seven immunologically distinct serotypes: A, O, C, Asia 1, and SAT (Southern African Territories) 1, 2, and 3. There are a number of vaccine strains for each serotype, particularly O and A, are required to cover the antigenic diversity. Transition occurs by contact through oral or respiratory routes.

### ***Clinical Symptoms***

The clinical signs and lesions are similar to cattle (*see* Diseases of Cattle: Foot and Mouth Disease). Vesicles may also appear on the teats and udder and on areas of skin subject to pressure and trauma, such as the legs of pigs. Young piglets may die before showing any vesicles,

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Diagnosis***

Clinical signs and confirmed by serology, ELISA or virus culture.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- There is no specific treatment for FMD. But antibiotic treatment is indicated for secondary infection (for indications, S/E, C/I, D/I, D/F, W/P, *see* page 155)

##### Prevention

- Vaccination
- 

## **Gastrointestinal Parasitism**

### **Ascariasis**

Pigs are infected by *Ascaris suum*. The parasites are found principally in the small intestine but may migrate into the stomach or bile ducts. The migration of larvae in the body damages tissues.

### ***Clinical Symptoms***

Poor growth rate of young pigs, mechanical obstruction of the intestine, or migrates into liver and may occlude the bile ducts, producing icterus.

Affected pigs show abdominal breathing, unthriftiness and weight loss are common.

### ***Diagnosis***

History, clinical signs, and microscopic examination of fecal smears.

**Standard Veterinary Treatment Guidelines for Veterinary Clinics**  
***Treatment and Prevention***

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**Management**

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*First line*

- Piperazine, 250-300mg/kg, PO
  - ✓ S/E: occasional emesis and diarrhea
  - ✓ C/I: Renal impairment
  - ✓ D/F: Tablets, 50 and 500 mg, Powder, 65%, Syrup, 100 mg/ml

or

- Fenbendazole 5-7 mg/kg, PO for 3 days
  - ✓ S/E: Hypersensitivity
  - ✓ C/I: early gestation
  - ✓ D/F: Suspension, 2.5, and 5%, Powder or granule, 4, 20, 22 and 25%,
  - ✓ W/P: slaughter 14 days

or

- Ivermectin 0.3 mg/kg, PO, or SC.
  - ✓ S/E: Ataxia, depression, tremors, mydriasis, listlessness, musculoskeletal pains, oedema of the face or extremities, itching and papular rash
  - ✓ C/I: Calves less than 12 weeks of age and lactating animals
  - ✓ D/F: Suspension, 800 mcg/ml, Powder or granule, 0.2%, Injection, 10 mg/ml

---

Prophylaxis and control

- Flubendazole 5mg/kg twice per year. S/E, C/I, D/F, *see* Fenbendazole above.
- 

## **Cysticercosis**

*Taenia solium* is a tapeworm found in the small intestine of man. Its metacestode (larval) stage, a cysticercus, is a large fluid-filled cavity or vesicle or bladder found in the musculature of pigs.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Infection causes pain, paralysis, epileptiform seizures, locomotor disturbances, and possibly death. The coenuri commonly localize on the meninges and in the neuropil.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- It has no specific treatment in pigs.

##### Prevention

- Preventing pigs' access to human faeces.
- Total confinement of pigs if integrated with other management practices such as housing and feeding with locally available materials and feedstuffs.
- Strict meat inspection and control
- Cooking of pork

*Public Health significance:* Humans are final hosts and could acquire by ingesting raw pork.

---

## **Strongyloides species**

It is intestinal threadworm caused by *Strongyloides ransomi*. Transmission occurs by ingestion of larvae in the colostrum in neonatal pigs. The adult worms (only females in the parasitic cycle) burrow into the wall of the small intestine.

### ***Clinical Symptoms***

In heavy infections, diarrhea, anemia, and emaciation develop and death may result.

### ***Diagnosis***

Demonstration of the characteristic small, thin-shelled, embryonated eggs in the feces or of the adults in scrapings from the intestinal mucosa is diagnostic.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention:*

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#### *Management*

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##### *First line*

- Fenbendazole, 5 mg/kg, PO. S/E, C/I, D/F, W/P, *see* page 160.

or

- Ivermectin, 0.3 mg/kg, PO, or SC. S/E, C/I, D/F, *see* page 160.

##### *plus*

- Treat with antibiotics to control secondary infection. S/E, C/I, D/F, D/I, *see* page 155/160.

##### Prophylaxis:

- Flubendazole, 5mg/kg body weight twice per year.

or

- Ivermectin is effective against adults and, if given to the sow 1-2 wk before farrowing, controls transmission to the piglets. S/E, C/I, D/I, D/F *see* page 160.
- 

### **Stomach Worms**

Three types of stomach worms occur in pigs: a thin worm, *Hyostromylus rubidus* (the red stomach worm), and two thick stomach worms, *Ascarops strongylina* and *Physocephalus sexalatus*.

#### *Clinical Symptoms*

Poor body condition, anemia, diarrhea, or weight loss. In sows, inhibited larvae resume development near parturition and may cause severe gastritis and, in addition, contaminate the environment of the young pigs.

#### *Diagnosis*

Fecal examinations and necropsy.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Treatment***

See treatment of Strongloides sp.

### **Trichuris sp**

Trichuris suis is 5-8 cm long and has a slender anterior portion and a thickened posterior third. Infection is by ingestion of embryonated ova.

### ***Clinical Symptoms***

Heavy infections may cause inflammatory lesions in the cecum and adjacent large intestine and be accompanied by diarrhea and unthriftiness.

### ***Diagnosis***

Demonstration of double-operculated eggs are diagnostic.

### ***Treatment and Prevention***

---

#### **Management**

---

Drug treatment

#### ***First line***

- Levamisole, 10 mg/kg, PO.
  - ✓ S/E: Frothing, salivation, tremor, transient head shaking, licks of lip, urination, defecation, vomiting, ataxia, collapse and death due to respiratory failure
  - ✓ C/I: With in 14 days of treatment of organophosphorus compound or diethylcarbamate.
  - ✓ D/F: Bolus, 200, 250, 300, 400 and 600 mg, Suspension, 15, 30, and 50%, Powder or granule, 10 and 20%

or

- Fenbendazole, 5 mg/kg, PO. S/E, C/I, D/F, *see* page 160.
- 

### **Swine kidney worm**

A worm infestation of kidney and uterine wall of pigs caused by *Stephanurus dentatus*. Transmission occurs by ingestion of earth worm, the intermediate host.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Pleuritis, peritonitis, and cirrhosis.

### ***Diagnosis***

Detection of eggs in urine is definitive.

### ***Treatment and Prevention***

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#### **Management**

---

Drug treatment

#### ***First line***

- Ivermectin, 300 mcg/kg, SC, PO, q 24 h for 3 days. S/E, C/I, D/F, *see* page 160.

or

- Fenbendazole, 3 mg/kg, PO, q 24 h for 3 days. S/E, C/I, D/F, *see* page 160.

Prevention

- Sanitation of the area by provision of a concrete pad under the feed.
- 

## **Pleuropneumonia**

A disease of pig caused by *Haemophilus pleuropneumoniae*. It is transmitted by inhalation. Over crowding and poor ventilation facilitate the spread of the disease.

### ***Clinical Symptoms***

Rapid onset, usually several death and others show respiratory problem, fever, and anorexia, sever dyspnea, and blood stained frothy discharge through nose and mouth.

### ***Diagnosis***

Clinical signs are suggestive; isolation is confirmatory.

**Standard Veterinary Treatment Guidelines for Veterinary Clinics**  
***Treatment and Prevention***

---

**Management**

---

Drug treatment

*First line*

- Lincomycin hydrochloride 10mg/kg, IM, q 12 h for 3-5 days. S/E, C/I, D/F, W/P, D/I, *see* page 155.

or

- Oxytetracycline, 500 mg/kg of feed for 7 days. S/E, C/I, D/F, W/P, D/I, *see* page 155.

or

- Trimethoprim-sulphadiazine(80: 400)15 mg/kg, PO, q 12 h for days. S/E, C/I, D/F, W/P, D/I, *see* page 156.
- 

Prophylaxis and control

*Premix:*

- Chlortetracycline or Oxytetracycline 20mg/kg of feed, q 24 h for 7 days.

✓ S/E: Irritant for IM injection, diarrhea, gastric upset

✓ C/I: Renal impairment, last 2-3 weeks of ingestion in pregnant animals and up to 4 weeks of age in neonates

✓ D/F: Powder, 10 & 20%

✓ W/P: meat 10 days,

✓ D/I: Antiacids, dairy products, calcium salts, iron salts, magnesium salts, zinc salts and warfarin

---

**Infectious Polyarthrits**

Porcine infectrons polyarthrits is an infectious disease of swine caused by *Hemophilus suis*. The transmission is not well established.

***Clinical Symptoms***

Fever (40-42°C), complete anorexia, rapid shallow mouth breathing, anxious expression, extension of head, animals stand on toes and move with shuffling gate. All joints are swollen and painful up on palpation. Chronic arthritis is more common in

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

weaning pigs.

### ***Diagnosis***

Clinical signs isolation of the organism.

### ***Treatment and Prevention***

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#### **Management**

---

Drug treatment

##### ***First line***

- Trimethoprim-sulphadiazine (80:400) 15 mg/kg of feed, PO, q 12 h for days. S/E, C/I, D/F, W/P, D/I, *see* page 156.
- 

Prophylaxis and control

- *See* Diseases of Pigs: Pleuropneumonia.
- 

## **Salmonellosis**

It is bacterial disease of pig caused by *Salmonella typhimurium* and *Salmonella choleraesuis*. Outbreaks may occur in pigs up to 6 month old.

### ***Clinical Symptoms***

Septicemia, anorexia, depression, fever (40.5-41.5°C), severe watery diarrhea, sometimes dysentery, and often tenesmus and death occur in 24-48 hr. A dark red to purple discoloration of the skin is common, especially at the ears and ventral abdomen. Nervous signs and pneumonia may occur. Mortality may reach 100%.

### ***Diagnosis***

Clinical signs and isolation of salmonella from feces, tissues animals, feed , or water supplies.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Treatment and Prevention***

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#### **Management**

---

##### Drug treatment

###### *First line*

- Trimethoprim-sulphadiazine, 15mg/kg, PO, q 12 h, S/E, C/I, D/F, W/P, D/I, *see* page 156

###### *Alternative*

- Ampicillin 10-20mg/kg of feed, PO, q 12-24 h for 3-5 days
  - ✓ C/I: Hypersensitivity reaction
  - ✓ D/F: Powder; 0.1, 0.15, 0.2, 0.5, 20, 70 and 75%, Oral Suspension; 5, 10 and 15%
  - ✓ W/P: meat 21 days, milk 7 days

###### *plus*

- Dexamethasone 20-200mcg/kg, IM, q 6-12 h.
    - ✓ S/E: Muscle wasting, cutaneous atrophy, telogen arrest of hair follicles and delayed wound healing.
    - ✓ C/I: Pregnant animals
    - ✓ D/I: Acetazolamide, antidiabetic drugs, barbiturates, phenylbutazone, phenytoin, diuretics
    - ✓ D/F: Injection, 1 mg/ml, 2 mg/ml, 5 mg/ml
- 

##### Prophylaxis and control

*Premix: See, page 165*

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*Note:* Oral medication should be given in drinking water because affected animals are thirsty due to dehydration, and their appetite is generally poor.

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*Public health significance: Salmonella typhimurium is zoonotic.*

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## **Streptococcal Lymphadenitis**

It is contagious disease of pigs. transmitted by ingestion of streptococcus contaminated feed.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Abscessation of in the cervical and cephalic lymph nodes. Scattered miliary abscesses may also develop in other lymph nodes; within 7 days of infection.

### ***Diagnosis***

Isolation of the organism from abscess exudates and agglutination test are indicated for diagnosis.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

#### ***First line***

- Tetracycline 200-400 mg/kg of feed. S/E, C/I, D/F, W/P and D/I, *see* page 155.

or

- Trimethoprim-sulphadiazine (80:400) 15 mg/kg, PO, q 12 h or 48 mg/kg, q 24 h, IM for 3-5days. S/E, C/I, D/F, D/I, W/P, *see* page 156.

or

- Neomycin 11 mg/kg, q 24 h for 5 days
    - ✓ S/E: Nephrotoxicity, ototoxicity, neuromuscular blockage, diarrhea, if dosage is higher
    - ✓ C/I: Myasthenia gravis
    - ✓ D/F: Powder, 20, 30, 70 and 100%
    - ✓ W/P: Pigs: ment 14 days and
    - ✓ D/I: Phenylmethyl penicillin and warfarin
- 

Prophylaxis and control

- In affected herds, piglets should be weaned at 21 days and reared in an environment free of older pigs.
- 

### **Streptococcosis**

It is a common cause of meningitis and arthritis on large, intensively managed pig farms. It is also associated with pneumonia, endocarditis, myocarditis, and diseases of the

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

genital tract in sows. Transmission occurs by close contact with clinical cases or subclinical carriers and the environment.

### ***Clinical Symptoms***

Meningitis manifested by depression, fever, tremors, incoordination, opisthotonus, convulsions, blindness, and deafness. Polyarthritis and lameness are common. The skin may be reddened in patches. Lymph nodes are often enlarged and congested, and fibrinous polyserositis is common. Joint capsules may be thickened, and joints may contain excess clear or cloudy fluid. Often, the meninges and brain appear normal, but there may be congestion, edema, and excess clear or cloudy CSF.

### ***Diagnosis***

History, clinical signs, histology and fluorescent antibody (FA) tests are important. Definitive diagnosis depends on isolation and identification of the causative organism

### ***Treatment and Prevention***

---

#### **Management**

---

Drug treatment

##### ***First line***

- Penicillin 10,000-20,000 IU/kg, IM, q 12 h for 3 days.
    - ✓ S/E: Allergic reactions
    - ✓ C/I: Hypersensitivity
    - ✓ D/F: Injection in 200,000 IU/ml to 400,000 IU/ml
    - ✓ W/P: meat 10 days.
    - ✓ D/I: Chloramphenicol, tetracycline and phenylbutazone  
or
  - Trimethoprim-sulphadiazine 15 mg/kg, PO, q 12 h for days.  
S/E, C/I, D/F, W/P, D/I, *see* page 156
- 

Prophylaxis and control:

Good husbandry practice.

*Premix: see* Diseases of Pigs, Pueropneumonia.

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Swine Dysentery**

A contagious disease of pig caused by *Treponema* characterized by mucohemorrhagic diarrhoea affecting the large intestine. The transmission occurs by ingestion.

#### ***Clinical Symptoms***

Fever, depression, inappetence, soft feces, progressive dehydration with gaunt and sunken abdomen.

#### ***Diagnosis***

Clinical signs are indicative and confirmed by isolation of the organism.

#### ***Treatment and Prevention***

---

#### **Management**

---

Drug treatment

##### ***First line***

- Lincomycin hydrochloride 10-15 mg/kg, IM, q 12 h for 3 days. S/E, C/I, D/F, W/P, D/I, *see* page 155

##### ***Alternative***

or

- Tylosin 8.8 mg/kg, IM, q 24 h for 3 days
  - ✓ S/E: Allergic, diarrhea, erythema and pruritis
  - ✓ C/I: Animals with impaired liver function.
  - ✓ D/F: Injection; 20, 50, 150, and 200 mg/ml
  - ✓ W/P: meat nill
  - ✓ D/I: Theophillin, Warfarin and beta-adrenergic

### **Swine Erysipelas**

An acute septicaemic disease of swine caused by *Erysipelothrix rhusiopathiae*. Recovered pigs and those chronically infected remain carriers.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Acute: septicemia, discoloration of the skin (sub acute) form, chronic arthritis, and vegetative endocarditis may occur in sequence, or separately. Pigs with acute septicemia may die suddenly without previous signs. Acutely infected pigs are febrile (40-42°C), walk stiffly on their toes, and lie on their sternums separately rather than piling in groups.

Skin discoloration may vary from widespread erythema and purplish discoloration of the ears, snout, and abdomen, to diamond-shaped skin lesions almost anywhere on the body, but particularly the lateral and dorsal parts. If untreated, necrosis and separation of large areas of skin can occur, but more commonly, the tips of the ears and tail may become necrotic and slough.

Chronic arthritis or vegetative valvular endocarditis is developed in untreated pigs. Chronic arthritis, the most common form of chronic infection, produces mild to severe lameness; the affected joints may be difficult to detect but tend to become visibly enlarged and firm.

### ***Diagnosis***

Response to penicillin within 24 hr supports the diagnosis. The typical diamond-shaped skin lesions, organism in stained smears or cultures confirms the diagnosis.

### ***Treatment and Prevention:***

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#### **Management**

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Drug treatment

*Acute infections*

- Penicillin 10,000-20,000 IU/kg, IM, q 6 h for 3 days. S/E, C/I, D/F, W/P, D/I, *see* page 169.

or

- Tetracyclines 5-6 mg/kg, IM, q 12 h for 3 days. S/E, C/I, D/F, W/P, D/I, *see* page 155

*Chronic infections*

- Better cull pigs
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

Prophylaxis and control

*Premix: see page 165*

- Vaccination of non- pregnant sows every six month.
- 

### **Swine Influenza**

An acute, highly contagious, respiratory disease that results from infection with type an influenza virus.

#### ***Clinical Symptoms***

Depression, fever 42°C, anorexia, coughing, dyspnea, weakness, prostration, and a mucous discharge from the eyes and nose; mortality is generally 1-4%; animals recover from 3-7 days in uncomplicated infections.

#### ***Diagnosis***

Clinical sign are indicative and confirmed by on isolation of the virus or demonstration of virus-specific antibody,

#### ***Treatment and Prevention***

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##### **Managment**

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Drug treatment

- There is no specific treatment, although antimicrobials may reduce secondary bacterial infections. *see page*

Prevention and control

- Vaccination and strict import controls are the only specific
  - Good management practices and freedom from stress, particularly due to crowding and dust, help to reduce losses.
- 

*Public health significance:* Swine influenza virus might revert its antigenicity and infect humans.

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Non Infectious Diseases**

#### **Iron Deficiency in Piglets**

Iron deficiency usually develops in nursing piglets reared in confinement mainly as a result of low iron content of sow's colostrum and milk due to elimination of contact with iron from soil.

#### ***Clinical Symptoms***

In absence of iron supplementation, pigs rapidly become anemic and remain unprosper for several weeks. The common clinical signs are identified with reduced growth rates, severe dyspnoea, contracting jerks of the diaphragm muscle, lethargy with exercise, pale skin and mucosae, and diarrhea.

#### ***Diagnosis***

Clinicals sign are suggestive.

#### ***Treatment and Prevention***

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#### **Management**

---

##### Drug treatment

- Iron dextran 100-200mg, IM, at 1-3 days of age and may be repeated in 10-14 days.
    - ✓ C/I: hypersensitivity, anemia, acute renal infections and oral iron supplement
    - ✓ S/E: high dose has teratorgenicity and embryotoxic, weakness, prostration and anaphlactoid reaction.
- 

##### Prevention

- Iron dextran, 100-150mg, IM, at 1 - 3 days of age.
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Sarcoptes**

Mange infests pigs and cause high morbidity but no mortality.

#### ***Clinical Symptoms***

Appearance of small nodules and pustules that forms large abcess which is cheesy in consistancy loss of hair and thickened skin in that commences on the face and spread down the ventral surface of the neck and belly. Intense puritis, erythematous spots with scales and minor exudation are common. Chronic infestation may result in to thickening and wrinkling of skin.

#### ***Diagnosis***

Clinical sign and confirmed by detection of mite in skin scrape.

#### ***Treatment and Prevention***

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##### **Management**

---

##### **Drug treatment**

- Vigorous therapy with acaricides, *see* page 103/104  
Ivermectin, 300 mcg/kg, SC, PO, *see* page 160

##### **Prevention**

- Avoid the contact of sick animals with healthy ones and disinfect house with acaricides
-

## **DISEASES OF EQUIDAE**

### **Infectious Diseases**

#### **Actinobacillosis**

Actinobacillosis in horses is caused by Gram-negative coccobacilli, *Actinobacillus equuli*. It almost always involves soft tissue, including lymph nodes through which the organisms frequently spread, but also may involve adjacent bony tissue. Infections occur through a contaminated umbilicus, inhalation, or ingestion.

#### ***Clinical Symptoms***

Young foals; diarrhea, which may be followed by meningitis, pneumonia, purulent nephritis, or septic polyarthritis (sleepy foal disease or joint ill). Adult horses; abortions, septicemia, nephritis, and endocarditis.

#### ***Diagnosis***

Clinical findings are suggestive and confirmed by microscopic examination from the exudates and by culture.

**Standard Veterinary Treatment Guidelines for Veterinary Clinics**  
***Treatment and Prevention***

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**Management**

---

Non-drug treatment

- Surgical debridement and 10% potassium iodide PO.

Drug Treatment

- Oxytetracycline 5%, 5 mg/kg, q 12 h, IV or IM for 3-7 days.
  - ✓ S/E: Irritant for IM injection, diarrhea, gastric upset
  - ✓ C/I: Renal impairment, last 2-3 weeks of ingestion in pregnant animals and up to 4 weeks of age in neonates
  - ✓ D/F: Injection; 5, 10, 20 and 30%
  - ✓ D/I: Antiacids, dairy products, calcium salts, iron salts, magnesium salts, zinc salts and warfarin

or

- Procaine Penicillin G, 15 mg/kg, q 12h, IM for 3-7days
    - ✓ S/E: Allergic reactions and immune mediated hemolytic anemia in horses
    - ✓ C/I: Hypersensitivity
    - ✓ D/F: Injection in 200,000 IU/ml to 400,000 IU/ml
    - ✓ D/I: Chloramphenicol, tetracycline and phenylbutazone
- 

or

- Iodine tincture (Iodine 2%) applied topically
    - ✓ S/E: Irritant and stains tissue
    - ✓ C/I: Concurrent use of other antiseptics and detergents
  - Control & Prophylaxis
  - Feeding foals with colostrums at the early age
- 

**Acute Bronchointerstitial Pneumonia in Foals**

Acute bronchointerstitial pneumonia is a sporadic, rapidly progressive, disease of foals aged between 1 week and 8 months characterized by acute respiratory distress and high mortality. The etiology is unknown, but autodestructive inflammation, endotoxins from gram negative bacteria or infection with *Rhodococcus equi* have been suspected.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical symptoms***

Acute or peracute onset and is accompanied by a marked fever. Foals are unable or reluctant to eat or move and are usually cyanotic. Severe respiratory distress is the most marked clinical sign.

### ***Diagnosis***

Clinical examination.

### ***Treatment and prevention***

The treatment should be immediate and aggressive.

---

### **Management**

---

#### Non-drug treatment

- Oxygen administration and external cooling of the foal in addition to the drugs below

#### Drug treatment

- Dexamethasone 0.1-0.2 mg/kg, q 12 h for 1-2 days initially (maximum for the two days ~80 mg), then once daily for another 3-5 days followed by a gradual tapering of the dose over the next 5 days) as early as possible. S/E, D/F, C/I, W/P, D/I, *see* page 7

#### *plus*

- Penicillin and streptomycin sulphate 20,000IU/250mg, 1 ml/20-25kg, q 24h for 3-7days. S/E, D/F, C/I, W/P, D/I, *see* page 176

or

- Oxytetracycline 5%, 3-5 mg/kg q 12h, IV or IM. SE, CI, D/I, DF, *see* page 176

or

- Sulfadiazine-Trimethoprim, 1 ml/30kg, q 12h IV or IM. S/E, D/F, C/I, W/P, D/I, *see* page 156
- 

*Caution* : Prolonged steroid use may predispose foals to the development of gastric ulcers.

---

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics** **African Horse Sickness**

African horse sickness (AHS) is an acute or subacute, arthropod-borne, viral disease of *Equidae* that is endemic to Ethiopia. It is caused by orbivirus and outbreaks occur after heavy rain. Mosquitoes are considered to be the vectors though ticks might be involve. Dogs are reservoirs of infection.

### ***Clinical Symptoms***

Two forms exist: Respiratory and cardiac forms.

*Respiratory form:* interlobular edema, fever (40-42°C) dyspnea, spasmodic coughing, and dilated nostrils; the animal stands with its legs apart and head extended. The conjunctiva is congested and the supraorbital fossa may be swollen. Recovery is rare and death is due to anoxia.

*The cardiac form:* is subacute disease with a longer incubation period (1-2weeks), fever (39-41°C), and swelling of the supraorbital fossa (pathognomonic). Swelling usually extends to the eyelids, facial tissues, neck, thorax, brisket, and shoulders. Death (50-70%) usually occurs within 1 wk and may be preceded by colic. Mixed signs are common.

### ***Diagnosis***

In endemic areas: clinical signs and lesions may lead to a tentative diagnosis. Serology and culture are confirmatory.

### ***Treatment and Control***

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#### **Management**

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##### Drug Treatment

- There is not specific treatment

##### Prevention

- Vaccination with polyvalent serotype vaccine
  - Avoid grazing of animals during the night
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### **Anthrax**

Anthrax is an acute, febrile disease caused by *B.anthraxis*. Most commonly, it is a septicemic characterized principally by a rapidly fatal course. It is reported in all domestic animals & humans all over Ethiopia. The epidemiology is similar to Cattle, *see page* .

#### ***Clinical Symptoms***

The disease in horses is acute. Signs may include fever, chills, severe colic, anorexia, depression, weakness, bloody diarrhea, and swellings in the region of the neck, sternum, lower abdomen, and external genitalia. Death usually occurs within 2-3 days of onset.

#### ***Diagnosis***

Clinical signs, epidemiology, methylene blue stained blood smear, Western blot and ELISA. Culture requires extreme care since aerosol transmission may occur.

#### ***Treatment and Prevention***

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### **Management**

---

#### **Drug treatment**

##### ***First line:***

- Penicillin G Procaine, 20,000 IU/kg, q 12 h, IM or 40,000 IU/kg, q 24 h, IM for 3-5 days in the early stages of the disease. SE, CI, D/I, DF, *see page* 176

##### ***Alternative:***

- Penicillin and streptomycin sulphate (200,000IU/250mg), 1ml/20 kg, IM for 3-5 days. SE, CI, D/I, DF, *see page* 176/17

or

- Oxytetracycline hydrochloride 5%, 11 mg/kg, q 12 h for 3-5days. SE, CI, D/I, DF, *see page* 176

or

- Gentamicin 5%, 5 mg/kg, q 8 IV or IM for 3-5 days. SE, CI, D/I,
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

DF, *see* page 35

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### Control & Prophylaxis

- Vaccination
- *Precautions:* Antibiotics should not be administered within 1 wk of vaccination. The carcass of animals that suddenly died should not be opened.

*Public health significance:* Anthrax is highly infectious zoonotic disease.

---

### **Aspergillosis**

Aspergillosis is caused by a number of *Aspergillus* spp, especially *A fumigatus*. It is very common as guttural pouch mycosis in Ethiopia. In horses, epistaxis and dysphagia are common complications of gutturomycosis.

#### ***Clinical symptoms***

The infected guttural pouch is characterized by a necrotizing inflammation which is thickened, hemorrhagic, and covered by a friable pseudomembrane. Mycotic rhinitis is characterized by dyspnea and nasal discharge that could be rapidly fatal disease associated with diffuse pulmonary invasion. Locomotor and visual disturbances, including blindness, may occur when the infection spreads to the brain and optic nerve.

#### ***Diagnosis***

The agar-gel double-diffusion test is indicative and ELISA is confirmatory.

**Standard Veterinary Treatment Guidelines for Veterinary Clinics**  
***Treatment and Prevention***

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**Management**

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Non-drug treatment

- Surgical exposure and curettage to treat gutturomycosis

Drug treatment

- Natamycin 10% in affected eye q1-2 h then 1 drop q 3-4 h after 3-4 days. S/E, C/I, D /F, D/I *see* page 24.

or

- ✓ Potassium iodide 10%, q 24 h, PO, 1-2 weeks. S/E and D/F *see* page 18

or

- Itraconazole, 3 mg/kg, q 12 h for 84-120 days (S/E, C/I, D/I, *see* page 50 and D/F: 10% ointment

Prophylaxis

- Hay should be sufficiently dry and care has to be given to silage making and storage
- 

**Aspiration Pneumonia**

Aspiration pneumonia is characterized by pulmonary necrosis due to inhalation of foreign material. Faulty administration of medicines is the most common cause. The epidemiology is similar to cattle.

***Clinical symptoms***

Fever (40-40.5°C), accelerated pulse, and rapid and labored respiration, sweetish, fetid breath characteristic of gangrene may be detected. A purulent nasal discharge that sometimes is tinged reddish brown or green. Occasionally, evidence of aspirated material, eg, oil droplets, can be seen in the nasal discharge or expectorated material. On auscultation, fluid sounds over one or both sides of the chest are heard early in the condition, followed by wheezing sounds, pleuritic friction rubs, and sometimes crackling sounds of subcutaneous emphysema.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Diagnosis*

Clinical signs and history suggesting recent foreign-body aspiration is of great diagnostic value. Auscultation is also a great value.

### *Treatment and Prevention*

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#### **Management**

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Non-drug treatment

- The animal should be kept quiet.

Drug treatment

*First line*

- Penicillin and streptomycin sulphate, 1ml/kg, IM for 3-5 days. SE, CI, D/I, DF, *see page/s 14/17*

or

- Oxytetracycline hydrochloride 5%, 11 mg/kg, q 12 h for 3-5days. SE, CI, D/I, DF, *see page 176*

or

- Gentamicin 5%, mg/kg, q 8h IV or IM for 3-5days. SE, CI, D/I, D/F, *see page 35*
- 

Control & Prophylaxis

- During surgery inject atropine sulfate to control salivation stimulated by the anesthetics (eg, thiobarbiturates).
- Use of an endotracheal tube with an inflatable cuff prevents fluid aspiration during surgery and **carre must be taken when drenching fluid.**

*Note:* A productive cough should not be suppressed.

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### **Babesiosis**

It is caused by *Babesia caballi* and *Babesia equi*. The pathogens are transmitted by ixodid tick species.

### *Clinical Symptoms*

Fever, petechial hemorrhages of the mucus membrane, anemia, icterus, and ecchymosis of the third eye lid are common.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

Extensive subcutaneous oedema of the eyelids, ventral abdomen, genital organs, and legs is also seen.

### ***Diagnosis***

Microscopic examination of Geimsa stained blood smears.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Diminazene aceturate *B. cabali* 5mg/kg IM, twice q 24 h interval and for *B. equi* 6-12 mg/kg IM, twice q 24 h interval; inject at multiple sites
    - ✓ S /E: reaction may occur at the site of injection
    - ✓ D/F: Powder / granule, 1.1 g, 1.05 g, 495 mg and 444 mg; Injection solution, 35 mg/ml
    - ✓ *Caution*: should be used with in 5 days from date of solution preparation and 14 days in refrigerator
- 

##### Control

- Tick control strategy is important
- 

## **Candidiasis**

This localized mucocutaneous disease is caused by fungus, *Candida albicans*. It is an opportunistic pathogen. Factors associated with candidal infections are disruption of mucosal integrity, indwelling, intravenous, or urinary catheters, longterm administration of antibiotics, and immunosuppressive drugs or diseases.

### ***Clinical symptoms***

Lesion may be single or multiple, raised, circular, white masses covered with scabs. Marked keratinous thickening of the mucosae of the tongue, esophagus, and rumen may be observed. *Candida* species also causes arthritis in horses.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Diagnosis***

Microscopic or cultural examination of scrapings or biopsy specimens from mucocutaneous lesions.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- Ketokonazole 10 mg/kg, q 24 h, PO for 5-7days. SE, CI, D/I, D/F, *see page 37*

or

- ✓ Itraconazole, 3 mg/kg, q 12 h, PO for 84-120 days. S/E, C/I, D/F and D/I *see page 50*
- 

### **Colic in Horses**

Colic or abdominal pain occurs if the wall of the intestine is stretched excessively either by gas, fluid, or ingesta. Excessive tension on the mesentery, as a result incarceration or severe twisting of the intestine or inflammation that may involve either the entire intestinal wall (enteritis) or the covering of the intestine (peritonitis) can cause it.

The more common of these include the following:

*In foals*, atresia coli, meconium retention, uroperitoneum, and gastroduodenal ulcers; *in yearlings*: ascarid impaction; *in the young*: small-intestinal intussusception, nonstrangulating infarction, and foreign body obstruction; *in the middle-aged*; epiploic foramen, cecal impaction, enteroliths, and large-colon volvulus; and *in the aged*; pedunculated lipoma and mesocolic rupture.

Migratory larvae of blood worms of *Strongylus vulgaris*, are common causes of colic.

### ***Clinical symptoms***

Pawing repeatedly with a front foot, looking back at the flank region, curling the upper lip and arching the neck, repeatedly raising a rear leg or kicking at the abdomen, lying down, rolling

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

from side to side, sweating, stretching out as if to urinate, straining to defecate, distention of the abdomen, loss of appetite, and decreased number of bowel movements.

### ***Diagnosis***

For presumptive diagnosis use history of any previous problems or treatments, determining which part of the intestinal tract is involved. Rectal examination and fecal sample test for parasite and bacteria are definitive techniques where its result is negative for bacteria and parasite egg.

### ***Treatment and Prevention***

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#### **Management**

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Non-drug treatment

- Surgery for horses that colic relapsed, doesn't respond to analgesic, pain is persistent and the intestine remains distended after fluid is removed.
- Apply rectal massage or enemas for fecal obstruction.

Drug treatment

*Drug therapy for abdominal pain:*

- Dipyrone 10-20ml/250-450kg, SC or IM or IV, may be repeat q 8 h
  - ✓ C/I: For horses within 5 days prior to racing
  - ✓ D/F: Injection, 500mg/ml
  - ✓ D/I: Phenylbutazone, barbiturates and chlorpromazine hydrochloride

or

- Flunixin meglumine 1.1 mg/kg, IM, or IV or PO stat
  - ✓ S/E: Prolonged use may cause gastrointestinal lesions, CNS depression, listlessness and anorexia.
  - ✓ C/I: Pregnant animals, gastrointestinal ulceration and hemorrhage
  - ✓ D/F: Injection, 50mg/ml
  - ✓ D/I: Acetazolamide, antacid, diuretics, heparin, methotrexate, metoclorpramide, phenytoin and warfarin

or

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

- Xylazine 1.1 mg/kg, IV or 2.2 mg/kg IM
  - ✓ S/E, C/I, D/I, D/F *see* page 70
  - ✓ *Caution:* Don't use for horses with pulmonary diseases

### *First line for parasitic colic*

- Ivermectin, 0.2 mg/kg, PO stat. S/E, D/F and D/I *see* page 52 or
- Fenbendazole 10 mg/kg, PO q 24h for 5 days or 20 mg/kg, PO q 24h for 3 days. S/E, C/I, D /F, D/I *see* page 46

### Control and prophylaxis

- It depends on etiology and for parasitic colic, routinely deworming horses every 8 weeks with ivermectin 0.2 mg/kg, SC or PO or Fenbendazole 5 mg/kg, PO or Pyrantel pamoate 6.6 mg/kg every 4 weeks (for S/E, C/I, D/F, D/I, *see above*)

*Note:* Almost all require some form of medical treatment, but only those with certain mechanical obstructions of the intestine need surgery.

## **Conjunctivitis**

Conjunctivitis is a very common condition affecting horses' eyes, particularly during the summer seasons where *Moraxella* spp. can be spread by flies. It may be associated with conjunctivitis.

### *Clinical Symptoms*

There are variable degrees of swelling of the eyelids, purulent exudate, inflammation and hyeraemia of the conjunctiva and photophobia.

### *Diagnosis*

Corneal ulceration and recurrent uveitis (periodic ophthalmia)

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention:*

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#### Management

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None drug treatment

- Mechanical removal of the worms
- Drug treatment
  - ✓ Chloramphenical (1%) and hydrocortisone ointment, 4-6 x/day. S/E, C/I, D/F and D/I *see* page 21

Or

- Cloxacillinbenzathine 16.7%, ointment
  - ✓ S/E), Swelling of face, difficulty in respiration
  - ✓ C/I: Hypersensitivity to penicillin and cephalosporins.
  - ✓ D/F: Ointment, 16.7% in 5 gm syringe
- Ivermectin, SC. S/E, C/I, D/F and D/I *see* page 52
- 2% Boric Acid drop

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*Note:* The above drugs are applied if no corneal ulcer occurs

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### **Dermatophytosis**

*Trichophyton equinum* and *T. mentagrophytes* are the primary causes of ringworm in horses. Transmission is by direct contact or by grooming implements. Most lesions are seen in the saddle and girth areas known as "girth itch."

#### ***Clinical symptoms***

Patches of alopecia and erythema, scaling, and crusting; early lesions may resemble papular urticaria,

#### ***Diagnosis***

Examination of skin scraping & culture is confirmatory.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics** ***Treatment and Prevention***

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### **Management**

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#### Drug treatment

##### *First line*

- Miconazole 1% cream or lotion q 24 h for 2-4weeks topically
  - ✓ S/E: local irritation, burning, oedema, erythema
  - ✓ D/F: Ceam, 1%

##### *Alternative*

- Chlorhexidine solution, 0.5% rinse
  - ✓ S/E: Mild irritation to tissue and skin

or

- Povidine-iodine, 0.5% rinse
    - ✓ S/E: Irritant to tissue, skin, mucus membrane
- 

#### Control and prevention

- Disinfect grooming or harnessing equipments, isolate infected animals
- 

## **Epizootic Lymphangitis**

It is chronic granulomatous disease of the skin, lymph vessels, and lymph nodes of the limbs and neck of *Equidae* caused by the dimorphic fungus *Histoplasma farciminosum*. In Ethiopia it is widely distributed and is most common in cart horses. Infection is acquired by wound infection or by blood-sucking insects.

### ***Clinical Symptoms***

It is characterized by freely movable cutaneous nodules, which originate from infected superficial lymph vessels and nodes and tend to ulcerate and undergo alternating periods of discharge and closure. Affected lymph nodes are enlarged and hard. The skin covering the nodules may become thick, indurated, and fused to the underlying tissues.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Diagnosis***

The clinical features are highly suggestive. Microscopical examination of exudates is important.

### ***Treatment and Prevention***

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#### **Management**

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Non-drug treatment

- No completely satisfactory treatment is known.
- 

Drug treatment

- If applied early, sodium iodide 10% and potassium iodide 10%, IV for at least one week. Good results are obtained if combined with surgical incision of wounds.
  - Surgical excision of lesions combined with Amphotericin B ointment q 6-12 h.  
✓ S/E: Pruritis, alopecia
- 

## **Equine Infectious Anaemia**

It is a mild viral disease caused by a lentivirus affecting equine species. The virus is transmitted by hematophagous insects.

### **Clinical symptoms**

Usually mild and related to the host's immune response rather than to direct viral damage. These include fever, depression and petechiae on mucous membranes and conjunctivae. Recovered animals may show chronic form of the disease characterize dby weight loss, anaemia, ventral oedema and debilitation, leading to death.

### **Diagnosis**

Agar gel diffusion test and ELISA

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- There is no specific treatment
- 

Prevention:

- Test and cull of animals before introduction to an EIA free farm
  - Insect control
- 

### **Gastrointestinal Helminthiasis**

Gastrointestinal parasites affecting horses include *oxyuris* species, *parascaris equorum*, large strongyles including *s. vulgaris*, *s. edentatus* and *s. equinus*; small strongyles like *S. tenuicollis*, strongyloides species and trichostrogylus species.

The migratory larval stages of most of these parasites cause severe damage in vital organs of thoracic and abdominal cavity.

#### ***Clinical symptoms***

Large strongyles cause anemia, weakness, emaciation, and diarrhea. *Strongylus vulgaris* cause colic; gangrenous enteritis; or intestinal stasis, torsion or intussusception, and possibly rupture. In heavy *P. equorum* infestation, unthriftiness, loss of energy and occasionally colic may be observed.

*T. tenuicollis* produces severe ulcers in the wall of the colon. Others disturb digestive and absorptive function, resulting in catarrhal enteritis of the large intestine.

#### ***Diagnosis***

Microscopic examination of feces for egg and there are also serological tests.

**Standard Veterinary Treatment Guidelines for Veterinary Clinics**  
***Treatment for GIT parasites***

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**Management**

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Drug treatment

- Ivermectin 200mcg/kg, PO or SC stat. S/E, C/I, D/F, D/I *see* page 52

or

- Albendazole 7.5mg/kg PO stat. S/E, C/I, D/F, D/I *see* page 48
- Fenbendazole at 10 mg/kg q 24h, PO for 5 days stat. S/E, C/I, D/F, D/I *see* page 46

or

- Pyrantel pamoate 6.6 mg/kg, PO stat.  
✓ D/F: Paste, 9.5%
- 

Control & Prophylaxis

- Strategic treatment has to be twice a year, which is before mid June to mid July and after mid September to mid October. If this is not possible, we can use atleast once a year preferably after a rainy season. Ascaris propylaxis should be started when foals are ~8 wk old and repeated at 6- to 8-weeks interval until they are yearlings.
- Pasture Management or rotational grazing

**Glanders**

Glanders, caused by *Burkholderia mallei* formerly *Pseudomonas mallei*, is a contagious disease of Equidae characterized by the formation of nodules and ulcers in the respiratory tract or on the skin. Transmission occurs following ingestion of food or water contaminated by nasal discharges of infected animals; less commonly inhalation and through skin abrasions.

***Clinical symptoms***

*Acute form:* fever, mucopurulent nasal discharge and respiratory signs.

*Chronic form:* nasal (ulcerative nodules in the nasal septum and lower turbinates, blood stained nasal discharge and regional lymphadenopathy, ulcers heal as star-shaped scars),

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

pulmonary (respiratory distress and nodular lesions in the lung) and cutaneous (nodules along the lymphatic vessels of the legs) form.

### ***Diagnosis***

Clinical manifestations are indicative.

Cultural examination, complement fixation test, agglutination test and mullein test

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- No completely satisfactory treatment is known.
  - If applied early, sodium iodide and potassium iodide, 10%, IV for at least a week. Good results are obtained if combined with surgical incision of wounds.
  - Surgical excision of lesions combined with Amphotericin B ointment q 6-12 h.  
✓ S/E: Pruritis, alopecia
- 

## **Lungworm Infection (Verminous Pneumonia)**

In horses and donkeys infection of the lower respiratory tract, with the parasitic nematodes *Dictyocaulus arnfieldi* causes pneumonia or bronchitis. The larva of the parasite could be demonstrated in faeces of.

### ***Clinical Symptoms***

Coughing may be moderate to severe & persistent. Coughing, tachypnea, and unthriftiness in older horses, but few if any signs in foals or donkeys.

### ***Diagnosis***

Clinical signs, epidemiology, and presence of first-stage larvae in feces. *D. arnfieldi* infections in horses from bronchial larvae.

**Standard Veterinary Treatment Guidelines for Veterinary Clinics**  
***Treatment and Prevention***

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**Management**

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Drug treatment

- *see*, page 46/48
- 

Control & Prophylaxis

- Strategic treatment before and after the rainy season
- Pasture Management or rotational grazing.

**Pleuropneumonia**

Pleuropneumonia is an acute or chronic inflammation of the pleural membranes, characterized by signs related to pleural pain and pleural effusion. Pleural effusion can be idiopathic but it usually associated with pneumonia, lung abscessation, penetrating thoracic wounds, esophageal rupture, neoplasia, or peritonitis.

Typical isolated organisms include *Streptococcus equi* subspecies *zooepidemicus*, *Escherichia coli*, *Pasteurella* spp, *Klebsiella* spp, anaerobes such as *Bacteroides* and *Clostridium* spp and *Mycoplasma felis* and other *Mycoplasma* spp.

***Clinical symptoms***

Fever, inappetence, depression, dyspnea, standing with abducted elbows and reluctance to move, and subcutaneous edema of the ventral thorax and limbs, and colic or myositis are typical of it. In chronic cases, there is often anorexia, weight loss, intermittent fever and cough, abnormal respiratory effort, and in horses with sterile or neoplastic effusion, reduced exercise tolerance.

***Diagnosis***

Clinical examination, Gram's stain and culture.

**Standard Veterinary Treatment Guidelines for Veterinary Clinics**  
***Treatment and Prevention***

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**Management**

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Non-drug treatment

- Drainage of the thoracic fluid by thoracentesis or thoracostomy
- 

Drug treatment

Antibiotic choice depends on the type of microorganism involved:

*First Line*

- Penicillin G procaine, 20,000IU/kg, q 12h, IM or 40,000units/kg q 24 h, IM for 3-5 days. S/E, C/I, D/F, D/I *see page 176*

or

- Gentamicin Sulphate 5%, 2 mg/kg, IM, q 12 h for 3-5 days. S/E, C/I, D/F, D/I *see page 35*

*Alternative*

- Oxytetracycline hydrochloride 5%, 10 mg/kg, q 12 h, IM is indicated for *Mycoplasma* spp infection for 5 days. SE, CI, D/F, D/I *see page 176*

*Plus*

- Metronidazole may be required for some anaerobic infections
    - ✓ S/E: central nervous system depression
    - ✓ D/F: Tablets, 200 and 400mg; Injection, 5mg/ml; Powder for injection, 400mg/ml
    - ✓ D/I: Cimitidine, phenobarbitone, phenytoin and warfarin
- 

**Rabies**

Rabies is an acute viral encephalomyelitis that principally affects carnivores and insectivorous bats, although it can affect any mammal. It is almost invariably fatal once clinical signs appear. It is endemic to Ethiopia. For its epidemiology *see* Disease of dogs and cats; Rabies.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Most signs are similar to pets. Horses and mules frequently show evidence of distress and extreme agitation. These signs, especially when accompanied by rolling, may be interpreted as evidence of colic. As with other species, horses and donkeys may bite or strike viciously and, because of size and strength, become unmanageable in a few hours. Such animals frequently suffer self-inflicted wounds.

### ***Diagnosis***

Clinical diagnosis is difficult. Therefore, when rabies is suspected and definitive diagnosis is required, laboratory confirmations is indicated.

### ***Treatment and Prevention***

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#### **Management**

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Non-drug treatment

- Restrain animals and dispose properly
- 

Drug treatment

- No specific treatment for rabies.
- 

Control & Prophylaxis

- Vaccinate animals. For applications, *see* Rabies vaccination.

To control Rabies refer rabies on dogs

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*Public health significance:* Rabies is highly fatal zoonotic disease transmitted through bite of infected animals.

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### **Salmonellosis**

Salmonellosis is caused by many species of *Salmonellae* and characterized by septicemia and acute and chronic enteritis. Young foals usually develop the septicemic form. Adult horses and donkeys commonly develop acute enteritis. The main causes are *S. typhimurium*, *S. anatum*, *S. newport*, *S. enteritidis*, and *S. arizonae*. The usual route of infection is oral. The disease occurs after stress of any cause.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Septicemic; usual syndrome in newborn foals; is acute, depression is marked, fever (40.5-41.5°C) is usual, and death occurs in 24-48 hr.

Acute enteritis; abdominal pain and severe in horses, they are severely dehydrated and may die within 24 hr of the onset of diarrhea.

Subacute enteritis; occurs in adult horses. The signs include mild fever (39-40°C), soft feces, in appetite, and some dehydration.

### ***Diagnosis***

Clinical signs are indicative but confirmation is based on the cultural examination.

**Standard Veterinary Treatment Guidelines for Veterinary Clinics**  
***Treatment and Prevention***

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**Management**

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Drug treatment

*First line*

- Sulfadiazine-Trimethoprim 200/40 mg/ml, 25+5mg/kg q 24 h, IM for 6 days. S/E, C/I, D/F, D/I *see* page 156

*Alternative*

- Ampicillin, 6.6 mg/kg q 12h, IM or IV for 6 days
  - ✓ S/E: diarrhea, injection site reaction
  - ✓ C/I: Hypersensitivity reaction, disturb normal cecal microflora
  - ✓ D/I: Tablets; 200 and 400mg, Injection; 100 and 150mg/ml

or

- Cephalothin, 20-35 mg/kg, IM or IV q 6 to 8h for six days.
  - ✓ S/E: Painfull when used IM,
  - ✓ C/I: Hypersensitivity to penicillin, impaired renal function
  - ✓ D/F: Injection, 0.5gm, 1gm
  - ✓ D/I: Furosamide and ethacrynic acid

*plus*

- For acute intestinal salmonellosis, sodium bicarbonate with sodium and potassium chloride, PO, 100gm/450 kg body wt.
  - ✓ D/F: Powder, 12.8gm/100gm

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*Public health significance:* Salmonella infecting Equidae are zoonotic.

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## **Strangles**

”Strangles” is contagious bacterial respiratory disease of horses caused by an obligate intracellular bacteria, *Streptococcus equi* var. *equi*. It is characterized by inflammation of nasal and pharyngeal epithelium, followed by lymphadenitis, and abscessation of the lymphnodes.

Species affected are horses, donkeys, mules and camels. Young (3 months to three years) are more affected. Infection is by inhalation or ingestion of the organism with subsequent localization in the mandibular and pharyngeal lymph nodes.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Submandibular swelling inappetence, dullness, depression and fever (38-39.5°C), slight submandibular lymph node enlargement, slight oculonasal discharge, possibly slight cough and progressive difficulty in swallowing. The signs progress to prominent cough and purulent nasal discharge, marked depression, anorexia, dysphagia, fever 39.5-41°C, submandibular /parotid/ lateral and medial retropharyngeal lymph nodes obviously enlarged, later rupturing and discharging purulent material, salivation and choke.

Possible complications include satellite abscessation with pyemic dissemination to meninges, lungs, pericardium, and abdominal viscera or extension to the guttural pouches; subcutaneous swellings, mucosal hemorrhages, and fever, may follow the acute disease in about three weeks.

### ***Diagnosis***

Clinical signs are highly indicative and confirmed by culture.

### ***Treatment and Prevention***

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#### **Management**

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##### Non-drug treatment

- Nursing with soft feeds
- Lance/drain mature abscesses
- Bath conjunctivae/abscess sinus tracts
- Tracheotomy if severe dyspnea

##### Drug treatment

- Procaine penicillin 20,000 IU/kg q 24h, IM for 7-10 days.  
S/E, C/I, D/F, D/I *see page 14*

or

- Penicillin 20,000IU and dihydrostreptomycine sulphate  
250gm 1ml/25kg, q 24 h, IM for 3-5 days/ S/E, C/I, D/F, D/I  
*see page/s 14/17*

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

- Purpura haemorrhagica requires aggressive long-term treatment with penicillin 20,000 IU/kg daily for more than 6 weeks. SE, C/I, D/F, D/I *see* page 14 with dexamethasone SE, CI, D/F, D/I *see* page 7

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*Note:* Guttural pouch empyema needs surgical drainage of both pouches

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### **Tetanus**

Tetanus toxemia is caused by a specific neurotoxin produced by *Clostridium tetani*. In Ethiopia the incidence of tetanus in horses and donkeys is more common than in any other species. The epidemiology is similar to cattle.

#### ***Clinical Symptoms***

Localized stiffness, often involving the masseter muscles and muscles of the neck, the hindlimbs, and the region of the infected wound followed by general stiffness becomes pronounced one day later and tonic spasms and hyperesthesia becomes evident.

The ears erect, the tail stiff and extended, the anterior nares dilated, and the third eyelid prolapsed. Walking, turning, and backing are difficult. Spasms of the neck and back muscles cause extension of the head and neck, while stiffness of the leg muscles causes the animal to assume a “*sawhorse*” stance. Sweating is common. General spasms disturb circulation and respiration, which results in increased heart rate, rapid breathing, and congestion of mucous membranes.

#### ***Diagnosis***

The clinical signs and history of recent trauma are usually adequate for a diagnosis of tetanus.

Confirm the diagnosis by demonstrating the presence of tetanus toxin in the serum, and Gram-stained smears and anaerobic culture from suspected wounds.

**Standard Veterinary Treatment Guidelines for Veterinary Clinics**  
***Treatment and Prevention***

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**Management**

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Non-drug treatment

- The horse should be placed in a quiet, darkened box stall with feeding and watering devices high enough to allow their use without lowering the head.

Drug treatment:

- Tetanus antitoxin, 15,000 IU (15ml), IV and 8,000 IU (8ml), IM to an average (120kg) weighing Ethiopian donkey and 25,000 IU, IV or 12,000 IU, IM to an average (260kg) horse.  
✓ D/F: Injection, 1000 IU, 10000 IU

or

- Acepromazine, 0.05-0.09 mg/kg, IV or IM or SC  
✓ S/E: Hypotension, thrombocytopenia,  
✓ C/I: Pregnant animals, male horses, concurrent use with organophosphates or procain hydrochloride in horses; don't ride horses with in 36 hours of treatment.  
✓ D/F: Injection, 2 and 10 mg/ml; Tablet, 10 mg or 25 mg  
✓ D/I: antimuscarinic drugs, metoclorpramide, and combination with any other CNS depressant drugs.

or

- Xylazine, 1.1-2.2 mg/kg, IV or IM in conjunction with 300,000 IU of tetanus antitoxin q 12 h, SC, IV or IP  
✓ S/E, C/I, D/I, D/F *see page 70*  
✓ *Cautions:* Don't use for horses with pulmonary diseases

*plus*

- Draining and cleaning the wounds
- Injection of maximum dose of short acting penicillin, 4,000,000 IU (10ml) Suspension of fortified procaine penicillin G, q 24h for 5days. S/E, C/I, D/F, D/I *see page 176*

or

- Oxytetracycline 5%, 11 mg/kg, q 12 h for 3-5days S/E, C/I, D/F, D/I *see page 176*

or

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

- Gentamicin 5%, 5 mg/kg q 8h IV or IM for 3-5days. S/E, C/I, D/F, D/I *see* page 35
- 

### **Control & Prophylaxis**

- Toxoid should be given simultaneously with the antitoxin and repeated in 30 days. Yearly booster injections of toxoid are advisable. Mares should be vaccinated during the last 6 wk of pregnancy and the foals vaccinated at 5-8 wk of age. In high-risk areas, foals may be given tetanus antitoxin immediately after birth and every 2-3 wk until they are 3 months old, at which time they can be given toxoid.
- 

### ***Trypanosoma evansi* Infection**

Disease is often acute in horses but tends to be more chronic in donkeys and mules.

#### ***Clinical Symptoms***

Animals become emaciated, anemic and oedematous plaques appear on the ventral surface of the body. Invasion of the central nervous system leads to meningitis. Paralysis of the hind limb occurs and the animal experiences difficulty in standing.

#### ***Diagnosis***

Thin blood film for *T. evansi*.

#### ***Treatment***

*See, treatments in Trypanosoma equiperdum* infection below.

### ***Trypanosoma equiperdum* Infection (Dourine)**

*T. equiperdum* is transmitted venereally. Trypanosomes penetrate the genital mucosa and develop at the site of entry for up to 3 months.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Within a month of infection there is oedema of the vulval labia in the mare and of the scrotum and penis sheath in the stallion. In the stallion, persistent oedema can enlarge the scrotum and sheath 2-3 times normal size. Ventral oedema can persist for long periods and may fluctuate throughout infection.

Skin plaques, often containing trypanosomes are considered to be a pathognomonic feature of dourine. Pyrexia is intermittent and trypanosomes appear briefly in the development of nervous signs may be observed. Animals with nervous involvement become emaciated and paralysis of the hind limb and muscles of the head region.

### ***Diagnosis***

It depends on clinical signs and confirmation is by complement fixation test.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

*First line:*

- Suramin 10 mg/kg IM stat.

*Second line:*

- Diminazene aceturate 3.5 mg/kg IM stat. S/E, C/I, D/F, D/I  
*see page 183*

or

- Isometamidium 0.5 mg/kg, IM stat ( curative treatment)
  - ✓ S /E: local transient reaction at injection site
  - ✓ D/F: Powder for injection, 125 mg and 1 gm

or

- Quinapyramine sulphate 7.5mg/kg, SC, stat
    - ✓ S /E: trembling, sweating, salivation, increased respiration for other treatment and heart rate, collapse and death.
    - ✓ D/F: Powder for injection, 1 gm
    - ✓ *See also diseases of cattle; Trypanosomosis*
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### Control and prophylaxis

- Isometamidium 0.5 mg/kg, IM stat is also used for prophylaxis.
  - Castration of infected male is effective.
- 

## **Lightning Stroke and Electrocutation**

Injury or death of an animal due to high-voltage electrical currents may be the result of lightning, fallen transmission wires, faulty electrical circuits, or chewing on an electrical cord.

### *Clinical Symptoms and lesions*

Occasionally, the animal becomes unconscious but may recover in a few minutes to several hours; residual nervous signs (eg, depression, paraplegia, cutaneous hyperesthesia) may persist for days or weeks or be permanent. Burn-marks on the carcass are more commonly found on the medial sides of the legs, although rarely much of the body may be affected; damage to the immediate environment may be seen.

### *Diagnosis*

History of a recent storm together with finding a dead or injured animal under a tree or near a fence is significant damage. *Rigor mortis* develops and passes quickly. The mucosae of the upper respiratory tract, including the turbinates and sinuses, are congested and hemorrhagic; linear tracheal hemorrhages are common, and large blood clots are occasionally found in the trachea.

### *Treatment and Prevention*

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#### **Management**

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##### Non-drug treatment

- Intubation may be required
- Cardiorespiratory resuscitation, with monitoring vital signs

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### Drug treatment

- Diphenhydramine hydrochloride, 100-200mg, IM or IV or SC
  - ✓ S/E: Incoordination, *xerostomia* and blurred vision.
  - ✓ C/I: Pregnant animals
  - ✓ D/F: Injection, 10 mg/ml
- For electric shock or cardiac problems use Dopamine hydrochloride 4.4 to 11.1 mcg/kg/minute, IV
  - ✓ S/E: tachyarrhythmia
  - ✓ D/F: Powder for injection, 250mg in vial.
- Those animals that survive may require Lactated ringer's solution 35 to 40ml/kg, q 24 h, IV and oxygen therapy
  - ✓ D/F: Dextrose 20gm + Sodium chloride 0.60gm + Potassium chloride 0.04gm + Calcium chloride 0.027gm + Sodium chloride 0.312gm/100ml

---

*Note:* Antibiotic treatments with similar dose as for other infections may be helpful.

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## **Arthropod Parasites**

### **Bot Fly**

*Gastrophilus spp.*

*Gastrophilus intestinalis*, the eggs are deposited mainly in forelegs, between the knee and the hoof but also in the scapular region. Larvae are found on cardiac portion of the stomach.

*Gastrophilus nasalis*: eggs are deposited in the intermandibular space and larvae are found in the pylorus region of the stomach and duodenum.

*Gastrophilus hemorrhoidalis*: eggs are laid on the hairs of lips and around the mouth. Larvae are attached to the stomach but also to host rectum. The species involved in donkeys is *Rhinoestrus spp.* and is found in the nasal cavity.

### **Clinical Symptoms**

Distress, dermatitis, inflammation of the pharynx, oesophagus, stomach or rectum, or rectal prolapse, and pyloric sphincter

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

problems are among the signs. In donkeys the larvae causes dysphagia.

### ***Diagnosis***

Observation of cream-white bot eggs, dysphagia in donkeys and examination of rectal mucosa for larvae is necessary for diagnosis.

### ***Treatment and Prevention***

---

#### **Management**

---

Drug treatment

*Larvae treatment*

- Ivermectin, 0.2mg/kg ( S/E, C/I, D /F, D/F, D/I *see page 52*)

*Adult fly control*

- Fenvalerate spray, dilute before use as per manufacturers recommendation on the container.
  - ✓ D/F: Emulsified liquid, 10%, 20% EC
  - ✓ *Cautions:* Avoid direct contact of milk and milking machine

or

- Diazinon spray, dilute before use as per manufacturers recommendation on the container.
  - ✓ D/F: Liquid 15% w/v, 16.2%, 20% and 60% EC w/v.
  - ✓ D/I: Combination of two or more organophosphorus compounds or drugs with anticholinestrase activity
  - ✓ *Cautions:* Provide adequate ventilation for operator

### **Onchocerciasis**

*Onchocerca cervicalis* localizes in the ligamentum nuchae and possibly other sites in Equidae. The microfilariae are found in the dermis and rarely in circulating peripheral blood.

### ***Clinical Symptoms***

*Onchocerca cervicalis* infection in horses has been associated with fistulous withers, poll evil, dermatitis, and uveitis.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

Adults in the ligamentum nuchae induce inflammatory reactions ranging from acute edematous necrosis to chronic granulomatous changes, resulting in marked fibrosis and mineralization. Mineralized nodules are more common in older horses.

Large numbers of microfilariae may be found in the skin without causing dermatitis

In some animals skin lesions such as scale, crusts, ulceration, alopecia, and depigmentation; and pruritis may be observed.

### ***Diagnosis***

Microscopic examination of filarial worms from skin biopsy.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

##### ***First Line***

- Dexamethasone 2.5 to 5 mg/450kg, IM. S/E, C/I, D/F, D/I, *see* page 7

*plus*

- Ivermectin 0.2mg/kg; S/E, C/I, D/F, D/I, *see* page 52
- 

### ***Ectoparasites***

#### **Mites**

##### **Sarcoptes**

*Sarcoptes scabiei equi* is found in horses.

##### ***Clinical Symptoms and Diagnosis***

Intense pruritis due to hypersensitivity to mite products that appear on the head, neck, and shoulders. Regions protected by long hair and lower parts of the extremities are usually not involved. Lesions start as small papules and vesicles that later develop into crusts. Alopecia and crusting spread and the skin becomes lichenified, forming folds. If untreated, the lesions may

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

extend over the whole body, leading to emaciation, general weakness, and anorexia.

Negative skin scrapings do not rule out the disease; biopsy may establish a diagnosis.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Diazinon 0.06% sponging q 12-14 days for atleast 3-4 days.  
S/E, C/I, D/F, D/I, *see* page 206

##### *Alternative*

- Ivermectin at 0.2mg/kg, q 2-3 weeks. S/E, C/I, D/F, D/I, *see* page 52
- 

##### Control & Prophylaxis

- It is important to treat all in contact animals.
- 

*Note:* Amitraz is contraindicated in horses because it can cause severe colic and death

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## **Psoroptic Mange**

*Psoroptes equi* produces lesions on thickly haired regions of the body, such as under the forelock and mane, at the base of the tail, under the chin, between the hindlegs, and in the axillae. *Psoroptes cuniculi* can sometimes cause otitis externa in horses and may cause head shaking.

### ***Clinical Symptoms and Diagnosis***

Pruritus is characteristic. Lesions start as papules and alopecia and develop into thick, hemorrhagic crusts. Mites are more easily recovered from skin scrapings compared with sarcoptic mange.

### ***Treatment***

It is similar sarcoptic mange.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Lice Infestation**

Common lice of equine are *Haematopinus asini* and *Damanilia equi*. The lice are host-specific. They have a particularly adverse effect on young animals and those in poor condition or subjected to stress.

#### ***Clinical Symptoms***

Unthriftiness and anemia.

#### ***Diagnosis***

Examination of the skin.

#### ***Treatment***

Similar to sarcoptic mange

### **Ticks**

Important tick species to equidae are *R. evertsi*, *Boophilus*, *Amblyoma*, and *Hyalomma*. Ticks can act as a vector for pathogenic organisms.

#### ***Clinical Symptoms***

Ticks can cause deterioration of condition in equines resulting from loss of blood, tick worry and tick toxicosis. Abscesses or deep-seated suppurating wounds may form this may be infested with maggots.

#### ***Diagnosis***

Clinical signs and the presence of ticks on the body.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics** ***Treatment and Prevention***

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### **Management**

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#### Drug treatment

- Diazinon spray or sponging q 12-14 days for atleast 3-4 days.  
S/E, C/I, D/F, D/I, *see* page 206
  - Chlorfenvinphos spray and sponging every 2 weeks
    - ✓ D/F: Liquid, 10% w/v
    - ✓ D/I: Combination of two or more organophosphorus compounds or drugs with anticholinestrase activity
    - ✓ *Cautions*: not approved for sheep scab control
- 

#### Control & Prophylaxis

Spraying of organophosphates before high tick infestation

---

### **Wound Management**

Wound is an open mechanical injury of the skin/epidermis, underlying tissues and organs. It is characterized by pain, gaping, bleeding and functional disturbance.

The most common causes of wound in working equines are little or no padding on saddles and straps, overloading and improper positioning of load predisposing to falling, beating of donkeys, hyena bites , donkey bites, injuries inflicted by horned Zebus, and use of improper bits. The types of wounds in working equine are abrasions, bruising, hematoma, puncture wound, laceration, burns, proud flesh and contaminated wounds.

Wound healing is commonly delayed if infection or infestation occurs, there is restriction of blood supply, there is foreign material in the wound, excessive movement or self trauma, poor nutrition and health status, inappropriate treatment, and exuberant granulation tissue.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics Treatment and Prevention

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### Management

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Pretreatment restraints:

*For non-complicated cases*

Sedative drugs

- Xylazine, 2.2-3 mg/kg, IM. S/E, C/I, D/F, D/I, *see page 186.*

*For complicated cases*

General anesthesia

- Ketamine hydrochloride, 11-33mg/kg, IM,
  - ✓ S/E: hypotension, increased cardiac output; tachycardia, muscle twitching
  - ✓ C/I: Sole anesthetics in horses, donkeys and dogs; hepatic or renal impairment; later stages of pregnancy in animals
  - ✓ D/F: Injection, 10, 50 and 100mg/ml

Non-drug treatment

- Incision of the wound which should be irrigated with a sprit solution and methylene blue
- Complete dissection is mandatory in contaminated wounds with toxic and radioactive substances, suspicion of tetanus and initial symptoms of it.

### ***Drug treatment:***

Topical Wound lavage

- *Povidone-iodine* 0.1 to 0.5% solution for wound lavage
  - ✓ S/E: Irritant to tissue, can stain
  - ✓ C/I: Concurrent use of other antiseptics and detergents
- D/F: Liquid, 5 and 10%
- Chlorhexidine 0.05% solution
  - ✓ S/E: Irritant to tissue, skin, eye and mucus membrane
  - ✓ D/F: Liquid, 10%
- Gentian violet 1 gm may be of value.
  - ✓ D/F: Aqueous solution, 0.5% and 1%
- At early stage, astringent packs (Burow's solution or 2% lead acetate) are indicated.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### Systemic treatment

#### *First line*

- Penicillins, 20,000 units/kg, IM, q 24 h, 3-7days depending on severity. S/E, C/I, D/F, D/I, *see* page 176.

#### *Second line*

- Streptomycin sulphate, 10 mg/kg, IM, q 24 h, 3-7days depending on severity. S/E, C/I, D/F, D/I, *see* page 17.

or

- Oxytetracycline 25mg and gentian violet 5 mg/ml spray q 12-24 h, from a distance of 15-20cm.

✓ C/I, D/I, *see* page 176

✓ D/F: Spray, 25mg + 5mg/ml;

✓ *Caution:* Don't spray in and around the eye. Don't incinerate or puncture the spray can.

or

- Gentamicin, 1-2 mg/kg IM, s.i.d for 3-7days depending on severity. S/E, C/I, D/F, D/I, *see* page 35.

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*Note:* Hydrogen peroxide at 3% is tissue toxic. Its use should be limited to circumstances when anaerobic conditions are likely (e.g. irrigation of a deep wound which might be infected with *Clostridium tetani*). Soluble antibiotics e.g. penicillin, ampicillin have been beneficial when added to lavage solutions.

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# **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

## **Reproductive Diseases**

### **Abortion**

#### **Non-infectious Causes**

*Twinning:* Most abortions related to twinning occur at 8-9 months of gestation and may be preceded by premature lactation. Placental insufficiency ultimately causes abortion of twins.

*Umbilical cord abnormalities:* such as torsion due to abnormal length, have been incriminated in abortions. Diagnosis of abortion due to cord torsion requires evidence of localized swelling or hemorrhage because torsions occur in some normal births.

*Ectopic pregnancy:* is rare but may result in abortion from 7 to 10 months of gestation.

#### **Infectious causes**

##### **Equine Viral Rhinopneumonitis (EVR)**

Equine Herpesvirus 1 is the most important viral cause of abortion in horses.

#### ***Clinical Symptoms***

Abortion is usually after 7 months of gestation and is not preceded by maternal illness. The placenta may be edematous or normal. Gross fetal lesions include subcutaneous edema, jaundice, increased volumes of thoracic fluid, and an enlarged liver with yellow-white lesions ~1 mm in diameter. There is often a necrotizing bronchiolitis.

#### ***Diagnosis***

It is by fluorescent antibody of fetal tissues or fetal serology.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics** ***Treatment and Prevention***

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### **Management**

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#### Drug treatment

- No specific treatment but it is possible to use antibiotics to prevent and treat infection with secondary invaders for 4-6 days. Dosage, S/E, C/I, D/F, D/I, *see* page 176.
- 

#### Prevention

- It is based on vaccinating at 5, 7, and 9 months of gestation as well as preventing exposure of pregnant mares to exposed horses
- 

### **Equine Viral Arteritis (EVA)**

Abortion may follow clinical cases of EVA by 6 to 29 days. Arteritis may be found in the fetal myocardium, or there may be no fetal lesions. EVA can spread venereally or by aerosol.

## ***Treatment and Prevention***

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### **Management**

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#### Drug treatment

- It has no specific treatment and similar to EVR.
- 

#### Prevention

- Similar to EVR
- 

### **Bacterial Abortion**

Potomac horse fever caused by *Ehrlichia risticii* may be followed by abortion in mid to late gestation. The organism has been isolated from fetal lymphoid tissues after abortion. Abortion due to *Streptococcus zooepidemicus*, other *Streptococcus* spp, *Escherichia coli*, *Pseudomonas*, *Klebsiella*, or other bacteria usually is caused by an ascending infection through the cervix that results in placentitis.

### ***Clinical Symptoms***

The placenta is edematous with brown fibrinonecrotic exudate near the cervical star. Chronic placentitis results in retardation of fetal growth. The fetus may be severely autolyzed when

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

expelled. Organisms can be recovered from aseptically obtained stomach contents. *Salmonella* spp and *Leptospira* sp have been implicated in equine abortions. The pathogenesis of abortion is not clear in these cases but may involve effects of stress and systemic endotoxemia on the fetus.

### ***Treatment and Preventions***

The objective of treatment is to control systemic infection on the dam

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### **Management**

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Drug treatment

#### ***First line***

- Dihydrostreptomycine sulphate, 12-25 mg/kg, q 12 h, IM, for 3 days. S/E, C/I, D/F, D/I, *see* page 17

or

- Gentamicin Sulphate, 2 mg/kg, IM, q 12 h for 3 days. S/E, C/I, D/F, D/I *see* page 35

#### ***Alternative***

- Oxytetracycline hydrochloride 5%, 10 mg/kg, q 12h, IM is indicated for *Mycoplasma* spp infection for a week. S/E, C/I, D/F, D/I *see* page 176
- 

### **Equine Mycotic Placentitis**

Mycotic placentitis in horses is also due to an ascending infection that causes a thickened chorioallantois with variable exudate. Causative agents include *Aspergillus*, *Mucor*, and *Candida*. Fetuses aborted in late gestation may be fresh, with evidence of growth retardation. A pale, enlarged liver or dermatitis may be found. Hyphae are found in the placenta, liver, lung, or stomach contents.

Clinical findings, diagnosis, and treatment, *see* Diseases of Equidae, Aspergillosis or Candidiasis.

### **Brucellosis**

Horses can be infected with *Brucella abortus* or *B. suis*. Suppurative bursitis, most commonly recognized as “fistula of

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

the withers” or “poll evil”, is the most common condition associated with brucellosis in horses. Occasionally, abortion has been reported.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Successful report on treatment is on Chloramphenicol, 1gm/100kg q 24 h for 12-20 days. S/E, C/I, D/F, D/I *see* page 21

##### Control and prevention

- Vaccination
  - Test and cull
- 

### **Acute Puerperal Metritis**

Acute puerperal metritis occurs within the first postpartum week. It results from contamination of the reproductive tract at parturition and often, but not invariably, follows complicated parturition. The condition is acute in onset.

#### ***Clinical symptoms***

Affected mares are depressed, febrile, and inappetent. Milk production is diminished, and nursing young may show signs of food deprivation.

#### ***Diagnosis***

It is based on its clinical signs and history of recent parturition.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics** ***Treatment and Prevention***

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### **Management**

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#### Non-drug treatment

- Drainage of the uterine content may be advantageous.

#### Drug treatment

- Procaine penicillin G at 20,000-25,000 IU/kg, IM, q 24 h. or Sodium Penicillin q 12 h for 3-5days. S/E, C/I, D/F, D/I, *see* page 176

or

- Oxytetracycline 50 mg/ml a dose of 11 mg/kg, q 12 h for 3-5days. S/E, C/I, D/F, D/I, *see* page 176

or

- Gentamicin 50 mg/ml at a dose of 5 mg/kg q 8h IV or IM for 3-5days. S/E, C/I, D/F, D/I, *see* page 35

---

*Note:* Drainage of uterine content should be done very carefully because the inflamed uterus may be friable, and manipulation of the uterus may result in bacteremia.

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### **Dystocia**

Difficult birth may result from myometrial defects, metabolic abnormalities such as hypocalcemia, inadequate pelvic diameter, insufficient dilation of the birth canal, fetal hormone (corticosteroid) deficiency, fetal oversize, fetal death, or abnormal fetal presentation and posture.

#### ***Clinical symptoms and Diagnosis***

Dystocia should be considered in any of the following situations: 1) an animal has a history of previous dystocia or reproductive tract obstruction; 2) parturition does not occur within 24 hr after the drop in rectal temperature (to <100°F [37.7°C]); 3) the resting period during active labor exceeds 4-6 hr; 4) there is a black, purulent, or hemorrhagic vaginal discharge; 5) there are signs of systemic illness; or 6) gestation is prolonged.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics** ***Treatment and Prevention***

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### **Management**

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#### Non-drug treatment

- Forceps may be used (carefully) to remove dead fetuses or to facilitate delivery of malpresented or partially delivered fetuses. Gentle manipulation and adequate lubrication must be used to prevent injury or death to living fetuses. Episiotomy may be helpful.
  - Surgery is indicated for obstructive dystocia, if dystocia is accompanied by shock or systemic illness, for primary uterine inertia, when active labor is prolonged, and/or if medical Management has failed.
- 

#### Drug treatment

- Medical Management may be considered when the condition of the dam and fetuses are stable, when there is proper fetal position and presentation, and when there is no obstruction
  - Oxytocin, 30-100 IU, IM,
    - ✓ S/E: Occasionally swelling and sloughing at site of injection
    - ✓ C/I: In dystocia due to obstruction
    - ✓ D/F: Injection, 10 units/ml
    - ✓ D/I: Clenbuterol
- 

#### Control & Prophylaxis

Assistance is necessary in dystocia where a delay in assisting may mean the loss of the fetus.

*Precautions:* It is imperative to determine the cause of dystocia (.i.e obstructive vs non-obsturctive.)

### **Endometritis**

Although profound endometritis accompanies contagious equine metritis in mares, most breeding problems are related to endometritis caused by nonspecific infections. In mares, the most common etiologic agent of endometritis is *Streptococcus zooepidemicus* , but several other organisms may be involved, including *Escherichia coli* , *Pseudomonas aeruginosa* , and

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

*Klebsiella pneumoniae* . Yeasts and fungi are incriminated in some cases, particularly in mares with reduced resistance, or as a sequela of exuberant antimicrobial therapy.

### ***Clinical symptoms***

Visible exudate is rarely a feature of endometritis in mares.

### ***Diagnosis***

It is by isolation of potentially pathogenic bacteria from appropriately guarded swabs of the endometrium.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

*For bacterial infections*

- Oxytetracycline 1000mg, Intrauterine. S/E, C/I, D/F, D/I, *see page 176*

or

- Infusion 250ml saline with 3gm Crystalline Penicillin S/E, C/I, D/F, D/I, *see page 176*

or

- Infusion of 250ml saline with 3gm Chloramphenicol. S/E, C/I, D/F, D/I *see page 21*

*Alternative*

- Penicillin and streptomycin, 1ml/20kg, IM for 3-5 days. S/E, C/I, D/F, D/I *see page/s 14/17*

or

- Oxytetracycline 50 mg/ml a dose of 11 mg/kg, IM, q 12 h for 3-5days. S/E, C/I, D/F, D/I, *see page 176*

or

- Gentamicin 50 mg/ml at a dose of 5 mg/kg q 8h IV or IM for 3-5days. S/E, C/I, D/F, D/I *see page 35*

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### *For chronic and fungal or yeast infections*

- Amphotericin B, 0.1 mg/ml at a dose of 0.1-0.5 mg/kg slow IV 3 times/week.
- Iodine solution 2.5%, 5-10ml of (Lugol's solution) in each uterine horn. S/E, C/I, D/F, D/I *see* page 18.

### Control & Prophylaxis

- S/E, C/I, D/I, D/F 100 units of Oxytocin with in several days of parturition *see* page 217.

*Note:* Treatment should be continued for several consecutive days, preferably during estrus

## **Mastitis in Mares**

Acute mastitis occurs occasionally in lactating mares, most commonly in the drying-off period, in one or both glands. *Streptococcus zooepidemicus* is the most frequent pathogen, but *S. equi*, *S. equisimilis*, *S. agalactiae*, and *S. viridans* are also found. A variety of Gram-negative bacteria have also been reported.

### ***Clinical symptoms***

Marked painful swelling of the affected gland and adjacent tissues develops, and the secretion is often seroflocculent. Fever and depression may be present. The mare may walk stiffly or stand with hindlegs

### ***Diagnosis***

Clinical signs and rapid tests similar to cattle.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Treatment and Prevention***

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#### **Management**

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##### Non-drug treatment

- Massage with hot water

##### Drug treatment

- *See* treatment for bovine mastitis.
- 

##### Control & Prophylaxis

- *See* bovine mastitis

*Note:* Little is known about subclinical infections.

### **Retained Fetal Membranes in Mares**

The equine fetal membranes are normally expelled within 3 hr after parturition, but expulsion may be delayed for 8-12 hr or even longer without signs of illness. The cause of retention of fetal membranes often is not known, but the condition is associated with infection, abortion, short or prolonged gestation, and uterine atony.

Retention of fetal membranes may mediate development of metritis or even peritonitis. Laminitis is a potential sequela.

### ***Treatment and Prevention***

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#### **Management**

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##### Non-drug treatment

- Manual removal of retained membranes carries the risk of uterine damage or prolapse therefore it should be gentle tugging to remove already loosen membranes.

##### Drug treatment

- Oxytocin, 20 IU, IM, every 2-3 hr; S/E, C/I, D/I, D/F *see* page 217
  - Oxytetracycline, 1000 mg/kg, intrauterine S/E, C/I, D/F, D/I, *see* page 176 for prolonged cases.
- 

##### Control & Prophylaxis

- Oxytetracycline 1000 mg/kg, intrauterine should be administered prophylactically along with 2.5-5mg/kg, IM post partum.
-

## **DISEASES OF CAMELS**

### ***Infectious and Non-infectious Diseases***

#### **Anthrax**

Anthrax is a disease of animals and man caused by a single uniform antigenic type of *Bacillus anthracis*. It is a peracute disease characterized by septicaemia and sudden death. The spore can survive in contaminated soil for many years and continue to infect animals by inhalation or ingestion.

#### ***Clinical Symptoms***

Dromedaries affected show difficult breathing, trembling, and pronounced swelling of the throat, the base of the neck and the goin region.

#### ***Diagnosis***

It is based on blood smear and confirmed by fluorescent antibody test.

#### ***Treatment and Prevention***

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#### **Management**

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##### Drug Treatment

- Penicillin, 22,000 IU/kg, IM, q 24 h for 5 days; the dose should be divided into two parts for the first two days.  
S/E, C/I, D/F, D/I *see* page 14

or

- Oxytetracycline, 4.4 mg/kg, q 24 h, for 5 days; the dose should be divided into two parts for the first two days.  
S/E, C/I, D/F, D/I *see* page 14

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##### Prophylaxis and control

- To prevent sporulation, the carcass should not be opened;
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

the cadaver should be burnt and equipment disinfected by either of the following solutions: 10% hot caustic soda solution, 4% formaldehyde solution, 7% hydrogen peroxide, 2% glutaraldehyde, or calcium hypochloride with 5% active chlorine.

- Vaccination with Sterne vaccine annually; the dose should be similar to cattle

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*Public health significance:* Anthrax is zoonotic transmitted through consumption of contaminated meat or contact with wound.

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## **Bluetongue**

Bluetongue is a disease of ruminants caused by an *Orbivirus* belonging to the family *Reoviridae*. Camelids are less susceptible but are considered to be reservoirs of infection to sheep and cattle. There are serological indications in Amhara and Oromia regional states in sheep; however, the causal virus is not yet isolated.

### ***Diagnosis***

It is by serology and virus isolation.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- No specific treatment for bluetongue.

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Prevention and control

- Control of *Culicoides*, which are the vectors of the disease and vaccination with the appropriate serotype; however, it is difficult to implement.
- 

## **Botulism**

This is toxæmia caused by ingestion of preformed toxin of *Clostridium botulinum* and characterized by progressive

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

paralysis. The epidemiology of botulism in camels are similar to that in cattle (*see* Diseases of Cattle: Botulism). It is sporadically reported by pastoralists and nomads in Somali and Oromia regional states.

### ***Diagnosis***

Commonly, the diagnosis is made by eliminating other causes of motor paralysis and look for potential sources of toxin.

### ***Treatment:***

It is the same as in cattle (*see* Diseases of Cattle: Botulism).

## **Brucellosis**

Brucellosis is the most common disease of camelids caused by *Brucella melitensis*, *B. abortus* and *B. ovis* and characterized by abortion. Retained placenta has not been reported in camels. Serological tests conducted in Borena zone have shown relatively high prevalence. The prevalence of brucellosis is high in areas when camels are in contact with infected ruminants.

### ***Clinical Symptoms***

Abortion is most commonly sign.

### ***Diagnosis***

The tube agglutination test using 5% NaCl phenolized solution, CFT, ELISA and culture of blood, milk or tissue such as the placenta, and stomach and lung of aborted fetuses are recommended in camel.

### ***Treatment and Prevention***

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#### **Management**

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##### **Drug Treatment**

- Oxytetracycline, 25 mg/kg, q 48 h for 30 days. S/E, C/I, W/P, D/F, D/I, *see* page 14

or

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

- Streptomycin, 25 mg/kg, q 48h for 16 days, IM for seropositive animals. S/E, C/I, D/F, D/I *see* page 17

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### Prophylaxis and control

- Test and slaughter
  - Vaccination
- 

## **Camel Pox**

Camel pox is a highly contagious viral disease caused by an Orthopox virus, *Orthopox cameli*. It occurs at the beginning and early rainy season and characterized clinically by pox lesions.

### ***Clinical symptoms***

Initially moderate depression, mild fever and anorexia and enlargement of mandibular lymph nodes followed by vesicles that rupture and become covered by thick brown scabs and scar.

### ***Diagnosis***

Clinical signs are presumptive and confirmed by serological tests.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- There is no specific treatment.
- Antibiotic treatment is useful to control secondary bacterial infection, *see* Anthrax treatment above.

##### Prevention and control

- Vaccination and improved management strategies could reduce the prevalence.
- 

## **Contagious Ecthyma**

Contagious ecthyma is a highly contagious viral disease characterized clinically by pruritis, itching against objects followed by hemorrhages and extensive skin excoriations,

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

which leads to impaired grazing ability. The lesions could be localized or generalized.

### ***Treatment and Preventions***

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#### **Management**

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##### Drug Treatment

- Treatment is no specific treatment; however, secondary infection could be prevented by high doses of penicillins, 30000IU/kg, IM, q 24 h for 3 days. S/E, C/I, W/P, D/F, D/I, *see* page 14.

or

- Amoxicillin, 10-20 mg/kg, IM, q 24 h, for 3 days. S/E, C/I, D/F *see* page 77.  
✓ W/P: meat 10 days,

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##### Prophylaxis and control

- The effect of vaccination is controversial
- Isolation of infected animals from the herd

*Public health significance:* Contagious ecthyma is zoonotic thus care should be taken to avoid human infection.

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## **Dermatomycosis**

Dermatomycosis is caused by mainly by *Trychophyton* spp. of fungi. The predisposing factors are similar to dermatophytosis in cattle (*see* Diseases of Cattle: Dermatophytosis). The disease is mainly spread by direct contact with infected animals, but grooming tools, blankets, enclosures and man can also act as fomites. In kids typical ringworm lesions are quite often *seen* on the head. The importance of so called “carrier animals” without clinical signs for spread of infection is not known.

### ***Treatment:***

Treatment and control options are similar to cattle (*see* Diseases of Cattle: Dermatomycosis).

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Dermatophilosis**

Dermatophilosis is skin disease cattle, sheep, goat, camels and other animals caused by the actinomycete bacteria, *Dermatophilus congolensis*. The hair underneath infected skin appears as paintbrush. When the hair is pulled off, the skin is wet, reddish brown.

#### ***Diagnosis***

The bacterium is easily observed by direct smear stained with Giemsa or Gram's stains. Culture from the skin scrapping is confirmatory.

#### ***Treatment and Prevention***

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##### **Management**

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###### Non-drug Treatment

- Remove the scab

###### Drug Treatment

- Oxytetracycline 20%, 20 mg/kg, IV, q 12 h. S/E, C/I, W/P, D/F, D/I, *see* page 14.

or

- Disinfecting locally with iodine 5% solution for 7 days. S/E, C/I, D/F *see* page 18.

*Plus*

- Shearing of long hairs along the lesions reduces further development of the lesions

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*Public Health significance:* Dermatophilosis is zoonotic disease

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### **Gastrointestinal Disorders**

The most common gastrointestinal tract disorders in adult camels are caused by endoparasites, sudden diet changes and some specific diseases such as chronic trypanosomiasis, hemorrhagic septicaemia and plant poisoning. The disorder is mainly manifested by diarrhea and usually occurs at the

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

beginning of the rainy season. Neonatal calf diarrhoea is mainly caused by bacterial infection including *Escherichia coli*, enterotoxaemia and salmonellosis. Dietary diarrhoea caused by ingestion of excessive quantities of milk is rarely seen in immature and young calves.

### ***Clinical symptoms***

Diarrhoea may show alterations of odour, color and presence of parasites, blood, mucus and undigested feed. Persistent diarrhoea may also result in continuous soiling of rear quarter and a progressive loss in condition. Signs of septicaemia may also be observed in bacterial infections.

### ***Treatment and Preventions***

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#### **Management**

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Non drug treatment

- Dietary diarrhoea usually resolves itself if the diet change is corrected.

Drug treatment

- Endoparasitic diarrhoea treated with broad-spectrum anthelmintics (*see page 51*)
  - Bacterial or viral infections are treated with long acting antibiotics (*see page 221*)
- 

## **Hemorrhagic Septicaemia**

Hemorrhagic septicaemia is an acute bacterial disease caused by particular serotypes of *Pasteurella multocida*. It is characterized by high fever, increased pulse and respiratory rate and general depression. The disease is common in adult animals and precipitated by environmental stress factors such as high humidity and heavy *Hyalomma dromedarii* tick infestation. Infection is usually endogenous but also by ingestion of contaminated foodstuffs or by *arthropods*.

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### ***Clinical symptoms***

Acute onset, high fever ( $>40^{\circ}$  C), increased respiratory and pulse rate and general depression. Swelling of the subcutaneous tissue results in hot, painful swellings around the neck and lymph nodes become enlarged. Hemorrhagic enteritis characterized by *acute abdominal pain and excretion of tarry feces* and *discoloured urine* are observed.

### ***Diagnosis***

It can be diagnosed by its clinical signs and confirmed by microscopic examination of blood smears.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

High doses of antibiotics should be given.

- Sulphadiazine-trimethoprim, 15 mg/kg in drinking water, PO, for 5 days; remove all other sources of water before administration;
  - ✓ S/E: crystallization in urinary tract, hypersensitivity, and anaphylaxis for all species.
  - ✓ D/F: Powder, 500+50mg/g, 400+80mg/g and 33.3g+6.67mg/100gm; Oral suspension, 50+10, and 400+80 mg/ml
  - ✓ W/P: meat 7 days and don't use in lactating camel
  - ✓ D/I: Detomidine and halothane

Or

- Sulphamethoxine as suspension, injection or bolus; Initial 55 mg/kg, maintenance: 27.5 mg/kg, q 24 h, PO or IV or SC, for 5 days
  - ✓ S /E: crystallization in urinary tract, cutaneous eruption
  - ✓ C/I: pregnant and lactating animals
  - ✓ D/F: Bolus, 5 mg; Injection 330, 333 and 160 mg/ml; Powder, 8, 10, 16, 20, 25 and 30%
  - ✓ W/P: slaughter 5 days and milk 60 days
  - ✓ D/I: Thiopentone sodium and warfarin

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

✓ *Caution:* store at room temperature and protect from light.

IM injection cause local pain and inflammation.

- Other antimicrobial used in bovine (*see* Diseases of Bovine, Hemorrhagic septicaemia)

Prophylaxis and control

- Supplemental feeding, frequent watering and vaccination (endemic areas) with specific bacterin
- 

### **Hydatidosis**

Hydatids cysts of tapeworms belonging to the genus *Echinococcus* are common also in camelid particularly affecting the lungs and the liver.

#### ***Diagnosis***

It is difficult in the live animal. At postmortem the cysts are clearly observed.

#### ***Treatment and Prevention***

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##### **Management**

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Non-drug treatment

- Complete rest
- 

Treatment and prophylaxis

- Treatment in the camel is rarely employed. However, treatment in the dogs is recommended.
- Praziquantel, 5-10 mg/kg, PO (*refer also treatment in dogs*)
- Bunamidine hydrochloride, 25-30 mg/kg, PO (*see also treatment in dogs*)
- Combination of cestocidal and nematocidal components, e.g. Fabantel /praziquantel /pyrantel *see* page 49/52/53

*Note:* Rigorous meat inspection should be implemented and proper disposal of abattoir waste and offal.

*Public health significance:* Contamination of food/feed with infected dogs feces could cause human hydatidosis.

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## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### **Mastitis**

Mastitis, an inflammation of the udder is less common in camelids than bovine, ovine or caprine species. The aetiologies are similar to other animals. In the camels, it may be peracute, subacute and gangrenous. The lymph node enlarged and the milk becomes watery, yellowish or blood-tinged.

### ***Diagnosis***

The California Mastitis Test or Somatic Cell Count could be used as a screening test. Culture is important to determine the causal agent.

### ***Treatment and Prevention***

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#### **Management**

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Non drug treatment

- The teat canal should be penetrated with catheter

Drug treatment

- Benzathine Cloxacillin, 500mg, Intramammary infusion, single dose and may be repeated after 2-3 days;

- ✓ S/E: Allergic reactions

- ✓ C/I: Hypersensitivity to penicillin and cephalosporins

- ✓ D/F: Intramammary suspension, 200mg/dose

- ✓ W/P: withdrawal period during treatment period.

or

- Streptomycin plus penicillin (1 gm + 100,000 IU) q 24 h for 3 days

- ✓ S/E: Allergic reactions

- ✓ C/I: Hypersensitivity to penicillin and cephalosporins

- ✓ D/F: Intramammary suspension, 250mg +30000IU/dose

- ✓ W/P: withdrawal period is during treatment period.

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*Note:* Each teat in the camel has two streak canals, which are narrow; thus care should be taken not to damage it during intramammary infusion.

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## **Camel Myiasis**

Camel myiasis is caused by invasion of wound in the nasal or aural cavities by larvae of dipterous flies. In Ethiopia & the Sudan the larvae of *Wohlfahrtia nuba* causes myiasis in humans and animals particularly camels. The larvae from *Lucilia cuprina* and *Cephalopina titillator* are also reported as pathogenic myiasis.

### ***Clinical Symptoms***

*Wohlfahrtia nuba* larvae is found in wounds. *Lucilia cuprina* occur in the folds of the skin e.g. perineal area and cause stress to the camel, which continues to rub with objects and bite its body. *Cephalopina titillator* deposits larvae in the nostrils; the larvae migrate to the nasopharynx and nasal sinuses and attach to the mucous membrane. Clinical signs are observed only when the larvae mature. The camel shows respiratory and nervous signs and the local inflammation of the pharynx and congestion of the nasal cavity occurs.

### ***Treatment and Prevention***

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#### **Management**

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*For Wohlfahrtia nuba*

- Ivermectin 1%, 1 ml/50 kg, SC stat
    - ✓ S/E, C/I, D/I and D/F *see* page 52 &
    - ✓ W/P: meat, 21 days; milk, 28 days
- or
- Rafoxanide, 7.5 – 10 mg/kg, PO as a drench or bolus. S/E, D/F and C/I *see* page 48.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### *Lucilia cuprina and Cephalopina titillator*

- Insecticides and the wound should be cleaned and dressed  
or
  - Ivermectin 1%, 1 ml/50 kg, SC (as above)  
or
  - Hydrogen peroxide 2 %, ether or chloroform may cause  
hidden larvae to crawl.
- 

## **Pneumonia**

Pneumonia is the most common syndrome in camels. It is caused by viruses, bacteria, fungus or aspiration, as well as by toxins arriving hematogenously or by inhalation. Handling, transport, mixing, and overcrowding are often considered predisposing factors.

### ***Clinical symptoms***

Acute onset of lower respiratory disease characterized by a change in respiratory rate and depth, respiratory noise such as wheezing, coughing, unilateral or bilateral nasal discharge either serous, purulent or hemorrhagic, increased temperature, anorexia and usually general depression with reluctance to move or work are signs of pneumonia. Hyperlacrimation, abduction of the elbows, extended neck, and deviated carriage of the head with apparent swelling of the temporal region or above the sinus frontalis may be observed.

### ***Treatment and prevention***

Treatment depends on the type of organisms involved and the type of pneumonia.

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## **Management**

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Non drug treatment

Regular cleaning and flushing of the nasal cavity with saline

Drug treatment

- Penicillin Benzathine, 40000IU/kg, IM, q 24 h for 3 days.  
S/E, C/I, D/F, W/P, D/I, *see* Page 14.
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

or

- Oxytetracycline, 20 mg/kg, IV, q 24 h for 3-5 days. S/E, C/I, D/F, W/P, D/I, *see* page 14.

or

- Gentamycin sulphate, 5-8 mg/kg, IM, q 24 h for 3 days. S/E, D/F, D/I, C/I *see* page 35.

*plus*

- ✓ Dexamethasone, 3 mg/kg, IV or IM, q 6 h with antibiotics. S/E, C/I, D/I and D/F *see* page 7.

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### Prophylaxis

- Improved Management such as housing, hygiene and good nursing care
- 

## **Rabies**

Rabies is a fatal disease for humans and other warm blood animals causing encephalitis. It is transmitted by the bite of infected animals. A virus belonging to Rhabdoviridae, genus *Lyssa* virus causes it. Camelids are susceptible to rabies.

The clinical signs, control measures and public health significance are similar to dogs and cats (*see* Diseases of Dogs and Cats: Rabies).

## **Saddle sore**

Saddle sore is a disease condition of camels of the back where the saddle rests. It is characterized by injuries of the skin and deeper soft and bony tissues. The clinical signs range from erythematous through papular, vesicular, pustular, and finally, necrotic lesions. Diagnosis is based on the site of the lesion located specifically on the area where the saddle rests.

## ***Treatment and Prevention***

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### **Management**

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Non drug treatment

- Complete rest
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### Drug treatment

#### *Early stage*

- Lead acetate, 2% astringent packs.

#### *Chronic lesions*

- Povidone-iodine as 0.1 to 0.5% solution for wound lavage  
✓ S/E, C/I, D/F *see* page 18.

or

- Systemic antibiotics (eg penicillin + streptomycin) *see* pages 14/17.

#### *plus*

- Surgical removal of dead tissue and treating with astringent (500 ml of 0.1% Alcohol sublimate plus 30g tannic acid, and 1 g gentian violet)
- 

## **Tetanus**

Tetanus is a toxæmia caused by infection with *Clostridium tetani* that affects all mammals. The camelids are rarely affected. Infection occurs via contaminated wound, and/or frequent puncture wounds due to the long hard thorns of the acacia bush.

### ***Clinical Symptoms***

The clinical signs are similar to the classical tetanus with muscle spasms, neck stiffness and the characteristic disturbances of mastication; increased reflex activity and tetanic spasms may occur.

### ***Treatment and Prevention***

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#### **Management**

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#### Drug treatment

- Tetanus antitoxin(TAT) 100 ml, 1500 IU, IV q 12 h or SC, q 24 h for 3-5 days.

#### *Plus*

- Debridement of the wound and feeding via gastric tube

#### *Plus*

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

- Antibiotic treatment (similar to any systemic infection in camels like pneumonia above)

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### Prevention and control

- Wound treatment with antiseptics
- 

## **Trypanosomosis**

Camel trypanosomiasis is a debilitating protozoal disease caused by *T.brucei evansi* infection. The parasite is transmitted mechanically by biting flies such as *Stomoxis spp.* and *Tabanus ssp.* as vectors. Disease outbreaks show seasonal pattern associated with increasing numbers of biting flies during the rainy season or shortly there after. All age groups are susceptible, but immature, stressed and lactating animals are extremely vulnerable.

### ***Clinical symptoms***

Severe anaemia, high fever, anorexia and marked generalized edema and deteriorate rapidly and die. In the chronic *T. evansi* form of infection progressive weight loss, intermittent high fever, marked generalized muscular atrophy especially the rear end, pale mucous membranes and occasionally abdominal edema are observed. They may also exhibit a characteristic sweet odour due to urinary ketone. Late term abortions and premature birth are common.

### ***Diagnosis***

Clinical signs are indicative. Decreased PCV between 18-20 %, a responsive anaemia and perhaps demonstration of the parasite in stained blood smears are definitive techniques.

### ***Treatment***

See table 8 on page 240.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

Table 8. Drugs for the treatment of *Trypanosoma evansi* infection in camels.

<b>Drug</b>	<b>Dose mg/kg</b>	<b>Action</b>	<b>Route of admin.</b>	<b>Contraindication/ side effects</b>
Quinapyramine sulfate / chloride	5	C	SC	S/E: overdosing can cause tremors, salivation and collapse to death
Suramin	5-10	C, P	IV	Max. 10 g/camel C, & 5 g/head for P S/E: Leakage of the drug into the tissues may cause phlebitis
Isometamidium chloride	0.5-1.0	C, P	IV	Most <i>T.evansi</i> can have innate resistance. S/E, C/I, D/F, D/I, <i>see</i> page 84.
Diminazene aceturate	3.5-5	C	3.5-5	Diminazene aceturate is toxic at >3.5 mg/kg, thus it is not used in camels.

*Note:* Use 5% Dextrose or lactated ringer solution to dissolve the drugs. Drug resistance should be frequently monitored. Treatment of non-sedentary camel herds is only advisable if it is performed regularly. C=Curative and P= Preventive.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Tuberculosis**

Tuberculosis is caused by *Mycobacterium* species mainly *M. tuberculosis* and *M. bovis* and atypical mycobacteria. Transmission is mainly through aerogenic by inhalation and alimentary by ingestion of food contaminated with infected feces, urine or milk.

#### ***Diagnosis***

The intradermal tuberculin test often given non-specific reaction and the sensitivity has also been low.

#### ***Treatment and Prevention***

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##### **Management**

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Drug treatment

Treatment is sometimes recommended for zoo Camelidae,

- Isoniazid 2.4 mg/kg, PO in feed. S/E, C/I and D/F *see* page 75.

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Prophylaxis and control

- Disinfect contaminated utensils and surfaces with 3% formalin, 2% Lysol and 2.5% phenol
- 

### **Ectoparasites**

#### **Lice Infestation**

There are two orders: *Anoplurida*, the sucking lice, and *Mallophagida*, the biting lice. Transmission is either by direct close contact of the host or indirectly by grooming equipments, blanket, and saddles, scratching posts or dust bath areas.

#### ***Clinical Symptoms and Lesions***

Sucking lice infestation is characterized by licking, scratching and rubbing. Anemia may follow heavy infestations, particularly in young animals. They are usually found around the head, neck and withers.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

As for biting lice, heavy infestation may result in matted wool and alopecia. It also has pruritis resulting self-trauma. The predilection sites are at the base of the tail, the back, at along the ventral column and side of the neck and the body.

### ***Treatment and Prevention***

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#### **Management**

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Chemical treatment

- Coumaphos 0.05% on skin and wet the coat thoroughly  
✓ D/F: wettable powder, 50%

or

- Ivermectin, 0.2 mg/kg, SC or 0.5 mg/kg pour on. S/E, C/I, D/F, W/P, D/I, *see* page 52.
- 

### **Mites**

#### **Sarcoptes**

It is caused by *Sarcoptes scabiei* var *cameli*, a minute burrowing mite. It is transmitted by contact with animals or fomites. Young, immature, stressed adult and otherwise debilitated animals are generally affected and usually develop the chronic generalized form of mange. Healthy animals may be affected as well, but usually lesions remain localized. Morbidity is usually moderate, but poor Management and inclement weather can increase morbidity and mortality rates quite dramatically.

#### ***Clinical finding and lesions***

Intense pruritus, evolving small vesicles and inflammatory reaction of the skin followed by loss of hair and become moist and exudative. Animals rub against any object. The head, axillary, inguinal and perineal area is most commonly affected. Affected animals show a general loss in condition, decrease in milk production and poor reproductive performance.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Diagnosis***

Signs are indicative. Demonstration of mite from skin scrapings from affected area is confirmatory.

### ***Treatment and Prevention***

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#### **Management**

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Non drug treatment

- Improving Management practices and sanitation

Drug treatment

- Ivermectin, 0.2mg/kg, SC and can be repeated after 15 days  
For severe cases use topical application. S/E, C/I, D/F, D/I  
*see page 52.*

or

Diazinon 60% EC, spraying or sponging, similar to application in cattle and repeat every 10 days, *see page 103/104.*

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### **Tick Infestation**

Ticks are also common in camelds. Since they suck considerable blood, they cause debility and anemia. The role of ticks as vectors of diseases is much less important than in other animals, but could expose to bacterial infections by mechanical damage of the skin. The most important tick genus affecting camels is *Hyalomma* with the species *H. asiaticum*, *H. dromedarii*, *H. franchini* and *H. scupense*. Other genera are *Amblyomma*, *Rhipicephalus* and *Dermacentor*. *Ornithodoros* and *Boophilus* species also affect camelids. *Dermacentor* species can inject neurotoxins while ingesting a blood meal, which may cause sudden death and paralysis in camels.

### ***Clinical Symptoms***

Listless ness, sudden death in some, paralysis and high infestation of ticks on the body are common signs.

***Treatment and Prevention***

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**Management**

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Control and Prophylaxis

Routine application of acaricides is not recommended in camels, but applied in high infested animals

- Deltamethrin or Flumethrin 1% pour-on, 1-2ml/10kg applied along the back

✓ D/F: 1% pour on

or

- Organophosphates, carbamates and synthetic pyrethroids could be applied (*see* External Parasites of cattle on page 103/104)

or

- Ivermectin 1%, 10 mg/50kg, SC. S/E, C/I, D/F, W/P, *see* page 52
-

## **DISEASES OF POULTRY**

### **Non-infectious Diseases**

#### **Ascites Syndrome**

Ascites is an accumulation of noninflammatory transudate in one or more of the peritoneal cavities or potential spaces. The most common cause is right ventricular failure or hepatic fibrosis.

In poultry, right ventricular failure is secondary to valvular insufficiency. Liver damage is also caused by aflatoxin or by toxins from *Crotalaria* or by *Clostridium perfringens* infection.

#### ***Clinical Symptoms and lesions***

Affected broilers are cyanotic; the abdominal skin may be red, and peripheral vessels congested. Because growth stops as right ventricular failure develops, affected broilers are smaller than their pen mates. The ascites increases the respiratory rate and reduces exercise tolerance. Affected broilers frequently die lying on their back.

#### ***Diagnosis***

Enlarged or thickened right ventricle.

#### ***Control***

- Reduce the birds' oxygen requirement by slowing growth or reducing feed intake
- Ascites caused by other factors (eg, lung damage, liver damage, etc) can be prevented by avoiding the etiologic agents involved.

### **Cannibalism**

Cannibalism is a vice of chickens and turkeys most often manifested as vent-picking or picking at unfeathered skin on the head, comb, wattles, or toes. No single cause has been identified, but overcrowding, excessive light, and nutritional imbalances are directly correlated with its occurrence. Other factors that predispose to cannibalism are overly fat pullets where mucosa protrudes from the vent during and after egg laying, insufficient feeder space, mineral and vitamin deficiencies, skin injuries, and failure to remove dead birds daily.

#### ***Control***

Trim the tip of the beak at one-day old and repeat between 6 and 12 weeks age. Cautery often is required to provide hemostasis.

### **Calcium and Phosphorus Deficiency**

Adequate phosphorus and calcium nutrition depends not only on sufficient total dietary supplies, but also on the chemical forms in which they occur in the diet and on the vitamin D status of the diet or the animal. Phosphorus deficiency: more a problem of grazing ruminants, especially cattle, Calcium deficiency: is more common a problem of hand-fed animals, especially pigs and poultry. The optimum Ca:P ratio for growing chicks and pigs lies between 1:1 and 2:1. For laying hens greater Ca is required.

#### ***Clinical symptoms***

Abnormalities in the bones, subnormal growth, and reduced egg production, depressed appetite and efficiency of feed use and the development of pica or depraved appetite are observed.

***Treatment and Prevention***

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**Management**

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Prevention

- Direct supplement with 0.9% Ca and 0.7% P for starting chicks (0-8weeks) and for growing chicks (up to 18 weeks) with 0.6% and 0.4%, respectively.
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**Manganese Deficiency**

A deficiency of manganese in the diet of young growing chickens is one of the causes of perosis and of thin-shelled eggs and poor hatchability (see also calcium and phosphorus imbalances, Vitamin D Deficiency). It may also cause chondrodystrophy.

***Clinical Symptoms***

Perosis is a malformation of the hock joint in young chicks; usually the joint is swollen and flattened, and sometimes the achilles tendon slips from its condyles. The tibia and the tarsometatarsus of one or both legs may bend near the joint and rotate laterally. A shortening and thickening of the long bones of the legs and wings may be apparent. In adult chicken the shells of their eggs tend to become thinner and less resistant to breakage.

***Treatment and Prevention***

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**Management**

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Drug treatment

- Diet that contains 30-40 mg of manganese/kg in feed .

Prevention

- Requires a diet adequate in all necessary nutrients, especially manganese, choline, niacin, biotin, and folic acid.
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Riboflavin Deficiency**

If the ingredients of a poultry feed are not carefully selected, or if a special supplement is not included, a deficiency may result.

#### ***Clinical symptoms***

Young chicks, as early as 1-week-old, exhibit curling of the toes, inability to walk and sometimes diarrhoea.

#### ***Treatment and Prevention***

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##### **Management**

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Drug treatment

- Administering vitamin B preparations cures rapidly .

Prevention

- It is important to ensure adequate vitamin B levels not only in starter and grower diets, but also in the diet of parent breeders.
- 

### **Vitamin D Deficiency**

Vitamin D is required for the normal absorption and metabolism of calcium and phosphorus. Thus, a deficiency can result in rickets in young growing chickens and in osteoporosis and poor eggshell quality in laying hens.

The rickets and osteoporosis can be seen in poultry due to a deficiency of vitamin D. Most poultry reared in strict confinement need a higher dietary level of vitamin D than those that have access to sunshine. Mycotoxins in the feed or litter may interfere with absorption of the vitamin (as well as of fat and the other fat-soluble vitamins).

#### ***Clinical symptoms***

Young chicken and turkeys have a tendency to rest frequently in a squatting position, disinclination to walk, and a stiff gait. Other signs are retarded growth, enlarged hock joints, beading at

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

the ends of the ribs, marked softening of the beak and the feathers become ruffled.

Laying chickens: thinning of their eggshells, and if severe prompt reduction of egg production and hatchability, the breast bones become noticeably less rigid, and there may be beading at the rib ends. The lesions in young chickens and turkey are soft bones and enlarged parathyroid gland. In adult chickens, the bones tend to become rarefied (osteoporotic) rather than soft.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- Dry, stabilized forms of vitamin D<sub>3</sub> is added to commercial diets to provide three times the normally recommended level for a period of ~3 wk.
  - In cases of severe mycotoxicosis, a water-miscible form of vitamin D is administered in the drinking water to provide about three times the amount normally supplied in the diet
- 

### ***Infectious Diseases***

#### **Aspergillosis**

Aspergillosis is a mycotic disease caused by the fungus *Aspergillus fumigatus* that affects all species of birds. The organism is found in litter, and feed. Infection occurs predominantly by inhalation; however, the agent also penetrates eggs and infects embryos.

#### ***Clinical Symptoms***

Acute Aspergillosis occurs in young birds. It is manifested by respiratory distress and reduced feed intake. The chronic form, which occurs in mature birds, is manifested by reduced feed intake.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

The most frequent clinical signs are dyspnea, gasping, hyperpnea, cyanosis and usually without rales. Other signs include diarrhea, anorexia, somnolence, progressive emaciation; increased thirst and few animals show nervous signs. Pulmonary lesions are cream-colored plaques a few millimeters to several centimeters in diameter; which may occur in the larynx, air sacs, liver, intestines, and occasionally the brain and mediastinal canthus of the eye.

### ***Diagnosis***

The signs and gross lesions are suggestive; culture or microscopic examination of fresh preparations are confirmatory.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- Treatment of affected birds is considered useless.

Control

- Strict adherence to sanitation procedures in the hatchery and fumigate contaminated hatcher with formaldehyde or thiabendazole (120-360 g/m<sup>3</sup>)
- Avoid moldy litter or ranges; contaminated feed could be sprayed with nystatin.

*Public health significance:* Aspergillosis is zoonotic. It is transmitted via inhalation or ingestion.

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### **Avian Campylobacteriosis**

Campylobacteriosis in poultry is caused by *Campylobacter jejuni* and clinically characterized by rapid onset of diarrhea in day old chicks to 4 days old. Environment contamination is the source of infection. It is a food-borne infection of humans derived from poultry.

### ***Diagnosis***

Cultural examination

## *Treatment and Prevention*

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### **Management**

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#### Drug treatment

- Erythromycin thiocynate, 92.5-185 gm/ton of feed for 7 to 14 days; Erythromycin base 10 mg/1kg q 24 h for 3days IM.  
✓ W/P: 24 h for the lowest and 48 h for the highest dose levels
- 

#### Control

- Strict biosecurity measures for contaminated housing between successive flocks, exclusion of rodents and wild birds, and insect eradication.

*Public health significance:* Campylobacteriosis is zoonotic.

It is transmitted through ingestion of raw contaminated poultry meat.

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## **Chlamydiosis**

Chlamydiosis is subclinical, acute, subacute, or chronic disease of wild and domestic birds characterized by systemic, respiratory or digestive signs and lesions. It is caused by *Chlamydia psittaci*, an obligate intracellular bacterium. Respiratory discharges or feces are infective; air borne particles and dusts may harbor the organism. The organism is excreted via secretions or excretions and transmitted through inhalation. Recovered birds remain carriers.

### *Clinical Symptoms and lesions*

Nasal and ocular discharges, conjunctivitis, sinusitis, green to yellow-green droppings, inactivity, ruffled feathers, weakness, inappetence, and reduced feed consumption & weight loss can be seen in clinically affected birds. Air sacculitis, pericarditis, periohepatitis, and peritonitis with serofibrinous exudates and hepatosplenomegaly are common in acute cases. In chronic cases enlarged spleen or an enlarged, discolored liver, or both occur.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Diagnosis*

Impression smears of affected tissues stained by Giemsa, Gimenez, or Macchiavello's methods are sufficient to demonstrate intracellular organisms.

### *Treatment and Prevention*

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#### **Management**

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Drug treatment

#### *First line*

- Chlortetracycline, 20-30 mg/kg or 400-750 g/ton for a minimum of 2 weeks in feed
  - ✓ S/E & C/I: hypersensitivity to tetracycline, birds with impaired renal/liver function
  - ✓ D/I: Concurrent administration with penicillins cephalosporins, quinolones and cycloserine
  - ✓ D/F: 10% or 20% feed mix powder
  - ✓ W/P: Meat 1 day, egg - nil

or

- Doxycycline, 2.5 to 10 mg/kg, PO in drinking water, daily for 3-5 days.
  - ✓ S/E, C/I, and D/I as in chlortetracycline above
  - ✓ DF: 20% solution, 20% powder
  - ✓ W/P: meat 2 days; eggs- nil.

#### *Alternative*

- Flumequine diluted 1:1500-2000 in drinking water for 3-5 days.
  - ✓ C/I & S/E: hypersensitivity to flumequine, impaired liver and/or renal function, concurrent administration with tetracycline, chloramphenicol, macrolides, and lincosamides.
  - ✓ D/F: 20% liquid in oil
  - ✓ W/P: meat 3 days

*Note:* Extended treatment for 2-6 weeks

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*Public health significance:* The organism is transmitted to humans and cause eye lesions.

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### **Chronic Respiratory Disease**

Chronic Respiratory Disease (CRD) also called airsacculitis is an infection of chicken and turkeys caused by *Mycoplasma gallisepticum*. It is transmitted in eggs or by indirect contact. The disease is characterized by respiratory signs and lesions. Once started it follows a prolonged course in a flock. Concurrent infections such as infectious bronchitis virus, Newcastle disease virus, *Escherichia coli*, *Pasteurella multocida* and *Haemophilus paragallinarum* or increased level of dust in the environment predispose to CRD.

#### ***Clinical Symptoms and lesion***

Signs of CRD in a flock develop slowly and are usually manifested by drop in egg and meat production. They show varying degrees of respiratory distress, with slight to marked rales, difficulty in breathing, coughing, and/or sneezing. The lesions include airsacculitis, fibrinous perihepatitis and adhesive pericarditis.

#### ***Diagnosis***

A history of chronic respiratory symptoms accompanied by lowered feed consumption, poor weight gains or lowered egg production is suggestive. Positive plate or tube agglutination tests and isolation and identification are confirmatory.

#### ***Treatment and Prevention***

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##### **Management**

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*Note:* Treatment is expensive and thus marketing an infected flock with low incidence of disease may be more economical.

#### **Drug treatment**

- Tetracyclines 2.5 to 10 mg/kg, PO in drinking water q 24 h for 3-5 days.  
✓ C/I, S/E, DF, W/P see page 248.
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

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- Tiamulin 10%, 1:300-600 diluted in drinking water for 5 days
  - ✓ C/I, S/E & D/I: Hypersensitivity to tiamulin, concurrent administration with monensin, salinomycin or narasin
  - ✓ D/F: 10% Solution
  - ✓ W/P: meat 5 days

or

- Erythromycin 1: 10000 liters of drinking water for 3 days.  
W/P, *see* page 247.

or

- Tylosin, 0.5% in drinking water
  - ✓ S/E: Allergic reaction
  - ✓ C/I: animals with impaired liver function
  - ✓ D/F: Powder; 10, 20 and 30%
  - ✓ D/I: Theophylline, Warfarin and beta-adrenergic
  - ✓ *Caution:* store below 40°C

or

- Enrofloxacin 15 mg/kg, IM, q12h or other fluoroquinolones can be given in the feed or water for 5-7 days; however, relapses are common.
  - ✓ S/E: Arthropathy
  - ✓ C/I: Impaired liver and/or renal function, hypersensitivity
  - ✓ D/F: Oral suspension, 2.5, 10 and 25% and Powder, 10%
  - ✓ W/P: meat 12 days
  - ✓ D/I: Tetracyclines, chloramphenicol, macrolides and lincosamides.

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### Control and Prophylaxis

- Improve the management, husbandry or nutrition e.g. reduce dust in the house, remove accumulated litter, improve ventilation, etc.
- 

## Coccidiosis

Avian coccidiosis is a protozoal disease of poultry and many other birds frequently characterized by diarrhea and enteritis. The disease can occur in all age groups, but it usually occurs in young growing birds. It is caused by the species of *Eimeria* and

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

cross protection does not occur among the species. Coccidial oocysts are present in litter and can be transmitted by feed, water or soil ingestion.

### ***Clinical Symptoms and lesions***

Decreased growth rate, severe diarrhea, and high mortality, feed and water consumption are depressed followed by weight loss, decreased egg production, and increased mortality.

The location of the lesions in the intestine depend on the species of *Eimeria* involved. *Eimeria acervulina* is located in the upper small intestine; *E. bruneti* in the lower part of the intestine; *E. maxima* and *E. necatrix* in the middle intestine and *E. tenella* localizes in the caecum.

### ***Diagnosis***

The lesions are not characteristic; demonstration of oocysts in feces or intestinal scrapings coupled with the presence of clinical signs should be considered during diagnosis.

### ***Treatment and prevention***

Treatment is recommended only if it is commenced at early stage of the disease.

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## **Management**

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### **Drug Treatment**

- Sulfachlorpyrazine, 300mg/kg (0.03%) in drinking water for 3 days;
  - ✓ C/I: should not be given to layers that produce eggs for human consumption
  - ✓ D/F: powder, 10%
  - ✓ W/P: meat 4 days

or

- Trimethoprim-Sulphaquinoxalene sodium (1:5), 30 mg/kg PO in feed or drinking water, q 24 h, for 5 days or until two days after symptoms have subsided, but not exceeding 14 days altogether.
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

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- C/I, S/E & D/I: Other sulphonamides or coccidiostats should not be administered concurrently; should not be used for long term treatment; not to be administered for chickens producing eggs for human consumption.
  - ✓ D/F: granules or suspension
  - ✓ W/P: meat 7 days
  - ✓ *Precautions*: adequate water should be given

or

- Amprolium, 125mg/kg (0.0125%) in feed or 38.4 mg/ml in drinking water for 1-2 weeks or 1.2g/l/day for 3-5 days by continuous feeding
  - ✓ C/I: mixing with other medicinal products or substances having similar effect. Do not use for laying birds;
  - ✓ D/F: oral solution, 38.4 mg/ml; oral powder, 20%, 30%, and 60%
  - ✓ W/P: 3 days

or

- Monensin, 20 mg/kg, premix
  - ✓ C/I, S/E, D/I: treatment with tiamulin within 7 days after or before treatment with monensin may cause growth depression or death. Intoxication occurs in turkeys receiving chloramphenicol and sulphonamide treatment.
  - ✓ D/F: 20% Feed mix powder,
  - ✓ W/P: meat 3 days; do not use in layers destined for human consumption.

or

- Clopidol, 125 mg/kg (0.0125%) of feed, by continuous feeding
  - ✓ C/I: Egg-laying chicken should not be treated with the drug; overdose might cause inappetence; concurrent administration with other anticoccidial drugs is contraindicated.
  - ✓ D/F: powder, 6%
  - ✓ W/P: meat for least 7 days.

*Note*: Infected birds remain carriers despite treatment.

*Precautions*: avoid contact with skin and eyes; if it occurs,

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rinse immediately with water.

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### **Control & Prophylaxis**

- Amprolium HCl (25%) *plus* Ethopabate (1.6%) combination, 500g/ton of feed, from day-old to 16-18 weeks of age.
  - ✓ D/F: powder in 73.4% cereal carrier
  - ✓ C/I, W/P; *see* the treatment above

or

- Clopidol for applications and formulations, *see* treatment above.

or

- Lasalocid sodium 75-125 mg/kg continuously feeding from day old to adult age .
    - ✓ C/I: not to be given for layers that produce for human consumption
    - ✓ S/E: Overdose may cause inappetence
    - ✓ D/F: 15% Feed premix powder
    - ✓ W/P: meat, 5 days
- 

### **Colibacillosis**

Colibacillosis is a bacterial disease of poultry caused by *Escherichia coli*. It is characterized by an acute fatal septicemia or subacute pericarditis, sinusitis, omphalitis and airsacculitis. Systemic infection usually requires predisposing environmental or infectious causes. It affects all ages of poultry and other kinds of birds; most outbreaks occur in chicken under low sanitary standards. Infection is acquired by ingestion or transovarian .

Young birds that survive septicemia develop subacute fibrinopurulent airsacculitis, pericarditis, perihepatitis, and lymphocytic depletion of the bursa and thymus.

### ***Diagnosis***

The presence of predisposing factors, typical visceral serosities and epicarditis, coupled with isolation of a pure culture of *E. coli* from heart blood, liver and spleen should be considered.

## *Treatment and Prevention*

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### **Management**

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#### Drug treatment

- Furazolidone 400mg/kg (0.04%) in the feed or water for 7 to 10 days.
  - ✓ S/E: hyperesthesia and inappetance
  - ✓ C/I: systemic administration
  - ✓ D/F: Powder, 20, 25, 98 and 99%
  - ✓ W/P: meat 7 days

or

- Sulfamethazine-trimethoprim suspension, 1ml/5 liters of drinking water daily for 5 days; C/I, S/E, D/I, D/F and W/P: *see* page 247.

or

- Amoxicillin trihydrate (20-50%) powder, 200g per 600 ml of drinking water (for 2000 birds each 1kg), q 24 h for 3-5 (33.3%) days, water should be restricted to birds 3 hrs before
  - ✓ C/I and SE: to be used only broilers; not to be used in layers; Hypersensitivity following inhalation or ingestion or skin contact may occur
  - ✓ DF: power 50%
  - ✓ W/P: meat 24 hours

or

- Tetracycline 13.3 gm/120 liters of drinking water (equivalent to 60 mg/kg feed q 24 h) for 3-5 days; individual birds could be treated at 1ml of 5% SC; C/I, S/E, D/F, W/P *see* page 248.

#### Prophylaxis

- Remove carriers and prevent introduction of infected birds

*Note:* Earlier treatment is advisable

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## **Fowl Cholera**

Fowl cholera, (*Avian Pasteurellosis* or *avian hemorrhagic septicemia*) is a contagious bacterial disease of poultry characterized by septicaemia, sudden onset with high morbidity

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

and mortality; chronic and asymptomatic infections may also occur. It is caused by *Pasteurella multocida* and commonly reported in commercial flocks in Ethiopia. Transmission occurs by secretions from carrier birds, infected droppings, cannibalism of dead birds, and contaminated water, feed, equipment, or clothing. The organism is primarily excreted from mouth, nose, and conjunctiva of diseased birds that contaminate their environment.

### ***Clinical symptoms and lesions***

*In acute:* sudden death in the flock, fever, depression, anorexia, mucoid discharge from the mouth, ruffled feathers, diarrhea, bluish discoloration of the head, and increased respiratory rate are common symptoms.

*In chronic:* swelling of the joints, footpad, wattles, or tendon sheaths over the caudal portion of the hock joint could be observed.

### ***Diagnosis***

History, clinical signs and lesions are presumptive; bacterial culture and isolation of *P. multocida* are definitive.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Sulphonamides: 0.5-1% (500mg-1gm/kg) in feed or 0.1% (100mg/liter) in drinking water. First line treatment sulphonamides: include Sulphadimethoxazole, Sulphaquinoxalene, Sulphamethazine and sulphaquinonxalene. C/I, S/E, D/I, D/F and W/P, *see* page 251.

or

- Sulphamerazine 143 mg/kg PO (0.5% in feed) or 0.4% in drinking water; sulfaquinoxaline sodium, or trimethoprim-sulfadiazine 1:5, 15 mg/kg for 5 days in feed or water  
✓ C/I, S/E: localized abscesses
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

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✓ D/I, D/F and W/P, *see* page 251.

or

- Chlortetracycline 10%, 20-60 mg/kg, daily in feed for 5 to 7 days or should be continued until signs of the disease are no longer apparent. D/I, D/F and W/P, *see* doxycycline on page 248.

or

- Amoxicillin trihydrate water-soluble crystal, 20 mg/kg in drinking water, once per day for 3-5 days. D/I, D/F and W/P, *see* page 254.
- 

### **Prophylaxis**

- Sanitation, rodent and predator control, and proper disposal of dead birds; vaccination with adjuvant bacterins are generally effective methods of prevention

*Note:* Early treatment and adequate dosages are important. Sensitivity testing often aids in drug selection.

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## **Fowlpox**

Fowlpox is a slow-spreading viral infection of chickens and other poultry characterized by proliferative skin lesions. The disease is transmitted by direct contact between infected and susceptible birds or by mosquitoes. In Ethiopia fowlpox is common in commercial and backyard chicken.

### ***Clinical Symptoms***

Fowl pox is manifested in two forms: the dry form (cutaneous form) characterized by proliferative nodular lesions on unfeathered areas and the wet form (diphtheritic form), where lesions exist in the mouth, pharynx, larynx, and trachea and causing respiratory distress. Cutaneous lesions on the eyelids may cause complete closure of one or both eyes.

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### ***Diagnosis***

Cutaneous lesions are indicative; hematoxylin-eosin staining reveals eosinophilic cytoplasmic inclusion bodies; virus isolation is confirmatory.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- There is no specific treatment available
- 

##### Prophylaxis

- Vaccinate the remaining flocks with an attenuated fowlpox virus of high immunogenicity and low pathogenicity
- Control mosquitoes,

*Note:* Passive immunity may interfere with multiplication of vaccine virus

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## **Fowl Typhoid**

Fowl typhoid is caused by host-adapted salmonella serotype, *Salmonella gallinarum*. It is an egg-transmitted infection of particularly growing or mature flocks or transmitted by ingestion. Mortality at all ages is high.

### ***Clinical Symptoms***

The older bird may be dehydrated and have a swollen, friable, and often bile-stained liver, with or without necrotic foci; enlarged spleen and kidneys; anemia; and enteritis.

### ***Diagnosis***

Isolation and identification of the causal agent.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Sulfaquinoxalene 0.1% in feed for 2-3 days and 0.05% for an additional 2 days;
-

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✓ D/I, D/F *see* page 251.

✓ W/P: meat 10 days

or

- Furazolidone 0.011% in feed for 2 weeks followed by 0.0055% in feed until marketed. C/I, S/E and D/I *see* page 254.

✓ W/P: meat 5 days

---

### **Prophylaxis**

- Poults should be obtained from free stock and place them in a clean house
  - Protect poultry house from birds, rodents, insects etc.
  - Disinfection of humans entering the house
  - Vaccination with a rough strain of *S. Gallinarum* (9R) at 9-10 weeks of age.
- 

### **Fowl Paratyphoid**

Paratyphoid infections are caused by any one of the many non host-adapted salmonellae serotypes such as *Salmonella typhimurium* (most common), followed by *S. enteritidis* and *S.arizonae*.

Infections are often subclinical and mortality is increased due to shipping, delayed feeding, chilling, or overheating. Depression, poor growth, weakness, diarrhea, and dehydration may be seen. The clinical signs are not distinctive.

### ***Diagnosis***

Isolation and identification of the causal agent is essential.

### ***Treatment and Prevention***

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#### **Management**

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Non drug treatment

- Competitive exclusion: oral treatment of chicken with anaerobic culture from caecal contents

Drug treatment

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

- Furazolidone 0.011% in feed for 2 weeks followed by 0.0055% in feed. C/I, S/E, D/I, D/F and W/P: *see* page 254.
- Spectinomycin, 100 mg/kg q12h PO for 3-7 days in 1-2 gm/gallon of drinking water; Chicks 1-3 days old can receive 2.5 to 5 mg/bird, SC.  
✓ C/I: birds remain carriers despite treatment

### **Prophylaxis**

- Strict sanitation and early fumigation of hatching eggs
- Treat feed and supply with heat to kill the bacterias
- Monitor the environment by culturing from litter, dust, water, hatchery debris, and cull chicks

## **Gastrointestinal parasitism**

Poultry could be infected with nematode and cestode parasites. Among the round worms, *Heterakis gallinarum* and *Syngamus trachea*, *Ascarids* and *Capillarids* are economically important. *Railletina* spp *Davainea proglottina* are important cestodes species of poultry.

The worm *Syngamus trachea* inhabits the trachea and lungs of many domestic and various wild birds.

### ***Clinical Symptoms***

Loss of condition and anorexia.

### ***Diagnosis***

Identification of the parasites at necropsy

### ***Treatment and Prevention***

#### **Management**

##### **Drug Treatment**

- Piperazine, 50-100 mg/bird q 24 h, or 0.2-0.4% in the feed or at 0.1-0.2% in the drinking water for two consecutive feeds or drinking water for two days and

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

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deworm chicken at 4-6 weeks of age; repeat when necessary or after 2-4 weeks.

✓ D/F: 65% powder, 100mg/ml syrup

*plus*

- Phenothiazine (for cecal worms in chickens) 0.5 g/bird individual treatment or in dry or wet mash feed, once month to control ascaris.

✓ D/F: pills or tablets or in dry or wet mash feed

or

- Phenothiazine 0.5 gm/head or combined with piperazine (0.5-0.51% & 0.11% in drinking water) as a 1-day treatment, removes both heterakids and ascarids.

or

- Coumaphos, 0.004% in feed for 10-14 days for replacements, or 0.003% in feed for 14 days for layers, is used against capillarids.
- 

### **Histomoniasis**

Histomoniasis is a disease of chicken and occasionally other galliform birds caused by the protozoan parasite *Histomonas meleagridis*. It is transmitted most often in embryonated eggs of the cecal nematode *Heterakis gallinarum*, and sometimes directly by ingestion of contaminated feces.

#### ***Clinical symptoms and lesions***

Listlessness, drooping wings and sulfur-colored droppings; more acute in young birds and birds die within a few days; older birds may become emaciated before death.

#### ***Treatment and Prevention***

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##### **Management**

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Drug treatment

- Furazolidone, 0.022% in feed, for 2-3 weeks. S/E, C/I, D/F, D/I, W/P, *see* page 252.

or

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

- 
- Dimetridazole, 0.06-0.08% in feed, for 7 days.
  - ✓ S/E and C/I: central nerve system depression
  - ✓ D/F: tablet 200 or 400mg, Injection 5mg/ml
  - ✓ D/I: Phenobarbitone, phenitoin, warfarin
  - ✓ W/P: shouldn't be used in poultry for human consumption
- 

### Prophylaxis

- Furazolidone, 0.011% in feed, for 5 days. S/E, C/I, D/F, D/I, W/P, *see* page 252.

or

- Dimetridazole, 0.015-0.02% in feed, for 5 days. S/E, C/I, D/F, D/I, W/P, *see* above

### Prophylaxis

- Strict sanitation is indicated.
- 

## **Infectious Bursal Disease**

Infectious bursal disease also known as Gumboro disease, is an acute, contagious, viral disease of young chickens characterized by diarrhea, vent pecking, trembling, and incoordination followed by atrophy of the Bursa of Fabricius and by a variable degree of immune suppression. The virus, belonging to the *Birnaviridae* family is resistant to most disinfectants and environmental factors and persists for months in contaminated house, for weeks in water, feed and droppings. It is shed in the feces and transferred by fomites (direct and indirect contact).

Chickens at 3-6 weeks age are most susceptible and show clinical disease. It is subclinical at younger age.

### ***Clinical symptoms and lesions***

The clinical signs include blood stained feces and straining. Initially necropsy, the bursa may be twice as large as the normal size then it becomes atrophied and reddened haemorrhages may occur in thigh and pectoral muscles; kidneys may be swollen. Drop in feed and rapid onset with sudden water consumption & watery droppings and ruffled feather.



***Treatment and Prevention***

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**Management**

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Drug treatment

- Tetracyclines and erythromycin. For Dosage, S/E, D/F, C/I, Diseases of Poultry, *Mycoplasma synoviae* infection see pages 247/248 .
  - Earlier treatment is advisable.
- 

Prophylaxis & control

- Maintaining proper litter condition, minimizing mechanical injury, and controlling cannibalism
  - Vaccinate breeders against infectious bursal disease
  - Oxytetracycline, 0.02% in the feed rapidly reduces mortality in field outbreaks of clostridial infections. S/E, C/I, D/I, D/F, W/P, see page 248.
- 

**Infectious Coryza**

Infectious coryza is an acute respiratory disease of chickens caused by the bacterium *Haemophilus paragallinarum* [gallinarum]. Chronically ill or healthy carrier birds are the reservoir of infection. Transmission is by direct contact, airborne droplets, and by contamination of drinking water. The disease may be complicated with *Mycoplasma gallisepticum* concurrent infection.

***Clinical Symptoms and lesions***

The symptoms include oculonasal discharge, sneezing, conjunctivitis with some adherence of the eyelids, and swelling of the face under the eyes extending to the intermandibular space and wattles. Catarrhal inflammation of the nasal passages and sinuses and nasal discharge are observed at necropsy.

***Diagnosis***

History, signs including swelling of the face and wattles and lesion are suggestive; after inoculation of susceptible chickens, typical signs of nasal exudate are diagnostically reliable.

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Isolation and examination of Gram stained smear from sinus exudates are confirmatory

### *Treatment and Prevention*

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#### **Management**

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Drug treatment

- Oxytetracycline (20%), 200g/100 liters of drinking water for 3-5 days. C/I, S/E, D/I, D/F and W/P *see* page 248.

or

- Enrofloxacin, one liter suspension /1500-4000 liters of water for 3-5 days. C/I, S/E, D/I, D/F and W/P, (1.5) *see* page 250.

or

- Sulfamethazine-trimethoprim, 1000 mg/l in drinking water or 2000g/ton for 3 days. C/I, S/E, D/I, D/F and W/P, *see* page 251.
- 

Prophylaxis

- Depopulate and clean infected house before repopulating
- Medication combined with vaccination program in which starter pullets are to be reared or housed on *infected premises*

*Note:* Sulphonamides are contraindicated in layers

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### **Infectious Laryngotracheitis**

Infectious laryngotracheitis is an acute, highly contagious, herpesvirus infection of chickens and pheasants characterized by severe dyspnea, coughing, rattling, extension of the head and rales.

#### ***Clinical Symptoms and lesions***

*Acute form;* blood, mucus, and yellow caseous exudates or hollow caseous cast in the trachea are observed. *Subacute form,* punctiform hemorrhagic areas in the trachea and larynx and conjunctivitis with lachrimation, tracheitis, conjunctivitis, and

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

mild rales. The mouth and beak may be bloodstained from the tracheal exudates. Mortality may reach 50% in adults.

### *Diagnosis*

Clinical signs are suggestive. Demonstration of intranuclear inclusion bodies in the tracheal epithelium early in the course of the disease and isolating and identifying the specific virus or animal inoculation are confirmatory.

### *Treatment and Prevention*

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#### **Management**

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Drug treatment

- No specific treatment
- 

Prophylaxis

- Reduce dust level of the house to reduce severity of signs
  - In endemic areas, vaccination with modified strains of low virulence virus, by eye drop.
- 

## **Influenza**

Influenza in chicken is caused by an orthomyxovirus type A influenza viruses.

### *Clinical Symptoms and lesions*

Signs range from only a slight decrease in egg production or fertility to a fulminating infection with CNS involvement, but respiratory signs are most common. Other common signs in severely affected birds are greenish diarrhea; cyanosis and edema of the head, comb, and wattle; discoloration of the shanks and feet due to ecchymoses; and blood-tinged oral and nasal discharges.

### *Diagnosis*

Isolation of the virus in chicken embryo.

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### ***Treatment and Prevention***

#### **Management**

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##### Drug treatment

- There is not specific treatment
  - Broad-spectrum antibiotics to control secondary bacterial invaders and increasing house temperatures may help reduce mortality
- 

##### Prophylaxis

- Vaccination with autogenous virus or a virus of the same hemagglutinin type.

*Public health significance:* The virus could change its antigenic characteristic and infect humans.

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## **Marek's Disease**

It is a viral-induced-neoplastic disease of chickens characterized by infiltration of the peripheral nerve, brain, and other organs by lymphoid cells. Young chicken are mainly affected. Transmission occurs by inhalation of virus laden feather follicle or from excretion.

### ***Clinical symptoms and lesions***

The wings could not be raised; there is partial paralysis, blindness, ataxia, and wasting away.

### ***Diagnosis***

History, gross lesions and histopathology.

### ***Treatment and Prevention***

#### **Management**

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##### Drug treatment

- There is not specific treatment.

Prophylaxis: In endemic areas, vaccine

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## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### **Mycoplasma Synoviae Infection**

Infectious synovitis is an acute or chronic mycoplasmosis of chicken and turkeys caused by *Mycoplasma synoviae*, which is characterized by inflammation of synovial membranes, and, usually, by exudates in the joints and tendon sheaths. Most outbreaks occur in young broiler chicken, though adults are also infected. Transovarian transmission is the most important route of infection; infection also spreads via the respiratory tract.

#### ***Clinical Symptoms and Lesions***

Affected birds rest on the floor; the head parts are swollen; the hocks or food pads are swollen. At post mortem, the joints contain sticky, viscid, gray to yellow, characteristic exudates. Parenchymatous organs become swollen and diarrhea may occur.

#### ***Diagnosis***

Signs and lesions are suggestive; agglutination reactions and ELISA are commonly used for diagnosis. *Mycoplasma gallisepticum* should be confirmed by isolation and identification in embryonated eggs or by hemagglutination-inhibition.

#### ***Treatment and Prevention***

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##### **Management**

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###### Drug treatment

Several drugs are used; but the most effective are the following.

- Tylosin 100 g per 200 litres (0.05%) of drinking water for the first 3 days of life; repeated for 1 to 7 days every 5 weeks depending on the severity of the infection. C/I, S/E, D/I, D/F, W/P *see* page 250.

or

- Erythromycin, 500mg/gallon of water, for 7 days.  
✓ S/E: Allergic reaction
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

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- ✓ C/I: animals with impaired liver function
- ✓ D/F: Powder, 5, 20 and 30%
- ✓ W/P: meat 24 h
- ✓ D/I: Theophyllin, Warfarin and beta-adrenergic drug

or

- Chlortetracycline, 20-60 mg/kg or 300-400 mg/tonne of feed, for 5 days. C/I, S/E, D/I, D/F *see* page 248.
- Most effective if given by injection

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### Prophylaxis

- Maintain seronegative stock, because the organism is transmitted via eggs.
  - In valuable breeding stock, treat eggs with tylosin or heat
- Note:* Effective treatment must attack the agent and secondary invader.
- 

## **Mycotoxicoeses**

Mycotoxicosis is disease caused by toxic fungal metabolites that results from fungi growing in grains and feeds. Hundreds of mycotoxins have been identified, many of which have additive or even synergistic effects with other mycotoxins, infectious agents, and nutritional deficiencies. Many are quite stable chemically and maintain toxicity over time. The following are some of the most important groups:

### **Aflatoxicosis**

Aflatoxins are highly toxic, carcinogenic fungal metabolites produced by *Aspergillus flavus*, *A. parasiticus*, and others. Aflatoxicosis in poultry primarily affects the liver, but immunologic, digestive, and hematopoietic functions may be involved. Weight gain, feed intake, feed conversion efficiency, pigmentation, processing yield, egg production, male and female fertility, and hatchability may be affected. Some effects are a direct result of intoxication, while others are related indirectly to factors such as reduced feed intake. Susceptibility varies, but in general, ducklings, turkeys, and pheasants are

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

susceptible, and chickens, Japanese quail, and guinea fowl are relatively resistant.

### *Clinical symptoms and lesions*

Unthriftiness to high morbidity and mortality, the liver may be acutely reddened due to necrosis and congestion or yellow discoloration due to lipid accumulation; it may have hemorrhages of various sizes and patterns. In chronic aflatoxicosis, the liver may be discolored yellow to gray and atrophied. Although the aflatoxins are carcinogenic, tumor formation is rare with the natural disease, probably because the birds do not live long enough for this to occur.

### **Fusariotoxicosis**

The genus *Fusarium* produces many mycotoxins injurious to poultry.

### *Clinical symptoms and lesions*

Feed refusal, caustic injury of the oral mucosa and areas of the skin in contact with the mold, acute digestive disease, and diminished function of the bone marrow and immune system. Lesions include necrosis and ulceration of the oral mucosa, reddening of the mucosa of the remainder of the GI tract, mottling of the liver, atrophy of the spleen and other lymphoid organs, and visceral hemorrhages. In laying hens, egg production may decrease, accompanied by depression, recumbency, feed refusal, and cyanosis of the comb and wattles. Deformity of the bones may occur in others.

### **Ochratoxicosis**

Ochratoxins are among the most toxic mycotoxins to poultry. These nephrotoxic metabolites are produced chiefly by *Penicillium viridicatum* and *Aspergillus ochraceous*, which commonly occur on numerous grains and feedstuffs. Renal disease but also affects the liver, immune system, and bone marrow.

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### *Clinical symptoms and lesions*

Reduced spontaneous activity, huddling, hypothermia, diarrhea, rapid weight loss, and death are common. Sublethal intoxication can seriously impair weight gain, feed conversion, pigmentation, carcass yield, egg production, fertility, and hatchability.

### **Ergotism**

*Claviceps* spp are fungi that attack cereal grains, including wheat and especially rye. The mycotoxins that cause ergotism form in the sclerotium, a visible, hard, dark mass of mycelium that displaces the grain tissue. Within the sclerotium are the ergot alkaloids, which affect the nervous system, causing convulsive and sensory neurologic disorders. In the vascular system, vasoconstriction and gangrene of the extremities occurs and the endocrine system, influencing the neuroendocrine control of the anterior pituitary.

In poultry, the vasoconstrictive effect results in vesicles on the comb, wattles, face, and eyelids that rupture to form crusts, which may be followed by permanent atrophy and disfigurement. Vesicles also develop on the shanks of the legs and on the tops and sides of the toes, and rupture to form ulcers. In chicks, the toes may become darkly discolored due to vasoconstriction and ischemia. In laying hens, feed consumption and egg production are reduced.

### **Citrinin Mycotoxicosis**

Citrinin is a natural contaminant of corn, rice, and other cereal grains. It is produced by numerous species of *Penicillium* and *Aspergillus*. Spontaneous citrinin mycotoxicosis causes a diuresis that is manifested as watery fecal droppings and reductions in weight gain. At necropsy, lesions involve chiefly the kidney. Citrinin acts directly on the kidney to transiently alter several tubular transport processes.

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### **Oosporein Mycotoxicosis**

Oosporein is a mycotoxin produced by *Chaetomium* spp that can cause gout and high mortality in poultry. *Chaetomium* spp have been isolated from numerous feeds and grains, including peanuts, rice, and corn. Oosporein mycotoxicosis is characterized by visceral and articular gout related to impaired renal function and increased plasma concentrations of uric acid. Chickens are more sensitive to oosporein than turkeys. Water consumption increases and fecal droppings may be fluid.

### **Cyclopiazonic Acid**

This is a metabolite of *Aspergillus flavus*, which is the predominant producer of aflatoxin in feeds and grains. In chickens, cyclopiazonic acid causes impaired feed conversions, decreased weight gain, and mortality. Lesions are found in the proventriculus, gizzard, liver, and spleen. The proventriculus is dilated and the mucosa is thickened due to hyperplasia and ulceration.

### **Sterigmatocystin**

This is a biogenic precursor to aflatoxin and is also hepatotoxic and hepatocarcinogenic. It is less common than aflatoxin.

### ***Diagnosis of Mycotoxicosis***

Mycotoxicosis should be suspected when the history, signs, and lesions are suggestive of feed intoxication. Definitive diagnosis depends on a complete diagnostic evaluation including necropsy, histopathology, bacterial and viral cultures, and serology accompanied by feed analysis from multiple samples.

### ***Treatment and Prevention***

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#### **Management**

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##### **Drug treatment**

- There is no specific treatment.
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##### **Control & Prophylaxis**

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

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- The toxic feed should be removed and replaced with unadulterated feed.
  - Concurrent diseases (parasitic, infectious, and nutritional) should be treated to alleviate additive or synergistic disease interactions, and substandard management practices corrected.
  - In individual birds, give activated charcoal in the feed.
  - Inspect feed mills regularly and clean any feed residues.
  - Poultry houses should have sufficient ventilation to avoid high relative humidity
  - Antifungal agents such as organic acids (propionic acid 0.5-1.5 g/kg) are effective inhibitors.
- 

### **Necrotic Enteritis**

Necrotic enteritis is an acute enterotoxemia characterized by sudden onset, explosive mortality, and confluent necrosis of the mucosa of the small intestine associated with *Clostridium perfringens* Types A and C. It occurs most frequently in houses with built-up litter. Changes in the quality and quantity of feed that would alter the gut microecology predispose to infection.

#### ***Clinical Symptoms and lesions***

Diarrhea, the breast becomes dehydrated and darkened, and the liver is usually swollen and congested; the small intestine is ballooned and friable and contains foul-smelling, brown fluid; the mucosa is covered with a brownish, diphtheritic membrane.

#### ***Diagnosis***

Stained smear preparations are indicative and confirmed by anaerobic cultural examination.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Erythromycin, 500 mg/gallon of water for 7 days. C/I, S/E, D/I, D/F and W/P *see* page 268

or

- Tetracyclines, 20 ppm in feed. C/I, S/E, D/I, D/F and W/P *see* page 248.
- 

##### Prophylaxis

- Bacitracin methlene disalicylate, 50 g/ton (55 ppm) in the feed.
- 

### **Newcastle Disease**

Newcastle disease (NCD) is a contagious viral disease of poultry caused by a *Paramyxovirus*. Three strains exist: *the velogenic strains*, which are highly pathogenic and easily transmitted; the mesogenic strains, which show intermediate pathogenicity; and the lentogenic strains, which show low pathogenicity in chickens. The disease was reported in Ethiopia in 1974 from exotic chicken. Since then, NCD has become cosmopolitan.

#### ***Clinical Symptoms and lesions***

The clinical symptoms of NCD may be neurotropic (drooping wings, dragging legs, twisting of the head and neck, circling, depression, inappetence, and complete paralysis) or viscerotropic (respiratory signs gasping, coughing, sneezing and rales with peracute disease watery-greenish diarrhea, and swelling of the tissues of the head and neck). Onset is rapid, young chickens are more susceptible and show signs sooner than older ones, laying flocks may have partial or complete cessation of production and not recover.

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### ***Diagnosis***

Tentative diagnosis of a rapidly spreading, respiratory-nervous disease may be confirmed by isolation of the hemagglutinating virus identified by inhibition with Newcastle disease antiserum. A rise in hemagglutination-inhibition antibodies in paired serum samples is confirmatory.

### ***Treatment and Prevention***

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#### **Management**

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##### **Drug treatment**

- No specific treatment.
- 

##### **Prophylaxis**

- Vaccination (*see* Vaccines: Newcastle Disease).
- Control mycoplasma and other bacteria that may act synergistically with some vaccines to aggravate the vaccine reaction after spray administration.

*Public health significance:* Newcastle disease virus can produce a transitory conjunctivitis in man.

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### **Pullorum Disease**

Pollorum (Bacillary white diarrhea) is a bacterial disease caused by *S. pullorum* that usually cause high mortality in young chickens; infection is transmitted via egg or in the hatchery usually results in Death occurs during the first few days of life and up to 2-3 weeks of age.

#### ***Clinical symptoms and lesions***

Affected birds huddle near a source of heat, do not eat, appear sleepy, and show whitish fecal pasting around the vent recovered animals remain carriers

Lesions in young birds usually include unabsorbed yolk sacs; focal necrosis of the liver and spleen; and grayish nodules in the lungs, heart, and gizzard. Firm, cheesy material in the ceca and raised plaques in the mucosa of the lower intestine are sometimes seen. Occasionally, synovitis is prominent. Adult

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

carriers usually have pericarditis, peritonitis, or distorted ovarian follicles with coagulated contents; however, sometimes no gross lesions are seen. In mature chickens, acute infections produce lesions that are indistinguishable from those of fowl typhoid.

### ***Diagnosis***

Lesions may be highly suggestive, but diagnosis should be confirmed by isolation and identification of *S. pullorum*. Tube-agglutination or serum-plate test could be used as screening tests.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Antibacterial treatment helps to reduce mortality and treated chicken remain carriers.
  - Furazolidone 0.022% in feed is effective. S/E, C/I, D/I, D/F *see* page 254.
- 

##### Prophylaxis

- Breeding stock should be free from infection.
- 

## **Salmonellosis**

Salmonellosis in chicken and turkey is caused by host adapted serotypes including *Salmonella pullorum* and *S. gallinarum* causing fowl typhoid, (*see* pages 292 & 310) or other non-host adapted serotypes such as *S. typhimurium* and *S. arizonae* causing paratyphoid infections (*see* page 293) the latter are the most important as zoonotic diseases.

### ***Treatment and Prevention***

*See* treatment for Pullorum disease above.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Spirochetosis**

Avian spirochetosis is an acute, febrile and septicemic disease of poultry which is transmitted by the tick spp. *Argas pericus*. The disease affects a wide variety of birds.

#### ***Clinical symptoms and lesions***

Listlessness, depression, somnolence, moderate to marked shivering, and increased thirst are observed. Young birds are affected more severely than older ones. During the initial stages of the disease, there is usually a greenish yellow diarrhea with increased urates.

#### ***Diagnosis***

- Darkfield microscopic examination of blood & demonstrate Borrelia, the active motile organism or as stained spirochetes in Giemsa-stained blood smears.
- Anemia is common

#### ***Treatment and Prevention***

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##### **Management**

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##### Drug treatment

- Amoxicillin trihydrate and other penicillin derivatives, 20%, 100g/10 L drinking water for 3-5 days. S/E C/I, D/F, *see* page 254.
  - Chlortetracycline, 10%, 20-30 mg/kg to individual birds for 5 to 7 days in feed. C/I, S/E, D/I, D/F and W/P *see* page 248.
- 

##### Prevention

- Control of tick species.
-

### Staphylococcosis

Staphylococcus infections caused by *Staphylococcus aureus* is usually characterized by synovitis & septicaemia. The organisms are normal flora of the skin. Most infections occur because of a wound, either accidental or intentional (eg, debeaking or detoeing).

#### *Clinical Symptoms and lesions*

Synovitis and lameness due to involvement of the proximal tibiotarsus and proximal femur, the proximal tarsometatarsus, distal femur, and tibiotarsus.

#### *Diagnosis*

Isolation of *Staphylococcus aureus*

#### *Treatment and Prevention*

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#### **Management**

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##### Drug treatment

- Tetracyclines, 20 in the feed. C/I, S/E, D/I, D/F and W/P see Doxycyline page 248.

or

- Erythromycin, 500 mg/gallon of water for 7days. C/I, S/E, D/I, D/F and W/P see page 268.

or

- Sulphadimethoxine, 1892 mg/gallon of water or 0.05% solution for 6 days.
    - ✓ D/F: Injection 330, 333 and 160 mg/ml;
    - ✓ Powder, 25 %
    - ✓ D/I: Thiopentone sodium and warfarin
    - ✓ IM injection cause local pain and inflammation
- 

##### Prophylaxis

- Avoid using sharp objects in poultry houses or during transport.
- Proper sanitation of hatchery
- Competitive gut exclusion using *Lactobacillus*

*acidophilus* protects germ-free chickens

*Note:* Sensitivity test should be performed because antibiotic resistance is common.

*Public health significance:* *Staphylococcus aureus* can cause food poisoning. Enterotoxin-producing strains are found on poultry, thus take proper precautions.

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### **Streptococcosis**

Streptococcosis in poultry is a systemic or local disease due to infection with the streptococci, which are opportunistic pathogens. *Streptococcus zooepidemicus* and *S. faecalis* are considered the most pathogenic in avian species; however, all streptococci are capable of causing severe disease. Transmission is via the oral or aerosol route.

#### ***Clinical Symptoms and Lesions***

Acute: depression, lethargy, lassitude, pale combs and wattles, and a decrease in or cessation of egg production. Necropsy lesions include an enlarged spleen, liver, and kidney.

Chronic: Lameness, swollen hock and wing joints, conjunctivitis, and depression with emaciation; associated lesions include fibrinous arthritis and synovitis, salpingitis, pericarditis, perihepatitis, necrotic myocarditis, and valvular (vegetative) endocarditis. Well-circumscribed, pale areas of infarction in the liver and spleen due to emboli from the valvular lesions are common with vegetative endocarditis.

#### ***Diagnosis***

Isolation and identification of the bacteria.

#### ***Treatment and Prevention***

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##### **Management**

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Drug treatment

- See, Diseases of poultry, Staphylococcosis above.
- 

Control and Prophylaxis

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

- Reduce stress and prevent immuno-suppressive diseases and conditions, cleaning and disinfection is also effective.

*Note:* Sensitivity test should be performed because antibiotic resistance is common.

### **Tuberculosis**

Tuberculosis is a slowly spreading, chronic, granulomatous bacterial infection, characterized by gradual weight loss.

*Mycobacterium avium* serovars 1 and 2 are the usual causes. Infected birds excrete the organism in their feces. Cadavers and offal may infect predators and cannibalistic flockmates.

#### ***Clinical Symptoms and lesions***

Signs usually develop late in the infection when birds become thin and sluggish, and lameness may be seen. In chickens, granulomatous nodules of varying size are usually found in the liver, spleen, bone marrow, and intestine.

#### ***Treatment and Prevention***

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##### **Management**

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###### Drug treatment

- Antituberculosis drugs are not often used to treat chicken.
- Isoniazid 30 mg/kg plus Ethambutol 30 mg/kg plus rifampin 45 mg/kg, PO, for 18 months are effective for the treatment of exotic birds. C/I, S/E, D/I, D/F *see* page 117.

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###### Control & Prophylaxis

- Rapid turn over of chicken flocks.

*Public health significance:* *Mycobacterium avium* may cause disease in man thus care must be taken

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### **Ulcerative Enteritis**

Ulcerative enteritis is an acute bacterial infection in young chickens, poults and game birds characterized by sudden onset and rapidly increasing mortality. It is caused by *Clostridium colinum*. Outbreaks of the disease occur following coccidiosis, aplastic anemia, and infectious bursal disease or stress conditions. It is transmitted through droppings and birds are infected by feeding or via drinking water.

#### ***Clinical Symptoms and Lesions***

Infected birds become listless and humped up, with eyes partly closed, and feathers dull and ruffled. The lesions include hemorrhagic enteritis in duodenum followed by necrosis and ulcerations. The livers vary from light yellow to large, irregular yellow areas along the edges.

#### ***Diagnosis***

Gross postmortem lesions and isolation of the large Gram-positive sporulated bacteria are sufficient.

#### ***Treatment and Prevention***

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##### **Management**

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Drug treatment

- Streptomycin 60g/ton of feed or 1 g/gal in water C/I, S/E, D/I, D/F and W/P, *see page 17*
- 

Prophylaxis & control

- Streptomycin, 0.006% in feed. C/I, S/E, D/I, D/F and W/P, *see page 20*
- Remove contaminated droppings and disinfect the house
- Avoid stress

*Note:* Earlier treatment is advisable

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## **Ectoparasites**

### **Fowl Ticks**

*Argas persicus* is the tick species particularly active in poultry houses during warm, dry weather. All stages may be found hiding in cracks and crevices during the day. Ticks cause anemia and are vectors of diseases such as spirochaetosis and aegyptianellosis.

#### ***Clinical Symptoms***

Fowl ticks produce anemia (most important), weight loss, depression, toxemia, and paralysis. Egg production decreases. Red spots can be seen on the skin where the ticks have fed. Because the ticks are nocturnal, the birds may show some uneasiness when roosting. Production may be severely depressed.

#### ***Treatment and Prevention***

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#### **Management**

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##### **Drug treatment**

After houses are cleaned, poultry house should be treated thoroughly (using a high-pressure sprayer) with acaricides like:

- Coumaphos 20% E.C., is used in concentrations of 250 ppm, to be sprayed on walls, ceilings, cracks, and crevices.

or

- Permethrin 10% EC, spray, with 0.05-0.1% solution. The 0.1% solution is applied to ceilings, walls, and suspended objects using a pressurized or power sprayer; the 0.05% solution can be applied directly to the birds at the rate of 1 gallon per 75 adult chickens. The solution applied to the birds is effective for mites only

Or

- Carbaryl (Sevin) 80% WP, apply 0.5% solution. Apply to
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## Standard Veterinary Treatment Guidelines for Veterinary Clinics

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birds with a pressurized or power sprayer at the rate of 1 gallon per 75 adult hens.

✓ C/I: Do not repeat treatment before 4 weeks.

✓ W/P: meat 7 days.

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### **Lice**

Heavy infestation of poultry and other avian species with *Mallophagia* lice. Infested poultry results in reduced egg production and weight loss. The skin irritations are also sites for secondary bacterial infections.

#### ***Diagnosis***

The eggs or adult lice could be observed on the skin or feathers.

#### ***Treatment and Prevention***

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##### **Management**

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Control:

- Apply acaricides as in ticks above for treatment and control of lice.
- 

### **Chicken Mite**

*Dermanyssus gallinae* (Red mite) infests chickens, turkeys, other birds in breeder and small farm flocks, but rare in modern commercial cage-layer operations. Chicken mites are nocturnal feeders that hide during the day under manure, on roosts, and in cracks and crevices of the chicken house, where they deposit eggs. They are the most significant economically.

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## *Treatment and Prevention*

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### **Management**

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Accaricides for ticks can be used and miticide spray treatments must be applied with sufficient force to penetrate the feathers in the vent area. *see* below:

- Dichlorovos 23 EC, diluted 5oz/gallon, 1 gallon/100 birds or 1-2gallon/1000 sq. ft of litter.
  - Tetrachlorinfos 50 WP, 6.5 gallon, 1 gallon/100 birds or 1-2gallon/1000 sq. ft of litter
- 

### **Common Chigger**

*Trombicula alfreddugesi* and other chigger species (harvest mites, red bugs) infest birds as well as man and other mammals. Heavily parasitized birds become droopy, refuse to eat, and may die from starvation and exhaustion. Larvae may be found either singly or in clusters on the ventral portion of the birds.

### *Treatment and control*

- Use miticide sprays like chicken mite above.
- Control on the range is aided by keeping the grass cut short and dusting with sulfur or Malathion.

## **DISEASES OF DOGS AND CATS**

### **Non-infectious Diseases**

#### **Diabetes Mellitus**

Diabetes mellitus is a chronic disorder of carbohydrate metabolism due to relative or absolute insulin deficiency. It is common in dogs and cats. Most cases of spontaneous diabetes occur in middle-aged dogs and cats. Likely causes include infection with certain viruses, stress, obesity, and administration of corticosteroids or progestogens may increase the severity of clinical signs.

#### ***Clinical Symptoms***

The onset is often insidious, and the clinical course is chronic. Common signs in dogs include polydipsia, polyuria and polyphagia with weight loss, bilateral cataracts, and weakness.

Diabetic animals have decreased resistance to bacterial and fungal infections and often develop chronic or recurrent infections, such as cystitis, prostatitis, bronchopneumonia, and dermatitis. Cataracts develop frequently in dogs (not cats) and edema of the lens and disruption of normal light transmission.

#### ***Diagnosis***

The renal threshold for glucose is ~180 mg/dL in dogs and ~240 mg/dL in cats. In cats, stress-induced hyperglycemia is a frequent problem, and multiple blood and urine samples may be required to confirm the diagnosis.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

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#### **Management**

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##### Non-drug treatment

- Treatment involves a combination of weight reduction, diet (high fiber, high complex carbohydrate), and insulin injection or implant.
- Intact females should be neutered.

##### Drug treatment

- In dogs the initial treatment is NPH insulin, 0.5 u/kg, q 24 h. or q 12 h
- In cats 1-3 u of ultralente insulin

or

- Glipizide 2.5 mg, q 12 h, PO, in conjunction with dietary management.  
✓ C/I: Glipizide is contraindicated in dogs.

##### *In complicated cases*

- insulin 0.2 u/kg IM initial dose, followed by 0.1 u/kg, q 1 h; once the serum glucose is <250 mg/dL, 0.25-0.5 u/kg SC, q 4 to 6 h h, monitor the serum glucose at 1- to 2-hr intervals. If blood glucose levels fall rapidly, 2.5-5% dextrose IV may be required.

*Note:* Once the animal is on maintenance therapy and its condition is stable, it should be reassessed every 4-6 months.

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## **Epilepsy**

Epilepsy, a sudden, involuntary change in behavior, muscle control, consciousness, and/or sensation occurs commonly in dogs. A seizure is often accompanied by an abnormal electrical discharge in the brain.

Based on the cause of the seizure, epilepsy is divided into two: Idiopathic Epilepsy when there is no known cause for the condition and Secondary Epilepsy is when a specific cause for the seizures is known.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

Idiopathic Epilepsy is considered to be genetically related to some breeds of dogs such as Belgian Tervuerens, Beagles, Dachshunds, German Shepherds, Keeshonds, Boxers, Cocker Spaniels, Golden Retrievers, Irish Setters, Labrador Retrievers, Collies, Schnauzers, Poodles, Dalmatians and St. Bernards.

Secondary epilepsy is caused by hypoglycemia or “low blood sugar”, hypothyroidism, disease, lead poisoning, brain tumors, hydrocephalus, eclampsia, toxins (pesticides, fertilizers, poisonous plants, arsenic, strychnine and chocolate), trauma, organ failure such as end stage liver or renal failure can often cause, parasitic e.g. severe cases of intestinal worms, end stage heartworms or even anemia from fleas and ticks can cause seizures.

### ***Clinical Symptoms***

Stages of epileptic are:

- *The Prodrome* – This stage can last from minutes to hours or even days before the manifestation of the actual seizure activity. This stage is typically characterized by changes in the dog’s mood or behavior.
- *The Aura* – Some dogs will begin pacing, licking, salivating, trembling, vomiting, wandering aimlessly, hiding, whining or urinating. Other dogs may exhibit stranger activities such as excessive barking and attempts to get an owner’s attention.
- *The Ictus*- It is a period of abnormal activity in lose consciousness, gnash their teeth or appear to be chewing gum, thrashing about with their head and legs, drooling excessively, crying, paddling their feet as if running as well as losing control of their bladders and bowels are observed. Others signs that may occur include, running in circles, chew gum, some suddenly go blank and stare into space and then there are the ones that only have partial seizures in which the twitching is localized in one area. Such as in the face, a leg, in the shoulder or over the hips.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

- The Ictal – This stage occurs immediately after a seizure. Owners often report the dog acts drunk, doped, blind or deaf. Other dogs will show signs of pacing endlessly or drinking large amounts of water. Some will seem to pass out and just sleep.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Primadone (Mysoline), *see* Appendix E
- Phenobarbital\*\*\*

*Precaution:* check liver enzymes regularly.

There are several medications that are often used to control or stop the seizures. The most common medications are:

- Potassium Bromide

*Precautions :* Salt levels in feed should be monitored whenever the brand of food is changed.

- Dilantin, *see* Appendix E
- Valium (Diazepam), *see* Appendix E

*Note:* if resistance to a drug occurs, change to another alternative drug or inject Diazepam IV.

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## **Foreign Bodies in the Esophagus**

Esophageal foreign bodies are more common in dogs than cats. Bones are the most common foreign body, but needles, fishhooks, wood, metal objects, etc, may be found. Usually, the object lodges at the thoracic inlet, base of the heart, or in the caudal esophagus just before the diaphragm; occasionally, it may lodge at the upper esophageal sphincter.

### ***Clinical Symptoms***

Salivation, gagging, dysphagia, and regurgitation are signs of esophageal foreign bodies. Complete obstruction causes

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

regurgitation after food or water intake. In chronic obstruction, anorexia and weight loss may be predominant signs.

Perforation of the thoracic oesophagus may result in pleuritis, mediastinitis, pyothorax, pneumothorax, or bronchoesophageal fistula. The secondary problems may occur include esophagitis, mucosal laceration, esophageal stricture, and esophageal diverticulum. Aspiration pneumonia can be a serious complication of regurgitation.

### ***Diagnosis***

- Esophagoscopy or contrast esophagogram
- Aqueous iodinated contrast medium
- External palpation.

### ***Treatment and Prevention***

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#### **Management**

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##### Non-drug treatment

The object should be removed *per os* either with a flexible endoscope and forceps or with a rigid scope and alligator forceps.

- If a foreign body cannot be removed PO, it may be pushed into the stomach where it can be digested (eg, smooth bones), passed, or removed via a gastrotomy.
- In severe cases surgery may be performed; however, the prognosis is poor.
- Esophagitis should be managed medically after the foreign body is removed.

##### Drug treatment

###### *First line*

- Tetracycline 10-20 mg/kg, q 8h to q 6 h PO for dogs and cats for 3 days. S/E, C/I, D/F, D/I, *see* page 248.

or

- Penicillin and streptomycin 200,000 mg/kg, IM, q 24 h, for 3 days. S/E, C/I, D/F, D/I, *see* page 14/17.

*plus*

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

- Methylprednisolone 1 mg/kg, IM or SC, q 24 h for 3 days.
    - ✓ S/E: C/I: *see* page 7
    - ✓ D/F: Injection, 10mg.ml, 25mg/ml
    - ✓ D/I: Barbiturates, phenylbutazone, phenytoin, diuretics
- 

### **Motion Sickness**

Motion sickness is characterized by nausea, excessive salivation, and vomiting. It is caused by travel by plane or by car though fear from vehicle in its stationary state may also induce motion sickness.

#### ***Clinical Symptoms and Diagnosis***

Animals may yawn, whine, and show signs of uneasiness or apprehension; diarrhea in severe cases. Motion sickness is usually seen during travel.

#### ***Treatment and Prevention***

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##### **Management**

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Drug treatment

##### ***Antihistamines***

- Promazine hydrochloride, 2.2-4.4 mg/kg, IV or IM.
  - ✓ D/F: Injection powder

##### ***Centrally acting phenothiazine derivatives***

- Chlorpromazine hydrochloride, 3.3 mg/kg, q 6-24 h, PO, IV, or IM.
    - ✓ D/F, Injection, tablet
  - Acepromazine maleate, 0.055-0.11 mg/kg, IV or IM for canine and feline, 0.55-2.2 mg/kg, PO, for canine and 1.1-2.2 mg/kg, PO for feline.
    - ✓ D/F: Injection, tablet C/I, S/E, D/I *see* page 332
  - Dimenhydrinate, 4-8mg/kg, PO. and in cats 12.5mg/kg of total dose, PO.
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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

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### **Prevention**

- Phenobarbital and diazepam have been used to produce a general sedative effect. Oral administration of one of these drugs several hours before departure should reduce or eliminate the signs of motion sickness.
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### **Tick Paralysis**

Tick paralysis is a toxin-induced, a febrile, ascending, symmetrical condition in which there is flaccid tetraplegia and functional impediment to the reflexes of the superficial and deep tendons of the limbs and abdomen. Dogs are affected most commonly, but losses can also occur in cats. It is caused by Argasid ticks, and also larval stage which produce neurotoxin.

### ***Clinical Symptoms***

Hindlimb paralysis characterized by slight to pronounced incoordination and weakness, then the forelimb is affected. Sensation usually is preserved. There are also nystagmus and difficulties in breathing, chewing, and swallowing. Death can occur in several hours from respiratory paralysis. Temperature is normal; blood and humoral values are unchanged. In the latter stages of tick paralysis, acute respiratory failure may occur.

### ***Diagnosis***

This is based on the presence of ticks, sudden appearance of paralysis, rapid course, and quick clinical recovery after tick removal. Normal body temperature, blood and fluid values are observed. No specific laboratory diagnostic techniques are available.

***Treatment and Prevention***

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**Management**

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Drug treatment

Apply acaricides to kill the ticks

- Diazinon as collar 15%
  - Amitraz to be diluted as per label on its bottle.
  - Ivermectin 400-600mg/kg, start with 100mcg/kg and increase by 100 every day until the maximum reached.
- 

**Vomiting**

Vomiting is the forceful ejection of the contents of the stomach and proximal small intestine. Vomiting can be due to primary GI disease, renal or hepatic failure, electrolyte abnormalities (eg, hypoadrenocorticism), pancreatitis, or CNS disorders (including toxin ingestion).

***Clinical Symptoms***

Anxiety, depression, hypersalivation, and repeated swallowing accompanied by relaxation of the gastroesophageal sphincter are followed by retching. Forceful contractions of the abdominal muscles and diaphragm against a closed glottis and increases in intra-abdominal pressure force expulsion of food and fluid.

***Diagnosis***

When vomiting has been of a short duration, i.e, <3-4 days, it is limited to a detailed history, a physical examination, examination of the oropharynx, and a rectal examination. Chronic vomiting, in addition to a detailed history and physical examination, an initial database should include a complete blood count, biochemical profile (including serum electrolytes), urinalysis, and abdominal radiographs (and abdominal ultrasound if available).

# Standard Veterinary Treatment Guidelines for Veterinary Clinics

## *Treatment and Prevention*

### **Management**

#### Non-drug treatment

##### Acute vomiting

- Fasting and withholding water for 24 hr to rest the GI tract.
- Water can be provided in the form of ice

##### Drug treatment

##### *Acute vomiting*

- Lactated Ringer's solution (hypovolemic patients)

##### *Chronic vomiting*

- Diphenhydramine 2-4 mg/kg, q 8-12 h, PO
  - ✓ S/E: drowsiness, dry mouth and urinary retention; rarely, vomiting and diarrhea
  - ✓ D/F: 25 mg cap.

*Precaution:* Do not use in pregnant or nursing animals

or

- Prochlorperazine, 0.3 mg/kg, q 8 h, PO; 0.1 mg/kg, q 6 h, IM; or 0.1-0.5 mg/kg, q 8 h, SC
  - ✓ S/E: Adverse effects include sedation, depression, hypotension, hepatotoxicity and extrapyramidal reactions
  - ✓ D/I: Phenothiazine ther CNS depression, Quinidine - additive cardiac depression, antidiarrhoeal and Antacids - reduced gastro-intestinal absorption, Epinephrine – vasodilation and tachycardia, Propranol – increase blood levels of both drugs

or

- Chlorpromazine, 0.5 mg/kg, q 6 h, PO; 0.5 mg/kg, q 8 h, IM; or 1 mg/kg, q 8 h, rectally C/I, S/E, D/I, D/F *see* acepromazine page 289.

or

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

- Metoclopramide 0.2-0.5 mg/kg, q 6 h, PO or SC, or 1-2 mg/kg/day, slow IV or 1.3 µg/kg/min C/I, S/E, D/I, D/F *see* page 289.

or

- Cisapride 0.1-0.5 mg/kg, q 8 h, PO facilitates gastric emptying in dogs and cats and may be useful in the management of vomiting associated with delayed gastric emptying.
    - ✓ S/E: GI symptoms including abdominal pain and diarrhea.
    - ✓ C/I: decreased liver function, obstruction of the intestine, cardiac arrhythmia or conduction disorders, during pregnancy or lactation
    - ✓ D/I: Ketoconazole, itraconazole, IV miconazole, or troleandomycin, erythromycin, fluconazole, clarithromycin, cimetidine, and ranitidine, anticoagulants, benzodiazepine tranquilizers or alcohol.
- 

### **Systemic Anaphylaxis**

Anaphylaxis occurs in sensitized animals after parenteral injection of vaccines or drugs, ingestion of foods, or insect bites. Clinical signs occur within seconds to minutes after exposure to the allergen. This latent period is the time required for the allergen to bind to sensitized mast cells and for vasoactive mediators to be released. In cats, lungs are the primary target organ and the portal-mesenteric vasculature is secondary; this is reversed in dogs.

#### ***Clinical Symptoms***

Mast cell degranulation in the portosystemic vasculature causes venous dilatation and pooling of blood in the intestines and liver, with resultant shock, agitation, colic, nausea, vomiting and diarrhea, hypersalivation, dyspnea, cyanosis, and in severe cases, death.

# **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

## ***Treatment and Prevention***

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### **Management**

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#### Non-drug treatment

- Intubation to maintain air way
- Cardiorespiratory resuscitation, with monitoring vital signs

#### Drug treatment

- Adrenaline 0.05-0.5 mg, IV, SC or IM;
    - ✓ D/F: 1 mg/ml
    - ✓ S/E and C/I: nervousness, dizziness and cardiac arrhythmias
  - Dopamine 2-5mcg/kg/min, IV for S/E, C/I, D/F *see* page 204.
  - Diphenhydramine, 2-4 mg/kg, q 8 h, PO, S/E, C/I, D/F, D/I *see* page 204.
  - Prochlorperazine, 0.1 mg/kg, q 6 h, IM; or 0.1-0.5 mg/kg, q 8 h, SC. S/E, C/I, D/F, D/I *see* page 292.
- 

## **Infectious Diseases**

### **Amebiasis**

The causative agent is *Entamoeba histolytica* where it infects dogs and cats. Transmission of cysts occurs by fecal-oral route. Cysts from human are the likeliest source of infection to dogs and cats.

#### ***Clinical Symptoms***

Chronic diarrhea, dysentery, weight loss, and anorexia are the usual signs in susceptible hosts.

#### ***Diagnosis***

Demonstration of trophozoites in indirect saline smear of feces.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

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#### **Management**

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##### Drug treatment

##### *First line*

- Metronidazole, 25 mg/kg for dogs and 10 mg/kg for cats, PO, q 12 h for 5-7days.
  - ✓ S/E: central nervous system depression should be swallowed direct since it has bitter and unpleasant taste.
  - ✓ C/I: pregnant animals and liver impairment.
  - ✓ D/F: tablets, 200 and 400mg
  - ✓ D/I: cimitidine, phenobarbitone, phenytoin and warfarin

or

- Tinidazole 50 mg/kg, PO, q 24 h for 3 days in cats and dogs. S/E, C/I, D/F, D/I, *see* Metronidazole above.

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*Public health significance:* No zoonotic importance but humans are likeliest reservoirs of amoebia cyst.

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### **Aspergillosis**

Aspergillosis is caused by a number of *Aspergillus* spp, especially *A. fumigatus*. It is primarily a respiratory infection that may become generalized. Nasal and paranasal tissues of dogs are most commonly infected. Pulmonary and intestinal forms have been described in domestic cats, with most of the intestinal cases associated with feline infectious enteritis.

#### ***Clinical Symptoms and Lesions***

In dogs lethargy, nasal pain, ulceration of the nares, sneezing, unilateral or bilateral sanguinopurulent nasal discharge, frontal sinus osteomyelitis, and epistaxis. Lesions may involve the eyes. A layer of gray-black necrotic material and fungal growth may cover the mucosa of the nasal and paranasal sinuses.

#### ***Diagnosis***

Visualization of fungal plaques by rhinoscopy together with serologic and either mycologic or radiographic evidence of

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

disease are indicated. Positive culture and ELISA are confirmatory.

### ***Treatment and Prevention***

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#### **Management**

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##### Non drug treatment

- In chronic cases of canine nasal aspergillosis, surgical exposure and curettage with 10% iodine flushes.

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##### Drug treatment

- Griseofulvin 15-20 mg/kg, PO with fatty food, q 24 h for 7-14 days
  - ✓ S/E: High doses may cause hepatotoxicity, particularly in cats, leucopenia, hypoplasia
  - ✓ C/I: Hepatic impairment, pregnant animals
  - ✓ D/F: Tablets, 125 mg
  - ✓ D/I: phenobarbitone, phenylbutazone, prostogens and warfarin

or

- Ketoconazole 15 mg/kg, PO, q 12 h for dogs and 10 mg/kg, PO, q 12 h to cats for 6-8 wk.
    - ✓ S/E: Hepatotoxicity, anorexia, nausea, vomiting, with chronic therapy pruritus, alopecia, gynecomastia and sexual impotence
    - ✓ C/I: Hepatic impairment, pregnancy
    - ✓ D/F: Tablets, 200 mg
    - ✓ D/I: antacid, antimuscarinic drugs, cimitidine, ranitidine, phenytoin and warfarin
- 

### **Canine Babesiosis**

Bebesiosis is tick transmitted hemoprotozoan infection caused in dogs by *B. gibsoni* and *B. canis* and *B. felis* in cats. Babesiosis is very common in dogs in Ethiopia. The parasite affectes host erythrocytes. The disease is very severe in young dogs; though very young puppies that hacve maternal immunity are resistant.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Clinical Symptoms*

The infections can be either peracute/acute, chronic, or inapparent.

*Per acute disease:* extreme onset and shock, followed by death.

*Acute disease* anaemia, anorexia, depression, fever, hemoglobinuria, splenomegaly, hepatomegaly, lymphadenopathy, and in some dogs icterus, dehydration and vomiting may occur. The mucus membrane becomes congested followed by pale.

*Chronic disease:* mild anemia and icterus; in some cases anorexia, listlessness, and fluctuating fever may follow. In cats anemia, yellow feces are observed; clinical icterus is not characteristic sign of *Babesia felis* infection.

### *Diagnosis*

Clinical signs and apparent tick infestation are indicative. Demonstrating the babesia parasite in erythrocytes of affected animals from blood film is confirmatory; serological tests are also available.

### *Treatment and Prevention*

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#### **Management**

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##### Drug treatment

- Diminazene aceturate 3.5 mg/kg, IM, stat
  - ✓ S/E: hypersensitivity reaction, sweating, salivation, tremors, sometimes nervous signs and fatty degenerative changes on organs with multiple therapeutic doses.
  - ✓ C/I: hypersensitivity to diminazene and administration with impaired renal and hepatic infections.
  - ✓ D/F: powder/ granule for injection, 1.1 gm, 1.05 gm 496 mg and 444 mg; injection solution, 35 mg/ml

##### Supportive Treatment

- Lactated ringer solution 40-50ml/kg, q 24 h, IV, IP, SC until rehydration is restored.
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

- Tetracycline 10-20 mg/kg, PO, q 6-8 h for 3 days if infection occurs.
    - ✓ S/E, C/I: diarrhea and gastric upset in cats, antacids and dairy products are contraindicated.
    - ✓ D/F: powder at 5,10,20,25 and 50%; capsules 50, 100, 250, 500 mg
  - Vitamin B- Complex
- 

### Prophylaxis

- Tick control
- 

## **Canine Distemper**

Canine distemper is a highly contagious, systemic, viral disease of dogs commonly observed in Ethiopia. It is characterized by a diphasic fever, leukopenia, GI and respiratory catarrh, and frequently pneumonic and neurologic complications. The disease occurs in *Canidae* (dogs, foxes, wolves). Infection occurs via aerosol. Some infected dogs may shed virus for several months.

### ***Clinical Symptoms***

Transient fever, 3-6 days after infection and leukopenia (especially lymphopenia). The fever subsides several days and second fever accompanied by serous nasal discharge, mucopurulent ocular discharge, and anorexia. GI and respiratory signs may follow, an acute encephalomyelitis with or without systemic disease and hyperkeratosis of the footpads (“hardpad” disease) and epithelium.

Neurologic signs include: localized involuntary twitching of a muscle or group of muscles, such as in the leg or facial muscles; paresis or paralysis, often beginning in the hindlimbs evident as ataxia, followed by ascending paresis and paralysis; and convulsions characterized by salivation and chewing movements of the jaw (petit mal, “chewing-gum fits”).

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

In severe cases the dog may then fall on its side and paddle its legs, involuntary urination and defecation (grand mal seizure, epileptiform convulsion) often occurs.

In Chronic distemper encephalitis (old dog encephalitis) ataxia, compulsive movements such as head pressing or continual pacing, and incoordinated hypermetria may occur.

### ***Diagnosis***

Clinical signs (febrile catarrhal illness with neurologic sequelae) plus serologic demonstration of virus-specific IgM or an increased ratio of CSF to serum virus-specific IgG.

### ***Treatment and Prevention***

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#### **Management**

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Non drug treatment

- Good nursing and dietary supplements are essential.

Drug treatment

- No specific treatment is available but for secondary bacterial complications.

*Supportive first line*

- Procaine Penicillin + Dihydrostreptomycin Sulfate  
2000,000IU:200mg/ml, 1-2ml/20kg, IM, q 24 h for 3-5days
  - ✓ S/E: allergic reactions
  - ✓ C/I: hypersensitivity and should not be administered by intrathecal injection
  - ✓ D/F: injection, 200,000 IU and 200mg/ml respectively.
  - ✓ D/I: chloramphenicol, tetracycline, phenylbutazone, calcium gluconate, heparin sodium, sodium bicarbonate and tylosin.

or

- Sulfadiazine-Trimethoprim, 25:5 mg/ml, 1ml/10-20mg/kg, IM, q 24 h, for 3-5 days
    - ✓ S/E: crystallization in urinary tract, hypersensitivity and anaphylaxis in cats and dogs; *in dogs*: hemolytic anemia, anorexia, cutaneous drug eruption, diarrhea, facial
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

swelling, hepatitis, hypothyroidism, keratoconjunctivitis, neurologic disorder, polyarthritis, and polydipsia. *Cats*: salivation, thyroid function changes transient vomiting

✓ D/F: tablet , 100+ 20, 400+80 in mg; Injection, 200+40 and 400 + 80 in mg/ml;

✓ D/I: Detomidine and halothane

or

- Oxytetracycline 2-10 mg/kg, IM, PO, q 24 h for 3-5 days; oral treatment is preferred; S/E, C/I, D/I, D/F, similar to tetracycline *see* tetracycline page 297.

*plus*

- Lactated ringer solution 40-50 ml/kg q 24 h SC, IV, IP.
- Antipyretics e.g. acepromazine maleate 0.05-0.2 mg/kg, PO, SC, IM or IV q 12 h for three days. S/E, C/I, D/F, and D/I *see* page 289.

or

- Metoclopramide, 0.2-0.5 mg/kg, q 6 h., PO or SC or 1-2 mg/kg/day, slow IV
  - ✓ S/E: increases seizure effects and extra pyramidal effect
  - ✓ C/I: don't use with GI obstructions, phenothiazines or narcotic analgesics.
  - ✓ D/F, D/I, *see* above.

or analgesics

- Phenylbutazone 10-22 mg/kg PO, q 8 h for dogs and 6-8 mg/kg PO, IM q 12 h for cats every other week.
  - ✓ S/E: Cardiac, hepatic, or renal impairment, anemia
  - ✓ C/I: Prolonged use may cause gastrointestinal lesions
  - ✓ D/F: Injection, 200 mg/ml; Bolus, 25, 100 and 200 mg
  - ✓ D/I: Methotrexate, phenytoin, sulphonylureas, thyroxine and warfarin

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Prophylaxis

- Vaccinate pups 6 wk old and at 2- to 4-wk intervals until 16 wk old, IM; repeat vaccinations annually.
- 

### **Brucellosis**

Brucellosis in dogs is caused by *Brucella canis*.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical symptoms***

Abortions, decreased fertility, reduced litter sizes and neonatal mortality. In male dogs: orchitis and epididymitis.

### ***Diagnosis***

Tube agglutination test, ELISA and agar gel immunodiffusion test.

### ***Treatment***

Treat animals that are not intended for breeding and at the early course of infection. For treatment we can use broad spectrum antibiotics.

### ***Control***

No vaccine is available; serological detection and removal of infected animals is the only method of control.

## **Canine Monocytic Ehrlichiosis**

Ehrlichiosis is a generalized disease of *Canidae* caused by the rickettsiae *Ehrlichia canis*. It is transmitted by ticks especially *Rhipicephalus sanguineus*.

### ***Clinical symptoms***

The disease may progress through an acute, subclinical to chronic phases. The acute phase is characterized by fever, thrombocytopenia, leucopenia and anemia. Persistent bone marrow depression, along with haemorrhages, neurological disturbance, peripheral oedema and emaciation are characteristic. The disease may progress to chronic phase.

### ***Diagnosis***

Clinical and haematological features; detection of *E. canis* in mononuclear cells in Giemsa stained smears of the buffy coat; indirect fluorescence; and transmission to other dogs.

## **Treatment and Prevention**

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### **Management**

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- Doxycycline or any Tetracycline 2-10 mg/kg, IM, PO, q 24 h for tens days
  - Chloramphenicol 50-55mg/kg q 6 h for S/E, C/I, D/F and D/I *see* page 21.
- 

### Prophylaxis

- Tetracyclines can be administered to susceptible dogs before they enter an endemic area.

## **Canine Parvovirus**

Canine parvovirus is an asymptomatic or clinical contagious disease of dogs caused by canine parvovirus that replicates in the lymphoid tissue. The virus is shed in the feces of infected dogs up to 3 wks or from recovered dogs. Disease is only triggered after stress or concurrent infections.

### *Clinical Symptoms*

Initial signs are myocarditis commonly seen in very young puppies and gastroenteritis in pups 6-20 wk old. Lethargy, anorexia, fever, vomiting, and diarrhea are observed. The feces are loose and may contain mucus or blood. A common complication is pulmonary edema or alveolitis.

### *Diagnosis*

Clinical signs are indicative and confirmed by ELISA test or hemagglutination test from faecal samples.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### Treatment and Prevention

#### Management

##### Non-drug treatment

- Food and water should be withheld until vomiting has subsided.

##### Drug treatment

- Lactated Ringer's and 5% dextrose with additional potassium chloride for severe cases *see* page 289.  
*plus*
- Metoclopramide, *see* page 300.  
*plus*
- Procaine Penicillin & Dihydrostreptomycin Sulfate, or Sulfadiazine-Trimethoprim, *see* page 299.  
or
- Oxytetracycline *see* page 297.  
or
- Ampicillin 20-30 mg/kg, q 8 h, PO, or 10mg/kg, IV, q 6 h for a maximum of 5 days. S/E, C/I, D/F, D/I, *see* page 77.  
or
- Gentamicin 2-4 mg/kg, SC or IV or IM, q 8 h for a maximum of 5 days.
  - ✓ C/I: oral administration, in renal failure, anaerobic infections, and reserved for serious identified diseases.
  - ✓ Dosage Forms: injection; 40, 50 and 100 mg/ml
  - ✓ D/I: calcium gluconate, heparin sodium, sodium bicarbonate, IV and tylosin.

##### Prevention & Control

- Vaccinate at 6, 9, and 12 wk of age.

### **Campylobacteriosis**

Gastrointestinal campylobacteriosis, caused by *Campylobacter jejuni* or *C. coli*, is a common cause of diarrhea in dogs and cats. Transmission occurs via fecal-oral in food or water. Uncooked

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

or undercooked poultry, other raw meat products and asymptomatic carriers are sources of infection.

### ***Clinical Symptoms***

Diarrhea is common and most severe in kitten and puppies, which is mucus-laden, watery, and/or bile-streaked diarrhea or with blood that lasts 3-7 days; reduced appetite; and occasional vomiting. Fever and leukocytosis may also be present. In certain cases, intermittent diarrhea may persist for >2 weeks. Diarrhea with mucus and blood has also been seen in cats.

### ***Diagnosis***

Culture of feces and darkfield or phase-contrast microscopy of fresh fecal samples are definitive.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

*First line:*

- Erythromycin 10-20 mg/kg, q 8 h, PO for dogs cats for 3-5 d
  - ✓ S/E: gastrointestinal upset and allergic reaction
  - ✓ C/I: animals with impaired liver function
  - ✓ D/F: powder, 5, 20 and 30%
  - ✓ D/I: theophyllin, Warfarin and beta-adrenergic drugs

*Second line:*

- Gentamicin 2-4 mg/kg or 1 ml/40kg, q 12 h, IM, SC, IV for dogs and cats for 3-5 days. S/E, C/I, D/F, D/I, *see* page 303.

or

- Doxycycline hydrochloride, 5 mg/kg loading dose PO; then 2.5 mg/kg, then 2.5 mg/kg q 24 h for both dogs and cats. S/E, C/I, D/F and D/I *see* tetracycline page 297.

or

- Chloramphenicol 30-50 mg/kg, q 8 h, PO, IV, IM, SC for both dogs and cats.
    - ✓ S/E: depression, bone marrow hypoplasia and pancytopenia
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

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- ✓ C/I: animal with impaired liver function
  - ✓ D/F: oral powder, 25%; Tablets, 100 and 250mg; Oral suspension, 25mg/ml and Injection 100, 150 and 200mg/ml
  - ✓ D/I: barbiturates, phenytoin and sulfonylureas.
- 

### **Colitis**

Colitis, an inflammation of the colon, may be acute or chronic. In most cases, the inciting factor(s) is/are unknown. Bacterial (eg, *Salmonella* spp, *Clostridium* spp, and *Campylobacter* spp), parasitic, fungal, traumatic, uremic, and allergic causes have been postulated. Inflammation may be a result of a defect in mucosal immunoregulation.

#### ***Clinical Symptoms***

Tenesmus and frequent passage of mucus-laden feces, sometimes with frank blood on its surface; the faeces is often of a small volume and of a more liquid consistency.

#### ***Diagnosis***

A complete history, rectal palpation and evaluation of faeces are suggestive. Fecal smears for giardia and fungal elements, fecal flotation for parasite identification, and culture for bacteria is suggested in cases of chronic colitis.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

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#### **Management**

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##### Non-drug treatment

- Withheld food for 24-48 h in animals with acute colitis; the protein source should be one to which the animal has not previously been exposed.
- 

##### Drug treatment

- Sulfamethazine-Trimethoprim 20 mg/kg, q 24 h, IM for 3-5 days. S/E, C/I, D/F, D/I, *see* page 299.

##### *plus*

- Prednisolone, 2-4 mg/kg, q 24 h, for 2 weeks and then tapered over 6-10 wk.
    - ✓ S/E: prolonged therapy may precipitate sign of adrenal insufficiency and cautious in pregnant pets
    - ✓ C/I: in conjunction with vaccine
    - ✓ D/F: injection, 10mg/ml, 25mg/ml
    - ✓ D/I: acetazolamide, antidiabetic drugs, barbiturates, phenylbutazone, phenytoin, diuretics
  - In cats, the prognosis is more guarded, and generally, high doses of prednisolone 3 mg/kg, q 12 h are required for maintenance.
- 

## **Conjunctivitis**

Different strains of *Chlamydia psittaci* cause significant eye infection in cats. The disease in cats involves the eye and mucosa of the upper respiratory tract (rhinitis, sinusitis, pharyngitis). Chlamydial keratoconjunctivitis can also be seen in dogs.

### *Clinical Symptoms*

*Cats:* Early signs are unilateral, reddened, slightly swollen conjunctivae. Bilateral conjunctivitis develops after a few days, and the conjunctivae become hyperemic and chemotic, with prominent follicles on the inside of the third eyelid in more severe cases. The signs are most severe 9-13 days after onset

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

and then subside over 2-3 wk. Secondary bacterial infections with signs of keratitis; pannus and corneal scarring may follow. Gastric epithelial cells of cats are also infected. Ulcerative keratitis may also be observed.

*Dogs:* keratoconjunctivitis

### ***Diagnosis***

Diagnosis can be confirmed by demonstration of chlamydial inclusions in exfoliative cytologic preparations from scrapings or by isolation of the chlamydial organism in chicken embryos or cell culture.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

##### *First Line*

- Tetracycline eye drops 1%, 4 times/day for 5-7 days. *see* page 297.

##### *Second line*

- Chloramphenicol eye drops 0.5%, 4 times/day for 5-7 days. *see* page 304.

##### *In severe cases*

- Penicillin & streptomycin 200,000IU:250mg/ml, 1-2ml/20kg, IM, q 24 h for 3-5days. S/E, C/I, D/F, D/I, *see* page 299.

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##### Prophylaxis

- To reduce recurrence, treatment in cats should be continued for 7-10 days after clinical signs disappear.

*Public health significance:* Chlamydia may be transmitted to human and cause disease.

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## **Cryptococcosis**

Cryptococcosis is a fungal disease of dogs and cats caused by *Cryptococcus neoformans*. It may be systemic affecting the respiratory tract, central nervous system(CNS), eyes, and skin

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

(particularly the face and neck of cats). Transmission occurs by inhalation or wound contamination from the environment.

### ***Clinical Symptoms***

*In cats:* sneezing, mucopurulent, serous, or hemorrhagic unilateral or bilateral chronic nasal discharge, polyp-like mass/es in the nostril, and a firm subcutaneous swelling over the bridge of the nose. Cutaneous papules and nodules that are fluctuant to firm, larger may ulcerate. Neurologic signs like depression, changes in temperament, seizures, circling, paresis, and blindness may occur. Ocular dilated unresponsive pupils and blindness due to exudative retinal detachment, granulomatous chorioretinitis, panophthalmitis, and optic neuritis.

*In dogs:* More severe disseminated disease and most have CNS or ocular involvement. Clinical signs are usually related to meningoencephalitis, optic neuritis, and granulomatous chorioretinitis. About 50% of dogs have lesions in the respiratory tract, usually the lungs, and most have granulomas throughout the body. Structures often involved in order of decreasing frequency are kidneys, lymph nodes, spleen, liver, thyroid, adrenals, pancreas, bone, GI tract, muscle, myocardium, prostate, heart valves, and tonsils.

### ***Diagnosis***

The most rapid method of diagnosis is cytologic evaluation of nasal exudate, skin exudate, cerebrospinal fluid (CSF), or samples obtained by paracentesis of the aqueous or vitreous chambers of the eye or by impression smears of nasal or cutaneous masses. Gram's stain, India ink, new methylene blue and periodic acid-Schiff (PAS) stains are used. Culture from exudate, CSF, urine, joint fluid, and tissue samples are useful.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

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#### **Management**

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##### Drug treatment

- Amphotericin B 0.1-0.5 mg/kg (cats) and 0.25-0.5 mg/kg (dogs), IV with 5-20ml of 5% dextrose solution 3 times a week until a cumulative dose of 4-10 mg/kg is reached. S/E, C/I, D/I are similar to Ketokonazole, *see* page 296.

or

- Ketoconazole 10-20, mg/kg, q 24 h, PO has been used to successfully treat cats for a week. S/E, C/I, D/F, D/I, *see* page 296.

or

- Itraconazole 11-27 mg/kg, q 24 h, PO a week for dogs. S/E, C/I, D/F, D/I, *see* ketoconazole above.

or

- Fluconazole 100 mg, PO, q 24 h, a week for cats. S/E, C/I, D/F, D/I, are similar to Ketoconazole, *see* page 296.
- 

##### Prophylaxis

- Use antiseptics to clean wound.
- 

### **Dirofilariasis**

Dirofilariasis is infection of particularly the right ventricle and aorta of dogs by *Dirofilaria immitis*; cats are also infected occasionally. Mosquitoes are intermediate hosts.

#### *Clinical Symptoms*

Gradual weight loss, decreased exercise tolerance, and cough aggravated by exercise; and in advanced cases, dyspnea, increased temperatures, abdominal fluid, cyanotic mucous membranes and periodic collapse are observed.

#### *Diagnosis*

Identification of *Dirofilaria* worm in blood samples plus clinical signs and history; serological tests are also available.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

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#### **Management**

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- Arsenamide
    - ✓ S/E: nephrotoxic and hepatotoxic
    - ✓ C/I: liver disease
  - Steroids may be given to reduce anaphylaxis
  - Acetylsalicylic acid *plus* prednisolone prevents thromboembolism.
- 

#### Prevention

- Diethylcarbamazine daily, during the mosquito season
  - Ivermectin 6mcg/kg, IM, every 30 days
- 

### **Feline Infectious Anaemia**

Feline infectious anaemia is caused by *Haemobartonella felis*, belonging to the family *Anaplasmataceae*. The method of transmission is uncertain. Recovered animals may remain asymptomatic carriers.

#### ***Clinical symptoms***

*Peracute form*: anemia, immune suppression with high parasitaemia. *Acute form*: fever, anemia, depression, weakness and occasionally, jaundice. *Chronic form*: anaemia, lethargy and marked weight loss.

#### ***Diagnosis***

The parasite may be demonstrated on the surface of erythrocytes in Giemsa stained blood smear. Reduced PCV.

### ***Treatment and control***

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#### **Management**

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#### Drug treatment

##### *Acute disease*

- Doxycycline hydrochloride, 5 mg/kg loading dose PO; then 2.5 mg/kg, then 2.5 mg/kg q 24 h for both dogs and cats. S/E, C/I, D/F and D/I *see* page 297.
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

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- Supportive treatment: Blood transfusion
- 

### Prophylaxis

- Flea control
- 

## **Feline Panleukopenia**

It is highly contagious disease of cats caused by Feline Panleukopenia virus. It affects bone marrow cells, lymphoid tissue cells and intestinal crypt cells. The virus is shed through vomits and feces. Infected cats can shed the virus for one year after recovery.

### *Clinical Symptoms*

It may be acute or peracute in its clinical course. Anorexia and lethargy followed by vomiting and yellow and blood tinged diarrhea. Infected cat will have swollen gastrointestinal system.

### *Diagnosis*

Clinical signs are important. White blood counts are low.

### *Treatment and Prevention*

---

#### **Management**

---

##### Drug treatment

- Penicillin & streptomycin 200000IU/250mg, 1-2ml/20kg, IM, q 24 h for 3-5days. S/E, C/I, D/F, D/I, *see page 299.*

or

- Sulfamethazine-Trimethoprim 200 mg/ 40mg, 5- 30 mg/kg, IM, q 24 h, or 1ml/10-20kg, IM, q 24 h for 3-5days. S/E, C/I, D/F, D/I, *see page 299.*

##### *Antiemetics:*

- Acetylpromazine Maleate 0.05-0.2 mg/kg PO, SC, IM or IV q 12 h for 3 days. S/E, C/I, D/F, D/I, *see page 289.*

or

- Metoclopramide, 0.2-0.5 mg/kg, q 6 h., PO or SC, or 1-2 mg/kg/day, slow IV. S/E, C/I, D/F, D/I, *see page 300.*
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Feline Infectious Peritonitis**

Feline Infectious Peritonitis is a viral disease caused by some strains of corona virus. It is transmitted by inhalation or ingestion. Infected cats may remain carriers.

#### ***Clinical symptoms***

Early signs include anorexia, weight loss, listlessness and dehydration. Pleural exudates, dyspnea and death may occur within 6 weeks.

#### ***Diagnosis***

Histological examination of affected tissue is the only definitive diagnostic method. Pleural or peritoneal fluid, which may contain fibrin strands, clots on standing, neutrophilia, lymphopenia and in chronic cases, anemia; serum hyperproteinaemia are indicators.

#### ***Treatment and Prevention***

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##### **Management**

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###### Drug treatment

- There is no specific treatment of FIP.

###### Supportive therapy

- Broad spectrum antibiotics (for animals in good condition); for choice of drugs, *see* page 304.
- 

###### Prophylaxis

- when breeding, animals should be selected from breed with known FIP negative bloodlines of cats.
- 

### **Feline Respiratory Disease Complex**

Feline respiratory disease complex is characterized by rhinitis, conjunctivitis, lacrimation, salivation, and oral ulcerations. The principal diseases, feline viral rhinotracheitis (FVR) and feline calicivirus infections (FCV), affect exotic as well as domestic species. *Chlamydia psittaci* and mycoplasmal infections appear

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

to be of lesser importance. Transmission occurs via aerosol droplets and fomites; convalescent cats may continue to harbor virus for many months. Calicivirus is shed continuously, while infectious FVR virus is released intermittently. Stress may precipitate a secondary course of illness.

### ***Clinical Symptoms***

*Feline Rhinotracheitis*: fever (40.5°C), frequent sneezing, conjunctivitis, rhinitis, serous to mucopurulent nasal discharge and often salivation which may be induced by excitement or movement. Severely debilitated cats may develop ulcerative stomatitis, and ulcerative keratitis. Signs may persist for 5-10 days in milder cases and up to 6 wk in severe cases.

*Calicivirus*: An acute febrile response, inappetence, and depression are common signs. Serous rhinitis and conjunctivitis also can occur.

*Chlamydia psittaci* infections characteristically produce conjunctivitis and cats sneeze occasionally. Fever, serous lacrimal discharge to mucopurulent conjunctivitis, lymphoid infiltration, and epithelial hyperplasia may occur. Convalescent cats may undergo relapses.

### ***Diagnosis***

Typical signs and cytologic examination of Giemsa-stained conjunctival scrapings give presumptive diagnosis. A definitive diagnosis is based on isolation and identification of the agent.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

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#### **Management**

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##### Drug treatment

###### *First line*

- Chloramphenicol 40mg, q 8 h, PO for 3-5days. S/E, C/I, D/F, D/I, *see* page 304.

###### *Second line*

- Tetracycline 1% eye drops, 5 to 6 times daily against *C. psittaci*. S/E, C/I, D/F and D/I *see* page 297.

###### *plus*

- Nebulization or saline nose drops to remove tenacious secretions.

###### *plus*

- Vasoconstrictor (eg, two drops of ephedrine sulfate [0.25% solution] in each nostril, q 12 h

###### *plus*

- Lysine 250 mg, PO, q 12 h to q 8 h interferes with herpetic viral replication and may help reduce the severity of FVR infection.

###### *plus*

- Oxygen supply (if dyspnea is severe). Fluids may be indicated to correct dehydration, and force-feeding may be necessary. Esophagostomy may be indicated in severe cases.

###### *plus*

- Antihistamines eg, chlorpheniramine maleate, 8 mg for adults, 4 mg for kittens, PO, q 12 h, early in the course of the disease may be used. S/E, C/I, D/I and D/F *see* page 289.
- 

##### Prophylaxis

- Vaccination.
- 

## **Gastrointestinal Parasitism**

### **Ascariasis**

The large roundworms (ascaridoid nematodes) of dogs and cats are common, especially in puppies and kittens. Of the three species *Toxocara canis*, *Toxascaris leonina*, and *Toxocara cati*,

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

the most important is *T. canis*, causes fatal infections in young pups. *Toxascaris leonina* occurs in adult dogs and in cats. These species also occur in wild carnivores. The life cycles of *T. cati* and *T. leonina* are similar except that, in the former, no prenatal infection occurs, while in the latter, migration is restricted to the intestinal wall so that neither prenatal nor transmammary transmission occurs.

### ***Clinical Symptoms***

Lack of growth and loss of condition, worms may be vomited and are often voided in the feces. Pulmonary damage due to migrating larvae may be complicated by bacterial pneumonia. Diarrhea with mucus may be evident. In severe infections of puppies, verminous pneumonia, ascites, fatty degeneration of the liver and mucoid enteritis are common. Cortical kidney granulomas containing larvae are frequent in young dogs.

### ***Diagnosis***

Microscopic examination of feces for eggs.

### ***Treatment and Prevention***

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#### **Management**

---

##### Drug treatment

- Piperazine 50-100 mg/kg, PO at ones for dogs and cats
  - ✓ S/E: vomiting and diarrhoea may occur at a higher dosage
  - ✓ C/I: denal impairment
  - ✓ D/F: tablets, 50 and 500 mg; powder, 65%; syrup, 100 mg/ml
- or
- Mebendazole 22 mg/kg, q 24 h, PO with food for 3 days. S/E, C/I, D/F, *see* page 319.
- or
- Pyrantel pamoate, dogs: 5-10 mg/kg; cats 10 mg/kg, both PO, single dose.
  - ✓ D/F: Bolus, 600mg; Liquid, 50 and 150 mg/ml

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##### Prophylaxis:

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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

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- Fenbendazole: bitches from 40 days pregnancy to day 14 after whelping plus nursing ones, 50 mg/kg; pups at 2 wk after birth and repeated at 2- to 3-wk intervals to 3 month of age.
    - ✓ S/E: Hypersensitivity
    - ✓ C/I: Teratogenic and embryotoxic when administered at early gestation period.
    - ✓ D/F: Bolus, 250 and 750 mg; Suspension, 2.5, 5, 10, and 12.5%
- 

### **Ancylostoma caninum infection**

*Ancylostoma caninum* is the principal cause of canine hookworm disease in Ethiopia. Transmission may result from ingestion of infective larvae from the environment or, in *A. caninum*, ingestion of colostrum or milk of infected bitches or from larval invasion through the skin.

### ***Clinical Symptoms***

Acute normocytic, normochromic anemia followed by hypochromic, microcytic anemia in young puppies is the characteristic, and often fatal. Dogs may be, debilitated and malnourished. Diarrhea with dark, tarry feces accompanies severe infections. Anemia, anorexia, emaciation, and weakness develop in chronic disease.

### ***Diagnosis***

Flotation of fresh feces from infected dogs and acute anemia and death may be seen in young pups before eggs are passed in their feces.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

---

#### **Management**

---

##### Drug treatment

- Mebendazole 22 mg/kg, q 24 h, PO with food for 3 days. S/E, C/I, D/F, *see* page 319.

or

- Fenbendazole 50 mg/kg, q 24 h, PO with food for 3 days. S/E, C/I, D/F, *see* page 316.

##### *Plus*

##### *In severe cases*

- Iron dextran 10 mg/kg, q 24 h, IM in addition to anthelmintics to be followed by high protein diet.
- 

##### Prophylaxis

- Fenbendazole given to pregnant bitches from day 40 of pregnancy to day 14 after whelping greatly reduces transmammary transmission to the pups. S/E, C/I, D/F, *see* page 316.
- 

### **Spirocerca lupi**

*Spirocerca lupi* infection is an esophageal worm of dogs. The adult worms localize within nodules in the esophageal, gastric or aortic walls. Infection is acquired when dogs eat dung beetles (the intermediate host) or other animals such as chicken or reptiles which are incidental hosts.

#### ***Clinical findings***

Clinical signs appear when the nodules become large enough to interfere with swallowing and frequently vomit when trying to eat. Other signs spondylitis or enlargement of extremities characteristic of osteopathy. dogs may be suddenly due to rupture of the aorta.

#### ***Diagnosis***

Fecal examination, gastroscopic examination and radiologic examination.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Treatment and prevention***

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#### **Management**

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##### Drug treatment

- Treatment is not practical.

The following two may help:

- Levamisole 5mg/kg PO stat. S/E, C/I, D/F, and D/I *see* page 46.
- Albendazole 5mg/kg PO stat. S/E, C/I, D/F and D/I *see* page 319.

---

##### Prophylaxis

- Prevent dogs from eating dung beetles or raw chicken scraps, mice, lizard etc that may harbor the parasite.
- 

### **Strongyloidosis**

*Strongyloides stercoralis* is a small, slender nematode that when fully mature is buried in the mucosa of the anterior half of the small intestine of dogs. Usually, infections are associated with warm, wet, crowded, unsanitary housing. The species found most often in dogs is identical to that found in man. Other species in dogs include *S. planiceps* and *S. fuelleborni*; *S. cati* and *S. tumefaciens* are found in cats. The parasitic worms are all females.

### ***Clinical Symptoms***

A blood-streaked, mucoid diarrhea, usually seen in young animals during hot humid weather, is characteristic. Early signs include emaciation and reduced growth rate are observed however, appetite usually is good. In the absence of concurrent infections, there is little or no fever. Usually in advanced stages, there is shallow, rapid breathing and pyrexia, and the prognosis is grave.

### ***Diagnosis***

Characteristic clinical signs and larvae identified by direct microscopical evaluation.

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## Treatment and Prevention

### Management

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#### Drug treatment

- Mebendazole 22 mg/kg, q 24 h, PO with food for 3 days.
  - ✓ S/E: hypersensitivity
  - ✓ C/I: early gestation
  - ✓ D/F: tablet, 100mg; suspension, 4 and 10%

or

- Albendazole 25 mg/kg, q 12 h, PO.
  - ✓ S/E: hypersensitivity
  - ✓ C/I: teratogenic and embryotoxic when administered at early gestation period.
  - ✓ D/F: tablet, 150, 200, 250, 300 mg/kg

or

- Ivermectin 200 mcg/kg, PO or SC stat.
  - ✓ S/E: ataxia, depression, tremors, mydriasis, listlessness, musculoskeletal pains, oedema, of face or extremities, itching and popular rash
  - ✓ C/I: tablet is contraindicated and Coli breeds are sensitive for more than 0.006mg/kg.
  - ✓ D/F: injection, 10 mg/ml

*Public health significance: Strongloides stercoralis infection causes severe disease in humans.*

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## Tapeworms

Taenia species including *Dipylidium caninum* & *Taenia taeniaformis* are two important cestodes of pets acquired by ingestion of raw meat and offals. A number of cestodes can be expected in dogs. On sheep ranges and wherever wild ungulates and wild canids are common, dogs may acquire *Echinococcus granulosus* (the hydatid tapeworm).

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Clinical signs vary from unthriftiness, malaise, irritability, capricious appetite, and shaggy coat to colic and mild diarrhea; rarely, intussusception of the intestine, emaciation, and seizures are seen.

### ***Diagnosis***

Direct microscopic finding of proglottids or eggs in the feces. Fecal flotation may reveal the eggs of *E.granulosus* from other cestodes.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Mebendazole 22 mg/kg, q 24 h, PO with food for 3 days. S/E, C/I, D/F, *see* page 319.

or

- Albendazole 25 mg/kg, q 12 h, PO for 3 days. S/E, C/I, D/F, *see* page 319.

or

- Praziquantel at 7.5 mg/kg, PO for 2 consecutive days is effective against *Diphyllobothrium latum* and 20 mg/kg, PO as a single dose against *Spirometra mansonioides*/*E.granulosus* same dosage for dogs and cats.

✓ S/E: Vomiting and transient pain

✓ C/I: Don't use in puppies under 4weeks and kitten under 6 weeks of age

✓ D/F: Tablets, 50 mg; Bolus, 3125mg

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*Note:* Cestodes of dogs and cats are of public health importance.

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### **Giardiasis**

It is enteric disease of dogs and cats caused by parasitic protozoa of the genus *Giardia*. Transmission among hosts occurs by fecal-oral route. Cysts excreted in feces are immediately infective.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Chronic diarrhea either continuous or intermittent lasting for weeks, months or in unusual cases years or feces becomes pasty in consistency, pale, with foul odor and steatorrhea is likely to present.

### ***Diagnosis***

Microscopic examination feces is definitive approach.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

##### *First line*

- Metronidazole tablets 25 mg/kg for dogs and 10 mg/kg for cats PO q 12 h for 7 days. S/E, C/I, D/F, D/I, *see* page 294.
- or
- Furazolidone 4 mg/kg for cats PO q 12 h for 7 days.  
✓ C/I: for pregnant pets unless absolutely necessary.
- or
- Tinidazole 50 mg/kg PO q 24 h for 3 days in cats and dogs.  
*See* metronidazole page 294.
- 

### **Hemorrhagic Gastroenteritis**

Hemorrhagic gastroenteritis (HGE) is a disease of dogs characterized by an acute onset of bloody diarrhea in formerly healthy dogs.

The etiology is unknown. It has been suggested that an abnormal response to bacteria, bacterial endotoxins, or diet may be involved, but there is no evidence to support these suppositions. There is no sex predilection, and dogs of any age may be affected.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Dogs 2-4 years old: vomiting and bloody diarrhea, anorexia, and depression; do not become clinically dehydrated but hypovolemic shock may develop. The disease is not contagious and may occur without obvious changes in diet.

### ***Diagnosis***

The clinical sign of acute, bloody diarrhea accompanied by an increased PCV, which is often >60%. There is no change in biochemical profile.

### ***Treatment and Prevention***

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#### **Management**

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##### Non-drug treatment

- Food and water should be withheld for 2-3 days.
- For protein source, dogs should be given with food for which it is unfamiliar.

##### Drug treatment

###### *For severe cases*

- Lactated Ringer's 40-50ml/kg, PO, IV, with Potassium chloride

###### *Plus*

- Gentamicin Sulfate 2-4 mg/kg, q 8 h, IV (with IV fluid), IM, or SC. S/E, C/I, D/I, D/F, *see* page 303.

###### For mild cases:

- Sulfamethazine-Trimethoprim 200/40mg, 5- 30 mg/kg, IM, q 24 h, for 3-5 days. S/E, C/I, D/I, D/F, *see* page 299.
- 

## **Infectious Canine Hepatitis**

Infectious canine hepatitis (ICH) is contagious disease of dogs (also foxes) caused by canine Adenovirus. Ingestion of urine, feces, or saliva of infected dogs is the main route of infection. Recovered dogs shed virus in their urine for  $\geq 6$  months. The mortality rate is highest in very young dogs.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

The incubation period is 4-9 days. Biphasic fever of 40°C which lasts 1-6 days, leukopenia one day after fever, acute illness develops, tachycardia, leukopenia persists throughout the febrile period. Apathy, anorexia, thirst, conjunctivitis, serous discharge from the eyes and nose, and occasionally abdominal pain and vomiting are most common. Intense hyperemia or petechiae of the oral mucosa, as well as enlarged tonsils, may be seen. There may be subcutaneous edema of the head, neck, and trunk.

Clotting time is directly correlated with the severity of illness. CNS signs and intermittent convulsions during the course of illness, and terminal paralysis may involve one or more limbs or the entire body. In mild cases of ICH, transient corneal opacity may be the only sign of disease. Simultaneous infection with CAV-1 and distemper virus is sometimes seen.

### ***Diagnosis***

Usually, the abrupt onset and bleeding suggest ICH. The gross changes in the liver and gallbladder are more conclusive. Diagnosis is confirmed by virus isolation, immunofluorescence, or characteristic intranuclear inclusion bodies in the liver.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

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#### **Management**

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##### Drug treatment

##### *Severely infected dogs,*

- Blood transfusion

##### *plus*

- Dextrose 5% in isotonic saline should be given, preferably IV or

- Iron sulfate or gluconate, 100-300mg/kg, PO.

##### *plus*

- Sulfamethazine-Trimethoprim, 200mg/ 40mg, 5- 30 mg/kg, IM, q 24 h, or 1ml/10-20kg, IM, q 24 h for 3-5days. S/E, C/I, D/I, D/F, *see* page 331.

##### *plus*

- Atropine ophthalmic ointment one drop in affected eye q 24 h to q 12 h;
  - ✓ C/I: in presence of glaucoma
  - ✓ S/E: salivation in cats

##### Contraindicated drugs:

- Tetracyclines may cause discoloration of permanent teeth.
  - Systemic corticosteroids are generally contraindicated for treatment of corneal opacity associated with ICH.
- 

##### Prophylaxis

- Vaccination with modified live virus vaccine after 9-12weeks of age.
- 

### **Infectious Tracheobronchitis**

Infectious tracheobronchitis (Kernel cough) is a self-limiting mild disease of dogs that results from inflammation of the upper airways. The disease may progress to fatal bronchopneumonia in puppies or to chronic bronchitis in debilitated adult or aged dogs. The illness spreads rapidly among susceptible dogs housed in close confinement. Infections involved include Canine parainfluenza virus, canine adenovirus 2 (CAV-2), or canine distemper virus, can be the primary or sole pathogen

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

involved; *Bordetella bronchiseptica* especially in dogs <6 months old; other bacteria such as *Pseudomonas* sp, *Escherichia coli*, and *Klebsiella pneumoniae* may also cause secondary infections after viral injury to the respiratory tract. Stress and extremes of ventilation, temperature, and humidity apparently increase susceptibility to, and severity of, the disease.

### ***Clinical Symptoms***

Paroxysms of a harsh dry and easily induced cough, followed by retching and gagging to more severe signs such as fever, purulent nasal discharge, depression, anorexia, and a productive cough, especially in puppies, indicates a complicating systemic infection such as distemper or bronchopneumonia. Disease relapses after stress, particularly due to adverse environmental conditions and improper nutrition. Severity diminishes during the first 5 days, but the disease persists for 10-20 days.

### ***Diagnosis***

History and clinical signs are indicative.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

---

#### **Management**

---

##### Non-drug treatment

- Avoid contact
- Good nutrition, hygiene, and nursing care and correct predisposing factors

##### Drug treatment

- Codeine phosphate 0.25 mg/kg, q 6-12 h, PO to control persistent nonproductive coughing.
  - ✓ S/E: sedation
  - ✓ C/I: respiratory insufficiency and liver disease
  - ✓ D/F: tablet, 30 mg

##### *In severe chronic cases:*

- Tetracycline 10-22 mg/kg, PO, q 8 h for 5 days. S/E, C/I, D/I, D/F, *see* page 297.

or

- Sulfamethazine -Trimethoprim (200:40mg) 5- 30 mg/kg, IM, q 24 h, for 3-5days. S/E, C/I, D/I, D/F, *see* page 303.

or

- Chloramphenicol, 30-50 mg/kg, IM, IV or PO q 8 hr for 3-5 days. S/E, C/I, D/I, D/F, *see* page 304.

##### *In more severe cases:*

- Gentamicin sulfate (50 mg) diluted in 3 mL of saline may be administered by aerosolization q 12 h for 3 days. S/E, C/I, D/I, D/F, *see* page 303.

*plus*

- Phenylbutazone 20gm in 100ml, 1ml/15kg IM, q 24 h for 1-4 days S/E, C/I, D/I, D/F, *see* page 300.

---

##### Control & Prophylaxis

- Immunize with modified live virus vaccines against distemper, parainfluenza, and CAV-2, which also provides protection against CAV-1.
-

### **Leptospirosis**

The most common serovars infecting dogs are *Leptospira canicola* and *L. icterohaemorrhagiae*. New serovars isolated are *pomona* and *grippotyphosa*. Dogs of all ages and both sexes are affected. The incubation period is 4-12 days.

#### ***Clinical Symptoms***

Fever, depression, anorexia, and generalized pain, vasculitis, thrombocytopenia, and a coagulopathy may develop followed by uremia, dehydration, vomiting, and oral ulceration; icterus often reflects the severity of the disease, meningitis, uveitis, and abortion have been rarely reported. hematologic and serologic abnormalities include leukocytosis, lymphopenia, monocytosis, and thrombocytopenia and; azotemia and electrolyte disturbances secondary to the renal failure, including hyponatremia, hypochloremia, and hyperphosphatemia.

#### ***Diagnosis***

Demonstration of leptospira in urine or tissues (or both) and serology, in conjunction with typical clinical and laboratory abnormalities are diagnostic.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

---

#### **Management**

---

##### Drug treatment

##### *First line:*

- Penicillin and streptomycin 200,000IU/250mg, 1-2ml/25kg, IM, q 24 h for 3-5days. S/E, C/I, D/I, D/F, *see* page 299.

or

- Oxytetracycline 10mg/kg, q 24 h, IM for 5 days. S/E, C/I, D/I, D/F, *see* page 297.

or

- Enrofloxacin 5 mg/kg, q 24 h, PO, IM, SC q 24 h, for 3-5days
    - ✓ S/E: arthropathy in immature dogs, anorexia, vomiting and diarrhoea
    - ✓ C/I: young animals with bone growth, hypersensitivity, animals with impaired liver or renal function.
    - ✓ D/F: tablets, 50mg; suspension, 2.5, 10 and 25% and Injection 5, 10 and 20%
- 

##### Prophylaxis: Rodent control

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*Public health significance:* Leptospira are pathogenic to humans and could be transmitted from dogs.

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### **Listeriosis**

Listeriosis is a sporadic bacterial infection that affects a wide range of animals, including man and birds. It is caused by *Listeria monocytogenes*. The organism is transmitted between host species and becomes a source of infection to dogs and cats.

#### ***Clinical Symptoms***

Septicemic or visceral listeriosis is most common in dogs and cats. The septicemic form affects organs other than the brain, the principal lesion being focal hepatic necrosis.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

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#### **Management**

---

Drug treatment:

*First line:*

- Penicillin and streptomycin 200,000IU/250mg, IM, q 24 h for 3-5 days. S/E, C/I, D/I, D/F, *see* page 299.

or

- Oxytetracycline 10mg/kg, q 24 h, IM for 5 days. S/E, C/I, D/I, D/F, *see* page 297.

or

- Sulfamethazine-Trimethoprim (200 mg:40mg) 5- 30 mg/kg, IM, q 24 h, or 1ml/10-20kg, IM, q 24 h for 3-5days. S/E, C/I, D/I, D/F, *see* page 299.
- 

*Public health significance:* Listeriosis is zoonotic; thus handle suspected material with caution.

---

### **Oral Inflammatory and Ulcerative Disease**

Inflammation of the oral tissues may be a primary or secondary disease. Inflammation in the oral cavity may affect the gingival tissue (gingivitis), periodontium (periodontitis), oral mucosa (stomatitis), tongue (glossitis), glossopalatine arches (faucitis), palate (palatitis), or pharyngeal tissue (pharyngitis). The nature and severity of the lesions vary greatly depending on the etiology and duration of the disease. the aetiology includes chemicals, neoplasma, metabolic disorders, autoimmunity or immune deficiency, infectious diseases, trauma, burns, radiation therapy or idiopathic oral inflammatory diseases. Infectious agents include distemper virus, *Leptospira canicola*, and *L.icterohaemorrhagiae*. Uremia can cause stomatitis and oral ulcers. Recurrent oral ulcerations occur in gray Collies with cyclic hematopoiesis.

#### *Clinical Symptoms*

Signs vary widely with the cause and extent of inflammation. Anorexia may occur, especially in cats. Halitosis and drooling

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

are common with stomatitis, glossitis, and faucitis, and saliva may be blood tinged. The animal may paw at its mouth and resent any attempt to examine the oral cavity because of pain. Regional lymph nodes may be enlarged.

### ***Diagnosis***

Usually on clinical signs and physical examination

### ***Treatment and Prevention***

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#### **Management**

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Non-drug treatment

- Sedate, remove the cause and clean the area by Lugol's solution or mild iodine

Drug treatment

*First line*

- Acetylsalicylic acid, 10-25 mg/kg PO, q 8 h, for 3 days
  - ✓ S/E: prolonged use may cause gastrointestinal lesions
  - ✓ C/I: pregnant animals, gastrointestinal ulceration and hemorrhage
  - ✓ D/F: injection, 100 mg/ml; Bolus, 15.6 gm or 1.4gm
  - ✓ D/I: acetazolamide, antacid, diuretics, heparin, methotrexate, metoclorpramide, phenytoin and warfarin.

or

- Other analgesics

*plus*

- Penicillin and streptomycin (200,000IU:250mg/ml), 1ml/25 kg, IM, q 24 h for 3-5 days. S/E, C/I, D/F, D/I, *see page 299.*

or

- Oxytetracycline 10mg/kg, q 24 h, IM for 5 days. S/E, C/I, D/F, D/I, *see page 297.*

---

Prophylaxis: depends on the aetiology of the disease.

*Public health significance:* the signs may be similar to rabies; thus handle animal with precaution.

---

### **Otitis Media and Interna**

Otitis media, inflammation of the middle ear structures, is usually due to extension of infection from the external ear canal or to penetration of the tympanic membrane by a foreign object. Otitis media can lead to otitis interna and inflammation of the inner ear structures and can result in loss of equilibrium and deafness.

#### ***Clinical Symptoms***

Head shaking, rubbing the affected ear on the floor, and rotating the head toward the affected side, pain with discharge and inflammatory changes, facial nerve paralysis or Horner's syndrome (miosis, ptosis, enophthalmos, and protrusion of the nictitans), or both, may be present on the same side as the otitis media and fall toward the affected side. Nystagmus may also be seen.

#### ***Diagnosis***

The diagnosis can be confirmed by bulging, discoloration, or rupture of the tympanic membrane; radiologically, cytologic examination (Gram's stain and Wright's stain) and culture of the exudate may be beneficial, along with sensitivity testing of any microbial isolates.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

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#### **Management**

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##### Non-drug treatment

- If the eardrum is ruptured, the tympanic cavity should be carefully cleaned with visualization through an otoscope and the use of long alligator forceps, flushes of warm saline, and low vacuum suction.
- 

##### Drug treatment

###### *First line:*

- Penicillin and streptomycin 200,000IU:250mg/ml, 2ml/25kg, IM, q 24 h for 3-5 days. S/E, C/I, D/I, D/F, *see* page 299.

or

- Oxytetracycline 10mg/kg, q 24 h, IM for 5 days. S/E, C/I, D/I, D/F, *see* page 297.

or

- Sulfamethazine-Trimethoprim 200:40mg, 5- 30 mg/kg, IM, q 24 h, for 3-5days. S/E, C/I, D/I, D/F, *see* page 299.

###### *plus*

- Dexamethasone 0.5 mg/kg q 24 h during the first 5-7 days of treatment.
    - ✓ S/E: muscle wasting, cutaneous atrophy, telogen arrest of hair follicles and delayed wound healing.
    - ✓ C/I: pregnant animals
    - ✓ D/I: acetazolamide, antidiabetic drugs, barbiturates, phynylbutazone, phynytoin, diuretics
    - ✓ D/F: tablet, 250mcg; Injection, 1mg/ml, 2mg/ml, 5mg/ml
- 

*Note:* Otitis interna usually responds well to long-term antibiotic therapy, but some neurologic deficits (eg, incoordination, head tilt, deafness) may persist for life.

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### **Pneumonia**

Pneumonia is an acute or chronic inflammation of the lungs and bronchi characterized by disturbance in respiration and hypoxemia and complicated by the systemic effects of associated toxins. The primary aetiologic agents include canine distemper virus, adenovirus types 1 and 2, parainfluenza virus, and feline calicivirus that predispose to secondary bacterial invasion of the lungs. Others are parasites such as *Filaroides*, *Aelurostrongylus*, or *Paragonimus* spp., protozoa e.g. *Toxoplasma gondii*, tuberculosis or mycotic pneumonia.

Aspiration pneumonia may result from persistent vomiting, abnormal esophageal motility, or improperly administered medications (eg, oil or barium) or food (forced feeding); it may also follow suckling in a neonate with a cleft palate.

#### ***Clinical Symptoms***

Lethargy and anorexia are common with deep cough. Progressive dyspnea and cyanosis may be evident, especially on exercise. Body temperature is increased moderately, and there may be leukocytosis. Auscultation usually reveals consolidation, which may be patchy but more commonly is diffuse. In the later stages of pneumonia, the increased lung density and peribronchial consolidation caused by the inflammatory process can be visualized radiographically. Complications such as pleuritis, mediastinitis, or invasion by opportunistic organisms may occur.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Diagnosis*

Bacterial culture and sensitivity testing is required and may include anaerobe and mycoplasma culture, especially in refractory cases. A viral etiology generally results in an initial body temperature of 40-41°C. Leukopenia, often expected, may not be seen in many viral respiratory infections (eg, canine infectious tracheobronchitis, feline calicivirus pneumonia, feline infectious peritonitis pneumonia). A history of recent anesthesia or severe vomiting indicates the possibility of aspiration pneumonia. Acutely affected animals may die within 24-48 hr of onset. Mycotic pneumonias are usually chronic in nature.

### *Treatment and Prevention*

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#### **Management**

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Treatment depends on the specific aetiology.

Non-drug treatment

- The animal should be placed in a warm, dry environment.

Drug treatment

- Treatment depends on the specific aetiology refer to each disease.
- If cyanosis is severe, oxygen therapy may be used, administered by means of an oxygen cage, with a concentration of 30-50%.

*plus*

- Aminophylline 10 mg/kg q 8 h until the clinical sign subsides. If no response is seen after 48-72 hr of therapy, the treatment plan should be reassessed.

Antimicrobial therapy:

*First line:*

- *See*, antibiotic treatment for Otitis media and interna

*Alternative*

- Ketoconazole Dogs: 15 mg/kg; cats: 10 mg/kg, PO q 12 h; C/I, S/E, D/I, D/F, *see* page 296.

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*Note:* Animals should be re-examined frequently; atropine sulfate is contraindicated for severe respiratory diseases.

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### **Rabies**

Rabies is an acute viral encephalomyelitis caused by Rhabdoviridae that principally affects carnivores and insectivorous bats, although it can affect any mammal. It is almost invariably fatal once clinical signs appear. Rabies occurs throughout the world. Rabies is endemic to Ethiopia.

No cat-to-cat transmission of rabies has been recorded. Transmission is almost always by introduction of virus-laden saliva into the tissues, usually by the bite of a rabid animal. Contact with fresh wound or even intact mucous membrane may also transmit the disease. Virus may be present in the saliva and transmitted by an infected animal several days before onset of clinical signs (usually 3-5 days in domestic dogs and cats).

#### ***Clinical Symptoms***

Clinical signs of rabies are rarely definitive. The most reliable signs are behavioral changes and unexplained paralysis. Behavioral changes may include anorexia, signs of apprehension or nervousness, irritability, and hyperexcitability. The animal may seek solitude. ataxia, altered phonation, and changes in temperament are apparent. A normally docile animal may suddenly become vicious and the vice versa.

#### ***Clinical phases:***

##### ***Prodromal Form:***

Lasts 1-3 days; animals show only vague CNS signs, which intensify rapidly.

##### ***Furious Form:***

This is the classical “mad-dog syndrome,” the animal becomes irrational and, with the slightest provocation, may viciously and aggressively use its teeth, claws, the posture and expression is one of alertness and anxiety, with pupils dilated. Noise invites attack. Such animals lose all caution and fear of natural

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enemies. Carnivores with this form of rabies frequently roam extensively, attacking other animals and people. Rabid dogs chew the wire and frame of their cages, breaking their teeth, and will follow a hand moved in front of the cage, attempting to bite. Puppies usually become vicious in a few hours. Rabid domestic cats and bobcats attack suddenly, biting and scratching viciously. As the disease progresses, muscular incoordination and seizures are common.

### ***Paralytic Form:***

Paralysis of the throat and masseter muscles, often with profuse salivation and inability to swallow. Drooping of the lower jaw is common in dogs. These animals are not vicious and rarely attempt to bite. The paralysis progresses rapidly to all parts of the body, and coma and death follow in a few hours.

### ***Diagnosis***

Care must be taken when typical clinical features are seen. Immunofluorescence microscopy on fresh brain tissue, mouse inoculation test or tissue culture techniques using mouse neuroblastoma cells (or both) are confirmatory tests.

### ***Treatment***

No treatment for rabies.

### ***Control***

Comprehensive guidelines for control in dogs have been prepared by the World Health Organization and include the following:

- Notification of suspected cases, and destruction of dogs with clinical signs other and dogs bitten by a suspected rabid animal;
- Reduction of contact rates between susceptible dogs by leash laws, dog movement control, and quarantine;
- Mass immunization of dogs by campaigns and by continuing vaccination of young dogs;

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- Stray dog control and destruction of unvaccinated dogs with low levels of dependency on, or restriction by, man; and
- Dog registration.
- Vaccination of dogs and cats with modified live virus and inactivated types.

### Management of Suspected Rabies Cases Exposure of Pets:

Any animal bitten or scratched by a wild, carnivorous mammal not available for testing should be regarded as having been exposed to rabies. Any unvaccinated dog or cat exposed to rabies be destroyed immediately. If the owner is unwilling to do this, the animal should be placed in strict isolation for 6 months and vaccinated against rabies 1 month before release. If an exposed animal is currently vaccinated, it should be *revaccinated immediately* and closely observed for 45 days.

### Exposure of Man:

Any wild carnivore suspected of exposing a person to rabies should be considered rabid unless proved otherwise by laboratory testing. This also applies to “pet” wildlife. Any healthy dog or cat, whether vaccinated against rabies or not, that exposes (bites or deposits saliva in a fresh wound or on a mucous membrane) a person should be confined for 10 days; if the animal develops any signs of rabies during that period, it should be humanely destroyed and its brain promptly submitted for rabies diagnosis. If the dog or cat responsible for the exposure is stray or unwanted, it should be destroyed as soon as possible and submitted for rabies diagnosis.

### **Human Immunization:**

Preexposure immunization is strongly recommended for all people in high-risk groups.

### **Toxoplasmosis**

*Toxoplasma gondii* is a protozoan parasite that infects most species of warm-blooded animals, including birds and man. Members of the cat family are the only known definitive hosts and thus, serve as the main reservoir. Transmission is by ingestion of raw meat, food, contaminated faeces or congenitally. Infection clears due to immunity development.

#### ***Clinical Symptoms***

Toxoplasmosis is usually a subclinical illness. However, in young animals, interstitial pneumonia, myocarditis, hepatic necrosis, meningoencephalomyelitis, chorioretinitis, lymphadenopathy, and myositis are observed. The corresponding clinical signs include fever, diarrhea, cough, dyspnea, icterus, seizures, and death. Finally, systemic signs are observed immunocompromised adult animals.

#### ***Diagnosis***

Available tests include the Sabin-Feldman dye test, complement fixation, direct and indirect hemagglutination, latex agglutination, modified agglutination, ELISA, and indirect fluorescent antibody testing.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

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#### **Management**

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##### Drug treatment

- Clindamycin in dogs, 10-40 mg/kg q 12-24 h, for 2-4 weeks; cats, 25-50 mg/kg, q 12-24 h for 2-4 weeks.
  - ✓D/I: anaesthetics such as enflurane, halothane, isoflurane, methoxyflurane, or neuromuscular blocking agents resulting in respiratory depression or paralysis; chloramphenicol or erythromycin.
  - ✓C/I: hepatic or renal function impairment
  - ✓S/E: sensitivity to lincomycines; in cats, lip smacking in oral solution, salivation.
  - ✓D/F: 25, 75 or 150 mg capsules

or

- Sulfadiazine 73 mg/kg and pyrimethamine 0.44 mg/kg act synergistically.
  - ✓Sulfonamide-related S/E, D/I, D/F, *see* page 118.
  - ✓Pyrimethamine related S/E relate to folate deficiency including agranulocytosis, megaloblastic anemia, and thrombocytopenia; dehydration; gastrointestinal toxicity (diarrhea, occasionally bloody; vomiting); anorexia/decreased appetite; weakness; weight loss

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##### Prevention:

- All infective forms of *T. gondii* are destroyed by dry heat at 65°C, boiling water, iodine, and ammonia.

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*Public health significance: Toxoplasma gondii* may cause abortion in pregnant women and may cause birth defects in the fetuses.

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## **Diseases of the Skin**

### **Dermatophytosis**

Dermatophytosis is an infection of keratinized tissue (skin, hair, and claws) by one of the three genera of fungi *Epidermophyton*, *Microsporum*, and *Trichophyton*. *Microsporum canis* is the most common infection.

#### ***Clinical Symptoms***

Kittens are most commonly affected. Lesions consist of focal alopecia, scaling, and crusting; most infections occur around the ears and face or on the extremities. The hair becomes brittle. Feline miliary dermatitis with pruritis is occasionally observed. In dogs the lesions include alopecia, scaly patches with broken hairs and dogs may also develop regional or generalized folliculitis with papules and pustules.

#### ***Diagnosis***

Direct smear, culture and clinical signs are sufficient; the Wood's lamp is useful in establishing a tentative diagnosis.

***Treatment and Prevention***

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**Management**

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Non-drug treatment

- Dermatophytosis in dogs and shorthaired cats is usually self-limiting, but resolution can be hastened by treatment.

Drug treatment

*First Line:*

- Miconazole 1% solution, q 1-2 h, then q 3-4 h after 3-4 days.

In chronic or severe cases use

- Griseofulvin in dogs 25-100 mg/kg once daily or divided in two doses; in cats 25-50 mg/kg daily, also divided doses. Treatment should continue for 2-4 wk past clinical cure. S/E, C/I, D/F, D/I, *see page 296.*

*Alternative:*

- Ketoconazole 10 mg/kg, continue for 2-4 wk after clinical cure. S/E, C/I, D/F, D/I, *see page 296*

or

- Itraconazole at 5 mg/kg, daily should be continued for 2-4 wk past clinical cure. S/E, C/I, D/F, D/I, *see page 296*
- 

Prophylaxis: Avoid contact with infected pets.

*Public health significance:* It is zoonotic and one has to take care during handling of infected dogs.

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**Fleas and Flea Allergy Dermatitis**

Fleas have piercing mouthparts that they insert into the skin of their host to feed on blood. Species commonly infest dogs and cats: *Ctenocephalides felis* (the cat flea), *C. canis* (the dog flea), *Pulex simulans* (a flea of small mammals), and *Echidnophaga gallinacea* (the poultry sticktight flea). However, by far the most prevalent flea on dogs and cats is *C. felis*.

Fleas cause flea allergy dermatitis, are vectors of typhus-like rickettsiae and intermediate host for filarid and cestode parasites.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

In Flea allergy dermatitis (FAD) pruritus is observed. In dogs, papulocrustous lesions distributed on the lower back, tailhead, and posterior and inner thighs. Dogs may be particularly sensitive in the flanks, caudal and medial thighs, ventral abdomen, lower back, neck, and ears. Affected dogs are likely to be restless and uncomfortable, spending much time scratching, licking, rubbing, chewing, and even nibbling at the skin. Hair may be stained brown from the licking and is often broken off. Common secondary lesions include areas of alopecia, erythema, hyperpigmented skin, scaling, papules, and broken papules covered with reddish brown crusts.

In cats, papule, which often becomes crusted is observed on the back, neck, and face. Pruritus may be severe, evidenced by repeated licking, scratching, and chewing. Cats with FAD can have alopecia, facial dermatitis, exfoliative dermatitis, and “racing stripe” or dorsal dermatitis.

### ***Diagnosis***

History, clinical signs, presence of fleas or flea excrement, results of intradermal testing.

***Treatment and Prevention***

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**Management**

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Drug treatment:

*First line:*

- Microencapsulated chlorpyrifos (*see* accompanying insert for application).
- Permethrin (*see* accompanying insert for application).

*Alternative*

- Non-encapsulated chlorpyrifos (*see* accompanying leaflet for application).

*Second line:*

- Organophosphates, carbamates, pyrethroids, for dosage, S/E, C/I, D/F, D/I, *see* External Parasites of Cattle: Acaricides.

For secondary infection-

- Antibiotics; for dosage, S/E, C/I, D/F, D/I, *see* page 304.

*plus*

- Prednisolone 0.5-1.0 mg/kg daily, tapering the dosage and using alternate-day therapy until the lowest dose possible that still controls the pruritus. S/E, C/I, D/I and D/F *see* page 306.

*Note:* Anti-inflammatory therapy should never be used as a substitute for flea control. Fleas are vectors for zoonotic diseases and control should be implemented.

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## **Pyoderma**

Pyoderma is a pyogenic infection of the skin. Pyodermas are common in dogs but uncommon in cats. Primary pyoderma is usually due to infection with *Staphylococcus intermedius*. Secondary pyoderma occurs after infection of skin lesions with bacteria.

### ***Clinical Symptoms***

*Canine:* Alopecia, follicular papules or pustules, epidermal collarettes, and serous crusts. The trunk, head, and proximal extremities are most often affected and the hairs are easily

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

removed. In severe cases, signs include: erythema, swelling, ulcerations, hemorrhagic crusts, alopecia, and draining tracts with serohemorrhagic or purulent exudate. The bridge of the muzzle, chin, elbows, hocks, interdigital areas, and lateral stifles are more prone to deep infections, but any area may be involved.

*Cats:* alopecia, ulcerations, hemorrhagic crusts, and draining tracts where often indicate other systemic disease, like feline immunodeficiency virus or feline leukemia virus, or atypical mycobacteria may be present.

### ***Diagnosis***

Typical lesions are indicative. Tests for the underlying etiology include a complete blood count, chemistry profile, urinalysis, a thyroid profile, intradermal or serologic allergy testing, a food elimination diet trial for up to 3 mo, biopsies for dermatopathology, immunoglobulin quantitation, low-dose dexamethasone suppression testing, and adrenocorticotrophic hormone (ACTH) stimulation testing.

***Treatment and Prevention***

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**Management**

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Drug treatment:

For superficial pyoderma:

*First line*

- Enrofloxacin 5 mg/kg, PO or SC for  $\geq 21$  days. S/E, C/I, D/F, D/I, *see* page 328

or

- Amoxicillin trihydrate-clavulanic acid 7 mg/kg, IM, q 12 h for  $\geq 21$  days. S/E, C/I, D/F, D/I, *see* page 77.

For chronic, recurrent or deep pyoderma antibiotics:

- Enrofloxacin for  $\geq 8$  wk to resolve completely; *see* above

or

- Amoxicillin trihydrate-clavulanic acid for  $\geq 8$  wk to resolve completely; *see* above

*Second line:*

- Shampoo therapy containing Benzoyl peroxide, povidone-iodine, chlorhexidene, ethyl lactate, and triclosan to remove bacteria, crusts, and scales, as well as reduce the pruritus,

*Public health significance:* Most fleas are zoonotic .

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**Diseases of the Reproductive System**

**Acute Orchitis and Epididymitis**

Acute inflammation or infection of the testis or epididymis may be caused by trauma, infection (fungal, bacterial, or viral), or testicular torsion.

***Clinical Symptoms***

Pain and swelling of the testes, epididymides, and/or scrotum are common signs. There may be wounds or draining tracts in the scrotal skin.

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### ***Diagnosis***

Palpation of scrotal contents for evidence of torsions, foreign material, or focal lesions of the testes or epididymis. Semen should be collected for cytology and for bacterial and mycoplasmal culture. Collection of semen may be difficult in an animal with acute orchiepididymitis. A fine-needle aspirate of the involved testis or epididymis provides material for cytology and culture. A rapid slide agglutination test for *Brucella canis* should be performed.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

###### *First line:*

- Broad-spectrum bactericidal antibiotics, if maintaining fertility is important. *See*, page 304.

or

- Antifungal agents are indicated for fungal infections. *See* page 296.

###### *plus*

- Prednisolone 0.5 mg/kg, IM, daily. S/E, C/I, D/F, D/I, *see* page 306.

or

- Acetylsalicylic acid 10 mg/kg, q 12 h and local hypothermia (ie, cool water packs) may decrease testicular damage caused by local swelling and hyperthermia. S/E, C/I, D/F, D/I, *see* page 330.

*Note:* The prognosis for maintaining fertility is guarded. There is no successful treatment for *B canis* infection. All the antifungal agents interfere with spermatogenesis.

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### **Balanoposthitis**

Inflammation of the penile-preputial mucosa caused by bacteria normally present in the preputial cavity is common in dogs after trauma, lacerations, neoplasia, foreign bodies or mixed

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

infections, or phimosis may result in development of severe balanoposthitis. Balanoposthitis is rare in cats.

### ***Clinical Symptoms and Diagnosis***

Mucopurulent preputial discharge, swelling of the prepuce, and possibly pain are seen. The penis and prepuce should be examined thoroughly for underlying predisposing factors. Bacterial cultures of the preputial cavity, although sometimes difficult to interpret because of the normal flora, are helpful in identifying unusual organisms or antibiotic sensitivities for refractory cases.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- Povidone-iodine douche or sterile saline solution.
- Infusing antibiotic ointment into the preputial cavity for 7-10 days.

*plus*

- Broad-spectrum systemic antibiotic 7-10 days if systemic illness is present; *see* page 304.

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*Note:* Recurrence of mild balanoposthitis is common despite therapy. Castration may be helpful.

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## **Benign Prostatic Hyperplasia**

Benign prostatic hyperplasia is the most common prostatic disorder and is found in most intact male dogs >6 yr old. It is a result of androgenic stimulation or altered androgen /estrogen ratio.

### ***Clinical Symptoms***

There may be no clinical signs, or tenesmus, persistent or intermittent hematuria, and bleeding may occur.

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### ***Diagnosis***

History and physical examination confirmed by radiological examination and cytologic examination of massage or ejaculate specimens and confirmed by biopsy.

### ***Treatment and Prevention***

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#### **Management**

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##### Non-Drug treatment

- Castration is the treatment of choice.

##### Drug treatment

- Megestrol acetate (antiandrogens) 0.55 mg/kg, PO, q 24 h for 10 days
- 

### **Dystocia**

Difficult birth may result from myometrial defects, metabolic abnormalities such as hypocalcemia, inadequate pelvic diameter, insufficient dilation of the birth canal, fetal hormone (corticosteroid) deficiency, fetal oversize, fetal death, or abnormal fetal presentation and posture.

### ***Clinical Signs***

Dystocia should be considered in any of the following situations:

- 1) Parturition does not occur within 24 hr after the drop in rectal temperature 37.7°C;
- 2) Strong abdominal contractions or active labor for 1-2 hr without passage of a puppy or kitten;
- 3) The resting period during active labor exceeds 4-6 hr;
- 4) The bitch or queen is in obvious pain (crying, licking, or biting the vulva);
- 5) There is a black, purulent, or hemorrhagic vaginal discharge;
- 6) There are signs of systemic illness; or
- 7) Gestation is prolonged.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Diagnosis***

- History of pelvic trauma and breeding dates
- A change in the normal dark green color of vaginal discharge at parturition
- Sterile vaginal examination and position of fetus
- Radiography and ultrasonography

### ***Treatment and Prevention***

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#### **Management**

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##### Non-drug treatment

- Forceps may be used (carefully) to remove dead fetuses or to facilitate delivery of malpresented or partially delivered fetuses. Gentle manipulation and adequate lubrication must be used to prevent injury or death to living fetuses. Episiotomy may be helpful.
- Surgery is indicated for obstructive dystocia, if dystocia is accompanied by shock or systemic illness, for primary uterine inertia, when active labor is prolonged, and/or if medical management has failed.

##### Drug treatment

- Indicated if there is proper fetal position and presentation, and in the absence of obstruction. Oxytocin 3-20 u in bitches, 2-5 u in queens, IM up to three times at 30- min intervals, with or without 10% calcium gluconate, 3-5 mL, IV slowly, once.
  - If no response follows, a cesarean section should be performed.
- 

### **Paraphimosis**

It is an inability to completely retract the penis into the preputial cavity after erection and development of a functional phimosis. It is seen most often after semen collection or coitus or due to foreign objects around the penis, a constricting band of hair at the preputial orifice, trauma, or chronic balanoposthitis.

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### ***Clinical Symptoms and Diagnosis***

The exposed penis becomes edematous, dessicated, and painful. If untreated, ulceration, ischemic necrosis, or gangrene may develop. If recognized early, before severe edema and pain develop, paraphimosis is easily treated.

### ***Treatment and Prevention***

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#### **Management**

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Non-drug treatment:

- Cleansing and lubrication of the penis and replacement inside the prepuce by gently sliding the prepuce first in a posterior direction, extruding the penis further
  - Bathing the exposed penis in cold or hypertonic solutions may also help reduce swelling.
  - If the urethra has been damaged, an indwelling urinary catheter may be needed. If necrosis or gangrene is severe, amputation of the penis and prepuce, and castration may be necessary.
- 

### **Phimosis**

The inability to extrude the penis through an abnormally small preputial orifice may be congenital or develop because of inflammation, neoplasia, edema, or fibrosis after trauma, irritation, or infection.

### ***Clinical Symptoms***

Signs are variable. Usually, the problem is unnoticed until the dog attempts to mate and is unable to copulate.

### ***Diagnosis***

Physical examination of the prepuce and penis.

## *Treatment and Prevention*

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### **Management**

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#### Non-drug treatment

- If the dog is not used for breeding, therapy probably is not needed, although castration should be considered to prevent unexpected arousal.
  - Surgical enlargement of the preputial orifice is indicated if the animal is to be used for breeding, if the phimosis contributes to balanoposthitis, or in the unlikely event that phimosis interferes with normal micturition.
- 

### **Pyometra**

Pyometra is a hormonally mediated diestrual disorder characterized by an abnormal uterine endometrium with secondary bacterial infection. Factors associated with occurrence of pyometra include administration of long-lasting progestational compounds to delay or suppress estrus, administration of estrogens to mis-mated bitches, and post-copulation infections. *Escherichia coli* is the most common bacterium isolated in cases of pyometra, although, *Staphylococcus*, *Streptococcus*, *Pseudomonas*, *Proteus* spp, and other bacteria have also been recovered. Pyometra is less common in queens than in bitches. Pyometra can develop in uterine tissue left after ovariohysterectomy (stump pyometra). Pyometra can also occur secondary to postpartum metritis.

#### *Clinical Symptoms*

Clinical signs are seen during diestrus, usually 4-8 wk after estrus, or after administration of exogenous progestins. The signs are variable and include lethargy, anorexia, polyuria, polydipsia, and vomiting. When the cervix is open, a purulent vulvar discharge, often containing blood, is present. When the cervix is closed, there is no discharge and the large uterus may cause abdominal distention. Signs can progress rapidly to shock and death.

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Physical examination reveals lethargy, dehydration, uterine enlargement, and if the cervix is patent, a sanguineous to mucopurulent vaginal discharge. Only 20% of affected animals have a fever. Shock may be present.

### ***Diagnosis***

Diagnosis can be established from the history, physical examination, and abdominal radiography and ultrasonography. Vaginal cytology is often helpful in determining the nature of the vulvar discharge; complete blood count, biochemical profile, and urinalysis is indicated.

### ***Treatment and Prevention***

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#### **Management**

---

##### Non-drug treatment

- Fluid, electrolyte, and acid-base imbalances should be corrected as quickly as possible, before ovariohysterectomy is performed.

##### Drug treatment

###### *First line*

- Penicillin and streptomycin 200,000IU:250mg per ml, 1ml/25 ml, IM, for 14 days. S/E, C/I, D/F, D/I, *see* page 299.

###### *Alternative*

- PGF<sub>2α</sub>, 0.25 mg/kg, SC, q 24 h. for 5 days should be used in the bitch and queen. Synthetic analogs (eg, cloprostenol, fluprostenol, and prostalene)
- Broad-spectrum, bactericidal antibiotics, chosen on the basis of culture and sensitivity tests, should be given for ≥2 wk, *see* page 304.
- 1% iodine solution, daily vaginal douches are beneficial in promoting vaginal drainage, cervical dilation, and uterine evacuation.

*Note:* Oral antibiotics after ovariohysterectomy. The animal should be re-examined 2 wks after completion of medical therapy.

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## **External Parasites**

### **Mites**

#### **Demodex**

##### **1. Canine demodex**

This common skin disease of dogs occurs only when large numbers of *Demodex canis* mites inhabit hair follicles, sebaceous glands, or apocrine sweat glands. The mites are transmitted from dam to puppies during nursing within the first 72 hr after birth, but they are not contagious. *Demodex canis* and *D. cati* are normal inhabitants of dogs and cats, respectively but may cause clinical disease if animals suffer from immunosuppression, natural or iatrogenic. Other factors known to predispose to generalized demodicosis include systemic disease, estrus, and heartworm infection.

#### ***Clinical Symptoms***

There are two clinical forms; localized demodicosis occurs in dogs <1 yr old, and 90% of these cases are thought to resolve spontaneously. Lesions consist of areas of focal alopecia and erythema. A percentage of these cases will progress to the generalized form. In second form, generalized alopecia, papules, pustules, and crusting are observed. Lesions are usually aggravated by secondary bacterial infections, and pododermatitis is common. Dogs can have systemic illness with generalized lymphadenopathy, lethargy, and fever when deep pyoderma, furunculosis, and draining tracts are seen.

#### ***Diagnosis***

Deep skin scrapings reveal mites, eggs, and larval forms in high numbers. in cats with generalized disease. Dermatophyte cultures are essential, because dermatophytosis and demodicosis can be concurrent conditions.

***Treatment and Prevention***

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**Management**

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Drug treatment:

- Amitraz dips 0.025%, every 2 weeks after clipping the entire hair coat, and a benzoyl peroxide shampoo applied for its follicular flushing activity before the dip is applied.
  - The secondary bacterial infection must be treated with the appropriate antibiotic; *see*, page ... treatment of pneumonia.
- 

**2. Feline demodex**

*Demodex cati* is thought to be a normal inhabitant of feline skin follicles but causes disease in animals with immunosuppression. Another unnamed demodex species is found only in the stratum corneum of cats. Feline demodicosis is uncommon.

***Clinical Symptoms***

In localized demodicosis, there are one or several areas of focal alopecia on the head and neck. In generalized disease, alopecia, crusting, and secondary pyoderma of the whole body are seen. The generalized form has also been associated with other systemic disease, especially diabetes mellitus. In some cases, ceruminous otitis externa has been the only clinical sign. Pruritus is variable.

***Diagnosis***

Examination of skin scraping and medical evaluation is indicated in cats with generalized disease.

***Treatment and Prevention***

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**Management**

---

Drug treatment

- Amitraz, 0.025-0.05% can be used
    - ✓ S/E: In cats, it may cause anorexia, depression, and diarrhea.
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Notoedres**

This rare, highly contagious disease of cats and kittens is caused by *Notoedres cati*, which can opportunistically infest other animals, including man. The mite and its life cycle are similar to the sarcoptic mite.

#### ***Clinical Symptoms***

Pruritus is severe. Crusts and alopecia are seen, particularly on the ears, head, and neck, and can become generalized.

#### ***Diagnosis***

It is based on clinical signs and identification of mites in skin scraping.

#### ***Treatment and Prevention***

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##### ***Management***

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Drug treatment

- Amitraz spray, 0.025% as sarcoptic mange.
- 

*Zoonotic importance: Notoedres cati* is zoonotic and care should be exercised when handling infested cats.

---

### **Sarcoptes**

*Sarcoptes scabiei* subspecies *canis* infestation is a highly contagious disease of dogs. The mites are fairly host-specific, but animals (including man) that come in contact with infested dogs can also be affected.

#### ***Clinical Symptoms***

Asymptomatic carriers may exist. Intense pruritus is characteristic. Primary lesions consist of a papular eruption that, due to self-trauma, develops thick crusts with secondary bacterial infection. Typically, lesions start on the ventral abdomen, chest, ears, elbows, and legs and, if untreated, become generalized. Dogs with chronic, generalized disease develop severe thickening of the skin with fold formation and crust

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

buildup, peripheral lymphadenopathy, and emaciation; dogs so affected may even die.

### ***Diagnosis***

It is based on the history of severe pruritus of sudden onset, several extensive superficial scrapings at different sites, and fecal flotation to reveal mites or eggs.

### ***Treatment and Prevention***

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#### **Management**

---

Drug treatment

#### ***First line***

- The hair should be clipped, the crusts and dirt removed by soaking with a good antiseborrheic shampoo.

*plus*

- Amitraz, 0.025%

*plus*

- Prednisolone 0.5-1mg/kg, PO
- 

### **Tick Infestation**

For description, diagnosis, treatment and control *see* ticks in cattle. For dosages, *see* the label on the container of acaricides or mite treatment above.

## **DISEASES OF FISH**

### **Introduction**

Fish are the most diverse group of vertebrates occupying a variety of marine and freshwater habitat. They are cold-blooded or poikilothermic animals, their body temperature varying passively in accordance with the temperature of the surrounding water. Although fish as a group are tolerant of a wide range of temperatures, from just below 0°C up to 45°C, individual species generally have a preferred optimum, as well as a more restricted temperature range.

Water is the most important constituent in which fish are stocked, fed and raised and into which their waste products are voided. Changes in the environment affect fish more rapidly and profoundly than terrestrial animals.

The adoption of the aquatic habit has many implications for the structure and physiology of fish. The 800-fold higher density of water, when compared with air, makes the streamlining and shaping of the body an important prerequisite for successful aquatic life.

The respiratory system assumes a greater significance for fish compared to terrestrial animals because water contains about 1/20<sup>th</sup> of the oxygen available in air, a proportion that is reduced still further by such factors as an increase in water temperature and/or ionic concentration.

Each species of fish has preferred ranges for the various parameters of water quality, such as temperature, dissolved oxygen and salinity and ideally the fish farm should operate at the optimum levels of each parameter to achieve fast growth and

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

efficient performance. However, in considering water quality, it is necessary to bear in mind that the various parameters interact with each other and also that the fish's preferred range and optimum requirement like water temperature or dissolved oxygen will vary considerably over its life cycle and depend on the type of species under culture.

Selecting the wrong treatment because of misdiagnosis is a waste of time and money and may be more detrimental to the fish than no treatment at all. In addition it enhances development of drug resistance to the already available limited number of antimicrobial and other chemical agents.

Therefore, the best cure for any fish health problem is prevention. Good water quality management and proper fish husbandry techniques will eliminate most parasites and other health problems.

### **Water Quality Diseases**

#### **Algal Blooms**

Algae that proliferate rapidly may cover the surface of the water and lower oxygen levels due to increased photosynthesis resulting in aerobic conditions. The fish die at night. Various anaerobic products accumulate such as H<sub>2</sub>S or methane, which are themselves toxic to fish. Certain algal species also produce lethal toxins. Fish die during the day where photosynthesis occurs.

#### ***Clinical Symptoms***

The toxin (prymnesin) is thought to alter gill membrane permeability and hence cause loss of ionoregulation. There is mortality also.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and prevention*

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#### **Management**

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##### Drug treatment

- Copper sulfate 0.1kg/m<sup>2</sup>, treat empty pond bottom
- 

##### Prevention

- Use copper sulfate as above it is effective up to 1 year but expensive for large ponds

*Public health significance:* Although *Ciguatera* toxin is not toxic to fish, humans are highly susceptible.

---

### **Alkalinity, Hardness, Salinity and pH**

Alaklinity or the buffering ability of water is due to carbonates, bicarbonates and hydroxides and freshwater from limestone areas typically is well buffered, as in seawater. Waters with a good buffering capacity generally have a stable pH, and are able to resist agricultural or domestic pollution.

Water hardness is expressed as equivalent calcium carbonate and classified as:

- 0 – 50 ppm - soft
- 50 – 150 ppm - medium hard
- 150 – 300 ppm -hard

Soft water is usually acidic, and hard alkaline and each species has its own preference of pH.

The optimum pH for most fresh water fish species;

- pH > 11 is lethal to all fish
- pH 10 – 11 is lethal to most fish species if exposed over long period of time.

Sub-lethal effects may include gill damage and damage to the lens and cornea of the eye.

The addition of acid waste to hard water, acid rain metal smelting and other industrial waste result in acidic pH. This affects aquatic life.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

- pH < 4.0 induces direct mortality to many fish species.
- pH 0 – 5.0 induces sub-lethal effect of loss of body salts, gill damage, reduced spawning success, poor growth and lowered resistance to disease.

The remedy for this is flushing ponds with salt water.

### ***Clinical Symptoms***

The effects have been acute mortality, reduced growth, skeletal deformities but especially reproductive failure. Aluminum toxicity (in the hydroxyl form) is highest at pH 5.0 and causes increased bronchial mucous production and hyperplasia.

Acute toxicity of acid results from gill damage, with lamellar epithelial edema and necrosis, plus possibly plasma electrolyte imbalance due to a failure of ionoregulation.

### ***Treatment and prevention***

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#### **Management**

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##### Drug treatment

- Liming 20mg/l CaCO<sub>3</sub>, addition of acid water supplies (HCl and H<sub>2</sub>SO<sub>4</sub>) in small amounts and monitor pH for rapid pH fluctuation.

---

##### Prevention

- Increase the pH by addition of lime or by running the hatchery water through beds of chalks chips.
- 

### **Ammonia Toxicity**

Ammonia is usually the second most important water quality parameter after dissolved oxygen. Toxicity occurs during overcrowding, or where for example, chicken slurry is added to the water. Young fish are relatively quite susceptible. Free ammonia (NH<sub>3</sub>) is highly toxic, whereas bound ammonia NH<sub>4</sub><sup>+</sup> is much less so.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

Free ammonia increases in alkaline water or at high temperature where as elevated calcium levels (seawater, hard water areas) increase the tolerance of fish to ammonia.

### ***Clinical Symptoms***

Epithelial hyperplasia of the gills, thus effectively increasing the diffusion distance to O<sub>2</sub>, meningeal proliferation in young minnows and affects the ability of haemoglobin to bind oxygen.

### ***Treatment and prevention***

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#### **Management**

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Drug treatment

- Salt treatment 200 – 300kg/1600m<sup>2</sup>

Prevention

- Monitoring the pH of the water regularly.
  - Increase salinity and dissolved oxygen and high carbon dioxide concentration are high.
  - Remove left over feeds and other organic wastes.
  - Good pond management.
  - Control protein diets fed to fish in intensive culture.
- 

### **Carbon Dioxide Toxicity**

Fish hemoglobin is highly sensitive to free CO<sub>2</sub>. High environmental levels correlate with nephrocalcinosis in intensively cultured salmonids. This is a condition, which is common when liquid O<sub>2</sub> is used to boost holding capacities of water.

### ***Clinical Symptoms and Lesions***

Lesions comprise mineral within renal interstitium and tubules, often leading to severe granulomatous inflammation and cystic dilation of tubules. Muscles dorsal to the kidney are also involved in severe cases. Lamina propria of stomach is usually

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

involved, often before renal lesions. The condition reduces feed conversion efficiency, but causes apparently little else.

### ***Treatment and prevention***

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#### **Management**

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Drug treatment

- No specific treatment

Prevention

- Aerate the water supply to blow off the unwanted excess gas.
- Correct stocking, feeding and fertilization to control phytoplankton populations and organic loading

*Note:* Fish are able to detect and respond to carbon dioxide gradients and may avoid free CO<sub>2</sub> levels as low as 1-6 mg/liter at the other extreme it has been observed that they can acclimatize to levels as high as 60 mg/liter.

---

## **Chlorine Toxicity**

Chlorine added to water for sanitation from industrial process such as textile could be toxic to fish.

At pH 6, 96% of dissolved chlorine is present as the acid HOCl (hypochlorous acid) which is highly toxic producing gill necrosis. The toxicity is aggravated by the presence of nitrogen compounds such as ammonia resulting in chloramines.

### ***Treatment and prevention***

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#### **Management**

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Drug treatment

- Removal of chlorine and chloramines by adding fresh charcoal or natural clays (zeolites)

Prevention

- Aerate the water vigorously
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### **Electrocution**

Lightening may cause massive fish kills in hard water than soft water.

#### *Clinical Symptoms*

Massive fish kill.

#### *Treatment and prevention*

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#### **Management**

---

Drug treatment

- No treatment

Prevention

- Control water quality
- 

### **Heavy Metal Toxicity**

Heavy metals can occur in high concentrations in natural waters near mineral deposits, but usually present only in trace amounts. Cadmium and copper are extremely toxic to fish, especially in soft water of low oxygen content.

Zinc has a similar action but in addition, scoliosis is seen, possibly due to a myelopathy, which causes darkening as well.

Mercury causes bronchial changes but also renal tubular changes due to increased permeability of cell membrane and impaired mitochondrial ATP production cell death.

#### *Clinical Symptoms*

Damage to the gills is prominent with lamellar fusion and edema as early as 24 hours after exposure. Myelopathy and darkening of the muscle can also be seen.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Treatment and prevention***

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#### **Management**

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Drug treatment

- No specific treatment

Prevention

- Regular water quality monitoring is essential.
- 

### **High Temperature**

High temperature is important in both the farming situation and fancy fish keeping, which causes stressful conditions. While metabolic rates alter with varying water temperature (roughly doubling for each 10<sup>0</sup>C) this does not happen immediately. The fish will grow faster in warmer water. In general, fish will tolerate a temperature drop better than a rise. Some species osmoregulate better than others.

### ***Clinical Symptoms***

Higher temperatures cause an increased metabolic rate and hence an increased oxygen demand. Fish appear more susceptible to bacterial diseases in conditions of rising water temperatures. Therefore, it reduces the survival time of fish in pollutants and the toxicity of heavy metals is enhanced.

### ***Treatment and prevention***

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#### **Management**

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Drug treatment

- No specific treatment

Prevention

- Temperature should be maintained within the normal range required.
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### **Nitrate Toxicity**

Nitrate is formed by the complete oxidation of ammonia. It is naturally present sometimes in high concentrations in surface waters and in fish farms.

#### ***Clinical Symptoms***

They are considered essentially non-toxic although they do enhance the net productivity of aquatic systems, and under some situations may promote massive algal blooms.

#### ***Treatment and prevention***

See nitrite toxicity treatment.

### **Nitrite Toxicity**

This is an intermediate product in the biological oxidation of ammonium to nitrate, a process, which is carried out naturally and by the bacteria in biological filters.

- *Nitrosomonas* spp. converts ammonia to nitrite.
- *Nitrobacter* spp. converts nitrite to nitrate.

Alkaline conditions have a greater inhibiting action on *Nitrobacter* than on *Nitrosomonas* spp. Alkaline water (seawater) increases the nitrite levels.

Nitrite levels may be high; if sewage discharge, metals, dyes and celluloids manufacturing contaminate the water. Nitrite level in fresh water 100 ppb, in hard water is 200 ppb but high (up to 50x) in seawater. Oxygen levels affect nitrite toxicity because of the reduced carrying capacity of the blood. Similarly, temperature has an effect because of the increased demand for oxygen with a decreasing availability.

#### ***Clinical Symptoms***

Nitrite oxidizes the iron in haemoglobin to methaemoglobin and this pigment lacks the ability to bind reversibly to oxygen leading to “*chocolate blood disease*” of channel catfish farms.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and prevention*

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#### **Management**

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##### Drug treatment

- Sodium chloride to ponds at 250 mg/l

##### Prevention

- Correct stocking, feeding and fertilization practices and keeping ponds well oxygenated.
  - Biofiltration (biological conversion of nitrite to harmless nitrate).
- 

### **Pesticides and Herbicides**

Insecticides and weed killers are often a problem since they usually contain organophosphorous and organochloride compounds, which are highly toxic. They are obtained from insecticide dips that frequently enter hill streams causing fish kills. Toxicity depends on water chemistry, temperature and pH, and age and size of the fish.

#### Comparison of 96 hour LC50-s to OP-s given in mg/L

---

<b>Pesticide</b>	<b>Invertebrates</b>	<b>Fish</b>
Malathion	49	162
Ethyl parathion	24	1391
Methyl parathion	11	5411
Diazinon	7	640
Chlorpyrifos	4	81

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### *Treatment and prevention*

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#### **Management**

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##### Drug treatment

- No specific treatment

##### Prevention

- Avoid contamination of fishponds or water sources used for fish farm supply.
-

### **Oxygen Depletion**

The efficiency of extraction by the gills is high; at 15<sup>0</sup>C one litre of fresh water contains 7 cc O<sub>2</sub> and seawater even less as compared to almost 2 litre volumes present in air. In warm or polluted waters, O<sub>2</sub> levels are low. The energy required for ventilation exceeds that released by the O<sub>2</sub> so obtained. In general small fish have higher requirements than older and larger ones. A minimum of 5 mg/l is considered a satisfactory level.

#### *Clinical Symptoms*

There is respiratory distress syndrome, increased metabolic rate, appetite also increases and it is also demonstrated by gathering at inlets or by gasping at the surface and by decreased activity.

#### *Treatment and prevention*

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##### **Management**

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Drug treatment

- Super phosphate, spread over pond surface, 10 – 20 kg/Ha

Prevention

- Oxygen should be maintained within the normal range required.

*Note:* Reduce N: P ratio from 5:1 down to 2:1.

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### **Supersaturation**

Rapid increases in water temperature or reduced pressure may lead to a situation of supersaturation. Both of these may be seen when water from a tap is used to fill domestic aquarium. Supersaturation may also be seen in the wild associated with very rapid photosynthesis by plants and algae, or more commonly in an intensive culture operation, associated with leaky valves or pumps, in those farms where pumping is a

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

feature (air is forced under pressure into the water supply - so called Venturi principle).

### ***Clinical Symptoms***

There is a gas bubble disease where it causes emboli in the vessels of the gills pseudobranch, choroid gland and elsewhere. A candling procedure may be found advantageous in diagnosing the condition.

### ***Treatment and prevention***

---

#### **Management**

---

Drug treatment

- No specific drug treatment

Prevention

- Vigorous aeration or agitation of the incoming water, or replacement of the leaky valves, are considerations in curing the condition.
- 

### **Suspended Solids**

Suspended solids are solid materials present in the water retained on a fine filter paper after filtration of the water sample. They originate from flooding from catchments, phytoplankton blooms, uneaten food particles, various waste and inorganic clays. Non-inert inorganics may absorb substances such as heavy metals, pesticides or ammonia, and present these to the gill surface. Organic particles are more of a problem than inorganic.

### ***Clinical Symptoms***

Definite effects of suspended solids include; settling on eggs and young larvae and possibly suffocating them; reducing light penetration and therefore abundance of food; modifying behavior patterns and natural movements and gill damage cause excessive mucous production and coughing.

### *Treatment and prevention*

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#### **Management**

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##### Drug treatment

- Ponds with persistent turbidity; apply alum 25 – 45 kg/ha.

##### Prevention

- Filtration of the incoming water
  - Soil analysis prior to site selection for the construction of ponds
- 

## **Freshwater Fish Parasitosis**

### **Cestode Infection**

Cestodes use fish as the primary or intermediate host. They infect the alimentary tract, muscle or other internal organs. Larval cestodes called plerocercoids are some of the most damaging parasites to freshwater fish when affecting vital organs such as brain, eyes or the heart.

#### *Diagnosis*

It can be done by its signs and identifying its characteristic egg.

### *Treatment and prevention*

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#### **Management**

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##### Drug treatment

- Praziquantel at 2-10 mg/L for 1 to 3 h in a bath, for *ornamental* fish.
- No successful treatment for plerocercoids.

##### Prevention

- Ponds can be disinfected to eradicate the intermediate host, the copepod.
-

### **Leech Infestation**

Leeches are occasionally seen in wild and pond-raised fish. They have a direct life cycle with immature and mature worms being parasitic on host's blood. Heavily infested fish often have chronic anemia. Fish may develop secondary bacterial and fungal infections at the attachment site. Leeches have anterior and posterior suckers.

#### *Clinical Symptoms*

Chronic anaemia and secondary infection at the point of attachment are common.

#### **Diagnosis**

Visual inspection.

#### *Treatment and prevention*

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#### **Management**

---

Non drug treatment

- Manual removal.

Drug treatment

- 3% salt dip for leeches in fresh water
- For ponds, drain and treat with chlorinated lime, followed by several weeks of drying.
- Organophosphorus compounds like 'Dipterex', 'Trichlorofon' are used *see* treatment for Lernaea.

*Precaution:* Rubber gloves and protective clothing should be used.

---

### **Nematode Infections**

Nematodes, also called roundworms, occur worldwide in all animals. Three common nematodes affecting fish are described.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Camillanus**

*Camillanus* is easily recognized as a small thread-like worm protruding from the anus of the fish.

#### ***Clinical Symptoms***

Signs of nematodiasis include anemia, emaciation, unthriftiness and reduced vitality.

#### ***Diagnosis***

Based on clinical signs and identification of the parasite.

#### ***Treatment and prevention***

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##### **Management**

---

Drug treatment

- Fenbendazole (using gelatin as a binder) at 0.25% in food, 3 times/day, repeat in 3 weeks.
- 

### **Capillaria**

*Capillaria* is a large roundworm commonly found in the gut of angelfish, often recognized by its double operculated eggs in the female worm. Heavy infestations are associated with debilitated fish, but a few worms per fish may be benign.

#### ***Clinical Symptoms***

See above (treatment for *Camillanus*)

#### ***Diagnosis***

It is characterized by identifying its egg.

#### ***Treatment and prevention***

---

##### **Management**

---

Drug treatment

- See above. (Treatment for *Camillanus*)
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Eustrongylides**

*Eustrongylides* is a nematode that uses fish as its intermediate host. The definitive host is a wading bird, a common visitor to ponds. The worm encysts in the peritoneum or muscle of the fish and appears to cause little damage. Because of the large size of the worms infected fish may appear unsuitable for retail sales.

#### ***Clinical Symptoms***

See above (symptoms for *Capillaria*).

#### ***Diagnosis***

By identifying the parasite from the skin.

#### ***Treatment and prevention***

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##### **Management**

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##### **Prevention**

- Protecting fish from wading birds and eliminating the intermediate host, the oligochaete or Tubifex (soft-bodied worms), are the best means to prevent infection.
- 

### **Parasitic Crustacea Infection**

Parasitic crustacea are increasingly serious problems in cultured fish and can impact wild populations. Most parasitic crustacea of freshwater fish can be seen with the naked eye as they attach to the gills, body and fins of the host. Three most important genera are discussed below.

#### **Ergasilus**

*Ergasilus* are often incidental findings on wild or pond-raised fish and probably cause few problems in small numbers. However, their feeding activity causes severe focal damage and heavy infestations can be debilitating. Most affect the gills of freshwater fish, commonly seen in warm weather.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Deblitiation and secondary bacterial or fungal infection

### ***Treatment and prevention***

---

#### **Management**

---

Drug treatment

- A 3% salt dip, followed by 0.2 %-prolonged bath for 3 weeks.
- 

### **Lernaea**

*Lernaea*, also known as anchor worm, is a common parasite of goldfish and koi. The copepod attaches to the fish, mates, and the male dies. The female then penetrates under the skin of the fish and differentiates into an adult.

### ***Clinical Symptoms***

Debilitation and secondary bacterial or fungal infection may occur.

### ***Treatment and prevention***

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#### **Management**

---

Drug treatment

- A 3% salt dip, followed by 0.2 %-prolonged immersion to control it in goldfish and koi ponds.
- or
- Organophosphorus compounds like ‘Dipterex’, ‘Trichlorofon’ are used.
  - ✓ In permanent bath 0.25 – 0.5 ppm (0.1 ppm in coldwater ponds), 4 Treatments at 5 – 7 days intervals
  - ✓ Dip 1% 2- 3 minutes
  - ✓ Rapid breakdown in warmwater, use 0.5 ppm at temperatures over 27°C. Adults life span is 20 days at 25 °C).

*Note:* rubber gloves and protective clothing should be used.

---

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Argulus**

*Argulus* or fish louse is a large parasite that attaches to the external surface of the host and can be easily seen with the unaided eye. *Argulus* is uncommon in freshwater aquarium fish but may occur if wild or pond-raised fish are introduced into the tank. It is especially common on goldfish and koi.

#### ***Clinical Symptoms***

Deblitation and secondary bacterial or fungal infection.

#### ***Treatment and prevention***

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#### **Management**

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Non drug treatment

- Remove manually by forceps.

Drug treatment

- Salt, *see* above (treatment for *Lernaea*)
  - Organophosphorus compounds, *see* above (treatment for *Lernaea*).
- 

### **Protozoa Infections**

#### **Ciliates**

Ciliates have a direct life cycle and many are common inhabitants of pond-reared fish. Most species do not seem to bother host fish until numbers become excessive. Many of the parasites proliferate in organic debris accumulated in the bottom of a tank or vat. Nets, hoses, or caretakers' wet hands easily transmit ciliates from tank to tank. Typical symptoms of ciliates include skin and gill irritation displayed by flashing, rubbing, and rapid breathing.

The most common ciliates are:

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### White Spot Disease

It is caused by *Ichthyophthirius multifiliis*. It is called ‘Itch’.

#### *Clinical Symptoms*

Small blister-like raised lesions develop along the body wall and/or fins. If the infection is restricted to the gills, the gills will appear swollen and be covered with thick mucus without white spots.

#### *Diagnosis*

Identification of the parasite on the gills, skin, and/or fins is definitive. Classically, *I. multifiliis* is identified by its large horseshoe-shaped macronucleus.

#### *Treatment and prevention*

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#### Management

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##### Drug treatment

- Malachite green and formalin, 3 treatments on alternate days at 20<sup>0</sup>C (7 day intervals at 10<sup>0</sup>C); for applications, *see* page 381.
- 

### *Chilodonella*

*Chilodonella* is a ciliated protozoan that causes infected fish to secrete excessive mucus. Infected fish may flash and show similar signs of irritation. Many fish die when infestations become moderate (five to nine organisms per low power field on the microscope) to heavy (greater than ten organisms per low power field).

#### *Clinical Symptoms*

Common signs are excessive mucus secretion, irritation and many fish died.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Diagnosis***

Examine scrapings of skin mucus or gill filaments microscopically.

### ***Treatment and prevention***

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#### **Management**

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Drug treatment

- Formalin short-term bath and saltfor (*see* page 381).
- 

### ***Tetrahymena***

*Tetrahymena* is a protozoan commonly found living in organic debris at the bottom of an aquarium or vat. *Tetrahymena* is a teardrop-shaped ciliate that moves along the outside of the host.

### ***Clinical Symptoms***

Exophthalmia (markedly enlarged eyes) is common symptom.

### ***Diagnosis***

Identification of *Tetrahymena* internally is a significant.

### ***Treatment and prevention***

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#### **Management**

---

Drug treatment

- Formalin short-term bath and saltfor (*see* page 381).
- 

### ***Trichodina***

*Trichodina* is one of the most common ciliates present on the skin and gills of pond-reared fish. Low numbers (less than five organisms per low power field) are not harmful, but when fish are crowded or stressed, and water quality deteriorates, the parasite multiplies rapidly and causes serious damage.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Typically, heavily infested fish do not eat well and lose condition. Weakened fish become susceptible to opportunistic bacterial pathogens in the water.

### ***Diagnosis***

*Trichodina* can be observed on scrapings of skin mucus, fin, or on gill filaments. Its erratic darting movement and the presence of a circular, toothed disc within its body easily identify it.

### ***Treatment and prevention***

---

#### **Management**

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Drug treatment

- Salt solution, *see* page 373.
- 

### ***Ambiphyra***

*Ambiphyra*, previously called *Scyphidia*, is a sedentary ciliate that is found on the skin, fins, or gills of host fish. It is common on pond-reared fish, and when present in low numbers (less than five organisms per low power field), it is not a problem.

### ***Clinical Symptoms***

Debilitation associated with deteriorated water quality.

### ***Diagnosis***

Its cylindrical shape, row of oral cilia, and middle bank of cilia identify *Ambiphyra*.

### ***Treatment and prevention***

---

#### **Management**

---

Drug treatment

- Formalin, for applications *see* page 381.
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Apiosoma***

*Apiosoma*, formerly known as *Glossatella*, is another sedentary ciliate common on pond-reared fish. *Apiosoma* can cause disease if their numbers become excessive. The organism can be found on gills, skin, or fins.

#### ***Diagnosis***

The vase-like shape and oral cilia are characteristic.

#### ***Treatment and prevention***

---

##### **Management**

---

Drug treatment

- Formalin, for applications *see* page 381.
- 

### ***Epistylis***

*Epistylis* is a stalked ciliate that attaches to the skin or fins of the host. *Epistylis* is of greater concern than many of the ciliates because it is believed to secrete proteolytic ("protein-eating") enzymes that create a wound, suitable for bacterial invasion, at the attachment site.

#### ***Clinical Symptoms***

Wounds dispersed on the skin and fins.

#### ***Diagnosis***

It is similar in appearance to *Apiosoma* except for the non-contractile long stalk and its ability to form colonies.

#### ***Treatment and prevention***

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##### **Management**

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Drug treatment

- Salt solution, for applications *see* page 373.
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Capriniana*

*Capriniana*, historically called *Trichophyra*, is a sessile ciliate that attaches to the host's gills with a sucker.

#### *Clinical Symptoms*

In heavy infestations, *Capriniana* can cause respiratory distress in the host.

#### *Diagnosis*

They have characteristic cilia attached to an amorphous-shaped body.

#### *Treatment and Prevention*

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##### Management

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Drug treatment

- Formalin short-term bath and saltfor (see page 381).
- 

#### *General Treatment and Prevention of Ciliates*

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##### Management

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Drug treatment

- Copper sulfate 2 mg/liter, against ciliates in ponds to control external parasites and algae.
    - ✓ S/E: copper sulfate can cause dangerous oxygen depletions, particularly in warm weather since it has algicidal activity
    - ✓ C/I: in total alkalinity less than 50 mg/L
  - Potassium permanganate, 2 mg/liter, against ciliates as well as fungus and external columnaris bacteria, and it can be used in a pond or vat.
    - ✓ S/E: multiple treatments can burn gills and it is algicide.
  - Formalin is excellent parasiticide for use in small volumes of water such as vats or aquaria.
    - ✓ C/I: pond use because it is a strong algicide and chemically removes oxygen from the water.
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

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- Salt effectively controls protozoans on the gills, skin, and fins of fish. This is an effective treatment for small volumes of water such as aquaria or tanks.
  - ✓ S/E: not recommended to ponds, as a treatment needs large amount of salt and high cost.
  - ✓ C/I: on fish that navigate by electrical field such as knifefish and elephant nose fish.
- 

### Prevention

- Improve water quality and sanitation.
-

**Standard Veterinary Treatment Guidelines for Veterinary Clinics**

Table 9. The chemicals for treatment and control of ciliates and those that should not be used for this type of treatment are indicated by “X”.

<b>Chemical</b>	<b>Dip</b>	<b>Short-term Bath</b>	<b>Prolonged Immersion</b>
Copper sulfate	X	X	total alkalinity/100 (up to 2.5 mg/L), Do not use if total alkalinity < 50 mg/L
Potassium permanganate	X	10 mg/L, 30 min	2 mg/L
Malachite green		0.1 ppm, for 1 h	1 ppm, for 1 h
Formalin	X	150--250 mg/L, 30 min	15-25 mg/L (2 drops/gallon or 1 mL/10 gallons)
Salt	3%, duration is species dependent.	1%, 30 min to 1 hr, species dependent	0.02--0.2%

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

*Note:* Before applying treatment on large number of fish, a bioassay should be conducted in a small area.

### **Flagellates**

Flagellated protozoans are small microscopic parasites that can infect fish externally and internally.

#### ***Hexamita / Spiroucleus***

*Hexamita* is an intestinal parasite commonly found in the intestinal tract of freshwater fish. Recent taxonomic studies have labeled the intestinal flagellate of freshwater angelfish as *Spiroucleus*.

#### ***Clinical Symptoms***

Sick fish are extremely thin and the abdomen may be distended. The intestines may contain a yellow mucoid (mucus-like) material.

#### ***Diagnosis***

Make a squash preparation from the intestine and examine it at 200 or 400x magnification. The flagellates move by spiraling.

#### ***Treatment and prevention***

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##### **Management**

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###### Drug treatment

- Metronidazole, in a bath at a concentration of 5 mg/L (18.9 mg/gallon), q 48 h, for 3 treatments.
  - Medicated feed is even more effective at 50 mg/kg, (or 10 mg/gm food) q 24 h for 5 days.
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Ichthyobodo***

*Ichthyobodo*, formerly known as *Costia*, is a commonly encountered external flagellate. *Ichthyobodo* can be located on the gills, skin, and fins; however, it is difficult to identify because of its small size.

### ***Clinical Symptoms***

Infected angelfish also produce excessive mucus that can give dark colored fish a gray or blue coloration along the dorsal body wall. Infected fish flash and lose condition, often characterized by a thin, unthrifty appearance.

### ***Diagnosis***

Microscopically identify *Ichthyobodo* by its corkscrew swimming pattern.

### ***Treatment and prevention***

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#### **Management**

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##### Drug treatment

- Formalin, Bath, Flush or flowing treatment; for applications *see* page 381.
- 

### ***Piscinoodinium***

*Piscinoodinium* is a sedentary flagellate that attaches to the skin, fin, and gills of fish. The common name for *Piscinoodinium* infection is "Gold Dust" or "Velvet" Disease. *Piscinoodinium* is most pathogenic to young fish. The life cycle of this parasite can be completed in 10-14 days at 73-77°F, but lower temperatures can slow the life cycle.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

The parasite has an amber pigment, visible on heavily infected fish. Affected fish will flash, go off feed, and die. There is amber pigment on the skin.

### ***Diagnosis***

Identification and signs on the skin.

### ***Treatment and prevention***

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#### **Management**

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Drug treatment

- Repeated treatment of chemicals is required.
  - For non-food species, chloroquin (10mg/L prolonged bath)
  - Acriflavine 0.2 – 0.4 ppm in water
- 

### ***Cryptobia***

*Cryptobia* is a flagellated protozoan common in cichlids. *Cryptobia* typically is associated with granulomas, in which the fish "walls off" the parasite. These parasites have been observed primarily in the stomach, but may be present in other organs.

### ***Clinical Symptoms***

Fish afflicted with *Cryptobia* may become thin, lethargic and develop dark skin pigmentation.

### ***Treatment and prevention***

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#### **Management**

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Drug treatment

- Malachite green and Formalin (*see* page 381 for applications).
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Myxozoa*

Myxozoa are parasites that are widely dispersed in native and pond-reared fish populations. Most infections in fish create minimal problems, but heavy infestations can become serious, especially in young fish. Myxozoans are parasites affecting a wide range of tissues.

#### *Clinical Symptoms*

Clinical signs vary, depending on the target organ. For example, fish may have excess mucus production, observed with *Henneguya* infections.

White or yellowish nodules may appear on target organs. Chronic wasting disease is common among intestinal myxozoans such as with *Chloromyxum*. "Whirling disease" caused by *Myxobolus cerebralis* has been a serious problem in salmonid culture.

#### *Diagnosis*

Spores can be observed in squash preparations of the affected area at 200 or 400 x magnifications or by histologic sections.

#### *Treatment and prevention*

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#### **Management**

---

Drug treatment

- No established remedies

Prevention

- Disinfections of the environment
- 

### *Microsporidia*

Microsporidians are intracellular parasites that require host tissue for reproduction. Fish acquire the parasite by ingesting

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

infective spores from infected fish or food. Replication within spores (schizogony) causes enlargement of host cells (hypertrophy).

### ***Clinical Symptoms***

Infected fish may develop small tumor-like masses in various tissues. Its clinical sign can range from no visible lesions to mortalities. It has severe morbidity.

### ***Diagnosis***

It is confirmed by finding spores in affected tissues, either in wet mount preparations, or in histologic sections.

### ***Treatment and prevention***

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#### **Management**

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Drug treatment

- No treatment for microsporidian infections

Prevention

- Disinfections of the environment and elimination of the infected stock.
- 

### ***Coccidia***

*Coccidia* are intracellular parasites described in a variety of wild-caught and cultured fish. Their role in the disease process is poorly understood, but there is increasing evidence that they are potential pathogens. The most common species encountered in fish are intestinal infections but also reproductive organs, liver, spleen, and swim bladder.

### ***Clinical Symptoms***

It depend on target organ affected but may include general malaise, poor reproductive capacity, and chronic weight loss.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Diagnosis***

Histologic or electron microscopy are definitive for tissue coccidian.

### ***Treatment and prevention***

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#### **Management**

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Drug treatment

- Nitrofurazone 50 mg/kg fish q 24 h

Prevention

- Maintaining a proper environment and reducing stress
- 

## **Trematode Infections**

### **Monogenean Trematodes**

Monogenean trematodes, also called flatworms or flukes, commonly invade the gills, skin, and fins of fish. They have a direct life cycle and are host and site-specific. *Gyrodactylus* and *Dactylogyrus* are the two most common genera of monogeneans that infect freshwater fish.

### ***Clinical Symptoms***

Freshwater fish infested with skin-inhabiting flukes become lethargic, swim near the surface, seek the sides of the pool or pond, and their appetite dwindles. Areas of attachment show scale loss and may ooze a pinkish fluid, swollen and pale gills, respiration rate may be increased, and fish will be less tolerant of low oxygen conditions with piping and gulping air at the water surface. High mortality may occur if large numbers (>10 organisms per low power field) of monogeneans infest the skin or gills. Secondary infection by bacteria and fungus is common on tissue with monogenean damage.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and prevention*

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#### **Management**

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##### Drug treatment

- Bath or dip of organophosphorus compounds like ‘Dipterex’, ‘Trichlorofon’ are used
    - ✓ In permanent bath 0.25 – 0.5 ppm (0.1 ppm in coldwater ponds)
    - ✓ Dip 1%, 2- 3 minutes
- For *Gyrodactylus*
- Benzalkonium chloride, 2 ppm for an hour, q 24 h for 3 days. Use 0.5 ppm at temperatures over 27<sup>0</sup>C (rapid breakdown in warm water).

##### *Alternative*

- Formalin, for applications *see* page 381.
- Potassium permanganate, *see* page 381.

*Note:* rubber gloves and protective clothing should be used

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### **Digenean Trematodes**

Digenean trematodes have a complex life cycle involving a series of hosts. Fish can be the primary or intermediate host depending on the digenean species. They are found externally or internally, in any organ. For the majority of digenean trematodes, pathogenicity to the host is limited.

The life stage most commonly observed in fish is the metacercaria, which encysts in fish tissues. Again, metacercaria that live in fish rarely cause major problems. However, in the ornamental fish industry, digenetic trematodes from the family Heterophyidae, have been responsible for substantial mortalities in pond-raised fish. These digeneans become encysted into gill tissue and respiratory distress is eminent.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

Another example of a metacercaria that could cause problems in cultured fish is the genus *Posthodiplostomum* or the white grub. Another fluke is *Clinostomum*, often called yellow grub.

### *Clinical Symptoms*

This has caused mortalities in baitfish, but usually the only negative effect is reduced growth rate, even when the infection rate is high. In cases where mortalities occur, there are unusually high numbers in the eye, head, and throughout the visceral organs. *Clinostomum* is a large trematode and although it does not cause any major problems for fish, it is readily seen and will make fish unmarketable for aesthetic reasons.

### *Treatment and prevention*

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#### **Management**

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##### Drug treatment

- Copper sulfate in ponds has been used with limited success and is most effective against snails when applied at night, due to their nocturnal feeding activity
  - For ornamental fish growers there is a chemical for snail control, Bayluscide.
- 

## **Bacterial Diseases of Fishes**

### **Bacterial Gill Disease**

Most important diseases of cultured fish worldwide. Affects variety of species, but common in hatcheries of salmonids. A variety of “Myxobacteria” are usually isolated but flavobacteria have been used to experimentally reproduce the disease.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Diagnosis*

Microscopic examination and isolation of bacteria are important to diagnose.

### *Treatment and prevention*

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#### **Management**

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Drug treatment

- Copper sulfate, dip 500 p.p.m. (1:2,000), 1 min

*Note:* Hard water only, in soft water it is very toxic.

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### **Bacterial Kidney Disease**

It is caused by the bacteria *Renibacterium salmoninarum*, which is a small Gram positive, nonmotile rods occurring in pairs, an obligate parasite of Salmonidae and extremely fastidious organism.

BKD is a chronic slow progressing disease and affects both fresh and salt-water cultured fish. Mode of transmission of the disease is horizontally via water, via skin abrasions or ingestion of infected food or vertically from parent to progeny via eggs.

### *Clinical Symptoms and Lesions*

External signs of the disease include; exophthalmia, lesions in the eyes, swollen abdomen, and blood filled blisters on the flank and the presence of ulcers (abscesses).

Internal lesions develop in the kidney, liver, spleen and heart. The lesions contain; a fluidy mass of leucocytes, bacteria and cellular debris, at low temperature in Atlantic salmon; petechial haemorrhages are seen on the parietal peritoneum of the abdominal wall, diffuse white pseudodiphtheritic membrane over the abdominal viscera.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

Histologically there is proliferation of the macrophages in the kidney and other viscera, which are often replete with bacteria.

### *Diagnosis*

It is based on clinical signs, lesions and bacteria isolation.

### *Treatment and prevention*

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#### **Management**

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Drug treatment

- Trimethoprim / Sulfonamide, 30 mg/kg fish/day in feed.

or

- Oxytetracycline, 75 mg/kg fish/day in feed
  - ✓ W/P: 4 weeks before marketing

Prevention

- Stock should be purchased from sources free of the disease. Avoid feeding of viscera from affected fish unless pasteurized.
- 

## **Botulism (Bankruptcy Disease)**

Botulism is usually caused by toxins from a type E form of *Clostridium botulinum*, which is common in soil faeces, decaying organic matter and marine sediments. The toxin is probably present in the poorly stored fresh fish. *C. botulinum* is a Gram positive rod with sub terminal, oval endospores.

### *Clinical Symptoms*

Clinical signs are not usually obvious because the fish die too quickly.

### *Diagnosis*

Definitive diagnosis usually relies on demonstrating the toxin in the fish. The elaboration of neurotoxin by the organism is demonstrated by the inoculation of mice with culture filtrate

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

and specific toxin identified by neutralization tests using monovalent antisera.

### *Treatment and prevention*

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#### **Management**

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Drug treatment

- Addition of lime, 1.6 kg/ m<sup>2</sup> will kill the bacteria

Preventions

- Avoid feeding spoiled fish; keep ponds clean.

*Note:* Toxin will not be produced below 4 °C, at pH less or equal to 4.5 in salt concentration of greater or equal to 3%.

*Public health significance:* The toxin is dangerous for human health. Thus fish should be heated to 70 °C. Starving fish prior to slaughter will reduce the number of bacteria in the flesh.

---

### **Columnaris Disease**

It is caused by *Flexibacter culumnaris* and occurs commonly in freshwater fish at higher water temperatures (usually >15 °C). It is a necrotizing disease affecting mainly skin and less commonly gills.

#### *Clinical Symptoms and Lesions*

Grossly there is a pale “saddlepatch” round dorsal fin due to sloughing of epidermis and removing the underlying pigment cells in the process. If gills are affected, the lamellae and even filaments may be necrotic.

#### *Diagnosis*

It is based on bacteriology, histology and clinical signs.

### *Treatment and prevention*

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#### **Management**

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Drug treatment

- Oxytetracycline, *see* 391.

or

- Copper sulfate, *see* page 381.

or

- Potassium permanganate, 2 ppm, *see* page 381.
- 

### **Emphysematous Putrefactive Disease of Catfish**

The causative agent is *Edwardsiella tarda* affecting a wide range of hosts e.g. catfish, carp, tilapia, eels etc. It tends to be associated with organically rich ponds at higher temperatures but has also been seen as low as 10 – 18 °C. The organism is a normal inhabitant of the gut of mammals, reptiles, fish and crustacea. It can enter via the gut or external lesion.

#### ***Clinical Symptoms and Lesions***

In catfish it starts as a small cutaneous lesion and may progress to abscessation and putrefaction of the musculature and internal organs. It damages the host by the production of extracellular toxins. Externally these appear as pale swollen areas. If they ruptured, they release putrefied tissue and foul smelling gas. In some species like tilapia, it may cause severe peritonitis.

#### ***Diagnosis***

It is based on bacteriology, biochemical reactions, IFAT and ELISA.

### ***Treatment and prevention***

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#### **Management**

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##### Drug treatment

- Trimethoprim / Sulfnamide, 30 mg/kg fish/day in feed (*see* page 391)  
or
- Oxytetracycline, 100 mg/kg fish, *see* page 391.

##### Preventions

- Improvement in hygiene, water quality and stocking density are necessary
- 

### **Enteric Septicaemia of Catfish**

It is caused by *Edwardsiella ictaluri* primarily Channel Catfish – but has also been seen in carp, bass and others. The bacteria enter via the gut or snares. The bacteria can survive for long periods outside the host – but is commonly found within the gut of apparently normal fish. It is highly contagious and pathogenic and causes losses of up to 50%. It is a more fastidious organism than *E. tarda*

#### ***Clinical Symptoms and Lesions***

Usually the condition has the appearance of typical haemorrhagic septicaemia. However, acutely affected fish can be seen standing vertically in the water and spinning. Chronically affected fish may suffer from the open lesion on the head that earned the name “hole in the head disease”.

#### ***Diagnosis***

It is based on lesions, bacteriology and symptoms.

### *Treatment and prevention*

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#### **Management**

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##### Drug treatment

- Trimethoprim / Sulfonamide, 30 mg/kg fish/day in feed, *see* page 391.

or

- Oxytetracycline, 100 mg/kg fish, *see* page 391.

##### Prevention

- Routine hygiene precautions are very important to control the disease.
- 

### **Furunculosis**

*Aeromonas salmonicida* a Gram negative non-motile bacteria is the aetiological agent of furunculosis of salmonides. It is an obligate fish pathogen and may be readily isolated from diseased or apparently healthy carrier fish.

*A. salmonicida* has been isolated from a variety of other species of fish. The organism can be readily isolated from skin lesions, blood and kidney of affected fish.

Horizontal transmission is the principal mode of infection with ingestion and abrasions being the commonest routes of infection. Fish of all ages may be affected. Outbreaks of furunculosis are usually associated with high temperature, low oxygen levels and high stocking densities.

### ***Clinical Symptoms and Lesions***

Septicaemia accompanied by darkening in colour, lack of appetite, lethargy, and small haemorrhages at the bases of the fins are observed. Death may occur within 2 - 3 days.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Diagnosis*

It is based on symptoms, lesions and isolation of the bacteria.

### *Treatment and prevention*

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#### **Management**

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Drug treatment

- Potentiated Sulfonamide, *see* page 391.

or

- Oxytetracycline, *see* page 391.

or

- Oxolinic acid 10 mg/kg fish/day with feed.

*Precautions:* Sulfonamides may be toxic in seawater (crystallize in fish urine).

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### **Haemorrhagic Septicaemia**

It is caused by *Aeromonas hydrophila*, which is ubiquitous in fresh water with a high organic load. The disease is related to stress or damage like; superficial ulcers and wounds, haemorrhagic septicaemia or motile aeromonad septicaemia, epizootic ulcerative diseases, red-spot disease of fresh water prawns, superficial lesions in alligators and turtles.

### *Clinical Symptoms and Lesions*

It is similar to Furunculosis.

### *Diagnosis*

It is based on bacteriology, histology and clinical signs.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and prevention*

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#### **Management**

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##### Drug treatment

- Oxytetracycline, 100 mg/kg fish with feed or injections (*see* page 391).
- ✓ S/E: affected fish are often anorexic

*Public health significance:* Skin infections may occur in humans.

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### **Mycobacteriosis**

*Mycobacterium marinum* and *M. fortuitum* are the two most important mycobacteria affecting more than 150 species of fish.

#### ***Clinical Symptoms and Lesions***

There are two forms of the disease; acute fulminating form, which is relatively rare, the fish die, with no tubercles, but masses of acid-fast organisms are evident on histology. In more chronic form; multiple tubercles are common, but fish will lose color, become thin and external lesions may be visible. Spinal deformations are also common.

### *Treatment and prevention*

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#### **Management**

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##### Drug treatment

- Chemotherapy is not usually practical.

##### Preventions

- Keep the pond clean and avoid introduction of contaminated fish.

*Public health significance:* both species are zoonotic and thus care should be taken during handling.

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### **Proliferative Kidney Disease in Salmonid Fishes**

It is considered as one of the most economically damaging diseases of salmonid fish in aquaculture. Most reported cases of the disease occur in rainbow trout, but also occur in Atlantic salmon, chinook salmon, brown trout, coho salmon and grayling. Mortality in infected rainbow trout ranged from 0 – 100% and depends on the type of farm, the management procedures, the age of the fish, the water temperature and the presence of other diseases.

#### ***Clinical Symptoms and Lesions***

It is a chronic disease with nonspecific signs resulting from circulatory imbalance and anaemia, both secondary to renal malfunction. Affected fish often show abnormal swimming behavior, remaining at the surface and tending to collect at tank outlets, signs of oxygen starvation gasping spasmodically and unable to withstand stress produced by grading and transportation.

Abdominal distension is frequently seen with longitudinal swellings sometimes visible at the level of the lateral line.

#### ***Diagnosis***

It is based on the history of the fish, noting clinical signs and carrying out histological examination.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and prevention*

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#### **Management**

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##### Drug treatment

- Malachite green, weekly treatment of fish at 1.6 ppm (*see* page 381).

##### Preventions

- Avoiding stress, feeding maintenance diet only over the high risk period to avoid metabolic oxygen demand exceeding available supply, decreasing stocking density, increasing oxygen availability and making sure that secondary infections do not occur.
- 

### **Vibriosis**

Diseases caused by these groups of bacteria are essentially identical with the bacteria acting as opportunistic pathogens. *Vibrio anguillarum* is a halophilic organism and it is mainly a problem in the marine situations. *Vibrio* species are Gram negative, straight or curved rods and motile by polar flagellae. They are facultatively anaerobic and most species are oxidase positive.

Springtime is particularly stressful to pond fishes with increasing water temperature and low host immunity following the cold conditions of the winter. This is a serious problem in cultured pond fishes.

#### ***Clinical Symptoms and Lesions***

Clinical signs in fishes vary greatly and include congestions or haemorrhages under scales and particularly around the vent. Ascites and gross abdominal swelling and exophthalmia may also be seen.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Diagnosis***

It is based on clinical signs and histological examination.

### ***Treatment and prevention***

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#### **Management**

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##### Drug treatment

- Sulfonamide (Sulfamerazine), 200 mg/kg initially, maintain at 100 mg/kg fish/day (*see* page 391).

*Precautions:* Reduced appetite may be a problem. Sulfonamides may be toxic in seawater (crystallize in fishes urine).

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## **Mycotic Infections**

### **Branchiomyces Infections**

Branchiomycosis is also known as gill rot. It is a disease characterized by infarctive necrosis of the gills due to intravascular growth of the fungus *Branchiomyces* species. Carps are the most commonly affected species of fish.

### ***Clinical Symptoms and Lesions***

Histologically, hyperplasia, fusion of gill lamellae and areas of massive necrosis resulting from thrombosis of vessels by fungal hyphae, are seen together with telangiectasis (caused by physical or chemical trauma resulting in dilatation of the lamellar capillary and pooling of the blood) and vascular necrosis.

### ***Treatment and prevention***

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#### **Management**

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##### Drug treatment

- There is no suggested treatment of the disease.

##### Preventions

- Strict hygiene, the removal of dead fish and the avoidance
-

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

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of overfeeding, especially at high water temperatures. Increase of water supply and by draining and liming affected ponds.

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### **Saprolegnia Infection**

It is a disease known to potentially may affect all fish species in fresh water like Tilapia, Clarias, Mugil and rainbow trout etc. It is also infective to eggs.

The fungi of the genus saprolegnia are considered as secondary invaders of fish skin already damaged by abrasions and scale loss due to handling, netting, transfer and also skin lesions caused by ectoparasites notably by argulids.

Infections frequently occur on incubated eggs and newborn fry of rainbow trout in hatcheries.

### ***Clinical Symptoms and Lesions***

The fungal mycelium will also penetrate into the muscle beneath the dermis resulting in extensive necrosis of invaded tissues, oedema and extensive haemorrhages.

### ***Treatment and prevention***

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#### **Management**

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Drug treatment

- Malachite green oxalate (Zinc-free),
    - ✓ Dip, bath or flowing, applied to ponds at 0.15 ppm at holding tanks at a dose of 0.10 – 0.20 ppm for 1 h.
    - ✓ Bath treatment, 0.1 ppm ‘Permanent’
    - ✓ Local (swab), 1%
    - ✓ *Precautions:* Highly toxic to juveniles of some fish species and some eggs very sensitive, especially at early stage.
-

## DISEASES OF THE HONEYBEE

### **Introduction**

The honey bee is colonial insect. A healthy honey bee colony has three distinct individuals:- queen, worker and drone.

The queen bee is the only actively reproductive female and lays all the eggs in the colony. Normally only one queen is present in each colony.

The workers are female but not capable of producing fertilized eggs. They perform all the work and their number ranges from 20,000-60,000 per colony. Their tasks include caring for brood, defending the hive, building comb, taking care of the queen and gathering nectar, pollen and water. Drones are male honey bees. Their only task is to fertilize virgin queens in the air, usually from colonies other than their own. Colonies may contain a few to several hundred drones.

The queen lays eggs in the honey comb which hatch within three days. The larval stages of worker, queen and drone cells are capped at 5.5, 6 and 6.5 days, respectively.

Larvae remain pearly-white, plump and glistening during prepupal stage. A healthy worker brood pattern is easy to recognize; brood cappings are medium brown in color, convex and without punctures. Health capped worker brood normally appears as a solid pattern with only a few uncapped cells; these may contain eggs, or uncapped larvae, nectar or pollen.

After two days, healthy prepupae begin to change from their larval form into pupae, the third life state, on their way to

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

becoming adult bees. Healthy pupae remain white and glistening during the initial stages of development, even as their bodies begin to change to the adult form. Compound eyes are the first areas that begin to take on color, changing from white to brownish-purple. Soon after this, the rest of the body begins to darken, taking on the color and features of an adult bee.

The honeybees could be affected by many infectious diseases & parasites, pests and poisons and attacked by predators.

Both the brood and adult forms of the honeybees are affected by infectious agents specific to each stage of life. Brood diseases are easier to recognize. Generally bee diseases could be caused by bacteria, virus, protozoa, fungus and mites. The transmission of bee diseases from one colony to another can be by Adult bee, re-use of contaminated comb, beekeepers, beekeeping equipments, feeding honey and pollen.

### **Infectious Diseases**

#### **American Foulbrood**

American foulbrood (AFB) is the most virulent infectious brood disease caused by the spore-forming bacterium *Paenibacillus larvae larvae* [*Bacillus larvae*]. The spore is resistant to heat and drought, capable of germinating in a favorable environment. The vegetative form of the bacteria is infectious.

The spores germinate into vegetative form in the larval and early young bee pupae gut, which digests them with enzymes secreted by the bacterium.

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### *Clinical Symptoms*

Death typically occurs after the cell is capped, during the last two days of the larval stage or first two days of the pupal stage. The symptoms of AFB include: characteristic sour odor, perforated or sunken cappings, darker in color than healthy brood cappings, and resultant black scales and are difficult to remove from the cell because of their stickiness.

### *Diagnosis*

Indicative characteristic signs include glue-like consistency of dead larvae and are tested by one of the following methods.

Method 1: Ropy test

- Stir in the cell with a match stick. The affected larvae sticks tenaciously forming long string or rope when it drawn.

Method 2. Holst Milk Test

- Swirl the affected individual with 1% skim milk; if the milk clears, it is indicative of AFB.

Confirmatory laboratory tests include culture or transmission experiment.

### *Treatment & Prevention*

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#### **Management**

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Drug treatment

- Oxytetracycline 200 mg/colony in 1.6 g powdered sugar, apply at the top bars as dust, three times at 4-5 days interval; treat all colonies
  - ✓ S/E: Treatment delays vegetative growth but does not eliminate completely;
  - ✓ W/P: Apply at least 4 weeks before the main honey flow.
  - ✓ *Precaution:* commence one month before the first major nectar flow, and again after the honey crop has been removed
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

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### Prevention

- Eliminate all infected bee colonies or irradiate all frames or infected hive parts.
  - Requeen all remaining colonies with new queens from the hygienic stocks.
- 

### **Chalkbrood**

Chalkbrood, a fungal brood disease of honey bees, is caused by the spore-forming fungus, *Ascosphaera apis*. Worker, drone, and queen larvae are all susceptible. Spores of the fungus are ingested with the larval food & germinate in the hindgut of the bee larva. A change in brood nest temperature can trigger chalkbrood disease by enhancing growth of *Ascosphaera apis* in the honey bee. Common causes of stress are high and low temperatures, too moist or dry conditions, poor nutrition, failing queen, poor hive management and moving hives.

Transmission occurs by contaminated pollen, infected foraging bees leaving spores, by queens, drifting bees, and drones. The spores remain viable for up to 15 years or more in equipment and soil.

### ***Clinical Symptoms***

Dead larvae are usually chalky white and covered with fungus filaments (mycelia) that have a fluffy, cotton-like appearance. Sometimes the color may be mottled or blue-gray or black, which dries out and adheres to the cell wall. A slight non-objectionable odor may be present.

### ***Diagnosis***

Brood inspection and microscopic examination of samples.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Treatment & Prevention***

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#### **Management**

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##### Drug treatment

- No specific treatment is available.

##### Control

- Keep strong colonies, requeen severely affected colonies, and minimize colony dampness.
- 

### **Chilled Brood**

This is caused by poor condition and cold weather, if larvae are underfed, or if the brood covers a larger area than the bees can keep warm, some of the brood will die and turns gray. Such brood will be removed by bees from the cells as soon as the colony grows stronger and returns to normal.

### ***Treatment & Prevention***

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#### **Management**

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##### Drug treatment

There is no specific treatment

##### Prevention

- Work with the bees as little as possible when weather is cold
  - Replace combs in same order in which they were removed, especially if the colony is weak and it is early:
  - Do not leave frames of brood standing outside the hive any longer than necessary
  - The frames of brood should not be left outside longer
-

### **European Foulbrood (EFB)**

European Foulbrood (EFB) is a bacterial brood disease, caused by the bacterium *Melissococcus pluton* [*Streptococcus pluton*], which is a non-spore forming bacteria. It gains entry into the larva in contaminated brood food and multiplies rapidly within the gut of the larva. European foulbrood frequently disappears with a nectar flow and is less damaging than AFB.

#### ***Clinical Symptoms***

European foulbrood generally kills larvae that are two to four days old while they are still C-shaped in the bottom of the cells. Unlike American foulbrood, most of the larvae die before their cells are capped. A spotty pattern of capped and uncapped cells develops only when EFB becomes serious. Occasionally, pupae die from the disease.

The color changes are non-uniform ranging from a normal pearly-white to yellowish, then brown, and finally grayish-black but can be blotchy or mottled. Infected larvae lose their plump appearance and look under-nourished. Their breathing tubes or trachea are visible as distinct white lines. Larval remains often appear twisted or melted to the bottom side of the cell. Unlike larvae killed by AFB, recently killed larvae rarely pull out in a ropy string, when tested with a toothpick. The dead larvae form a thin, brown or blackish-brown scale which can be easily removed. EFB usually does not kill colonies, but a heavy infection will seriously affect population growth.

#### ***Diagnosis***

The diagnosis of EFB is almost the same as that of AFB. The ropy test shows less stringiness or ropy ness and the Holst Milk test does not result in a clearing of the solution.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment & Prevention*

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#### **Management**

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##### Drug treatment

- Similar to American foulbrood

##### Non-drug treatment

- Requeening colonies with a young queen eliminates infection; it gives the colony a more prolific queen and it provides a time lag between brood cycles that allows the house bees to remove diseased larvae.

##### Prevention

- Maintain young queen
- 

### **Nosema**

Nosema is an adult bee disease caused by a spore-forming protozoan, *Nosema apis*. Infection occurs through the mouth, germinates in the gut and invades the hindgut of honeybee workers, queens, and drones. Nosema increases during stress such as periods of long confinement, rapid brood buildup, nutritional imbalance and inclement weather; however, there is no specific season of the year where the disease is most prevalent.

#### ***Clinical Symptoms***

Dysentery (diarrhea), bees may defecate in the hive or outside of the hive, decreased honey production, unhooked wings, distended abdomens and disoriented or paralyzed behavior are observed. If the queen is infected, loss of the colony may be observed; if the worker bees are infected, the production of royal jelly is inhibited subsequently retarding brood production and colony development.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Diagnosis*

Remove the workers' head and examine the digestive tract microscopically. Numerous *Nosema apis* spores could also be microscopically observed.

### *Prevention and treatment*

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#### **Management**

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##### Drug treatment

- Fumagillin 100 mg/gallon of sugar syrup (50% w/v with water), feed 2 gallons during fall.
  - ✓ S/E: Infection could not be completely eliminated
  - ✓ D/I: fumagillin is less effective when fed with powdered sugar, extender patties, candy, or pollen supplements.
  - ✓ *Precaution*: Protect the mix from exposure of direct sunlight.
- 

##### Prevention

- Maintain sufficient honey during non-flowering season & vigorous queens.
  - Fumagillin could be supplied
- 

### **Paralysis**

Paralysis, a minor disease of adult honeybees, is usually associated with viruses. Two different viruses, chronic bee paralysis virus (CPV) and acute bee paralysis virus (APV), have been isolated from paralytic bees. Other suspected causes of paralysis include: pollen and nectar from such plants as buttercup, rhododendron, laurel, and some species of basswood; pollen deficiencies during brood rearing in the early spring; and consumption of fermented stored pollen.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Bees tremble uncontrollable and are unable to fly; lose the hair from their bodies and have a uniform dark, shiny, or greasy appearance and are submissive to attack. Affected bees can be found at the top bars or frames next to the hive cover with wings extended or at the colony entrance, crawling up the sides of the hive and/or blades of grass around the hive, and then tumbling to the ground. Healthy bees often tug at infected bees in an effort to drive them away from the hive.

### ***Diagnosis***

Clinical signs are indicative and usually one or two colonies in an apiary will show signs of the disease.

### ***Treatment & Prevention***

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#### **Management**

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##### Drug treatment

- There is no specific treatment; however, a colony may recover from paralysis after a short time

##### Non-drug treatment

- If no recovery occurs, replace the colony completely with healthy colony
- 

## **Parasitic Mite Syndrome**

Due to parasitic mites honeybee colonies exhibit a variety of unusual and highly variable symptoms. Collectively these symptoms are being called Parasitic Mite Syndrome (PMS). The disease is caused by several viruses at once. Although the circumstances under which the diseased brood appears are highly variable, all of the diseased colonies are infested with Varroa mites.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms and diagnosis***

Larvae affected with PMS die in the late larval or prepupal stage, stretched out in their cells with their heads slightly raised. The larvae appears dull, look deflated and later have gray or brownish spots. The cappings may be perforated or the cells may be uncapped completely by the bees. When the larval remains are stirred with a toothpick or small twig, they do not rope out but are globular (similar to EFB).

### ***Treatment & Prevention***

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#### **Management**

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##### **Drug treatment**

There is not specific drug treatment for the viruses but treat mites with miticides

- Fluvalinate to control mites, *see* page 415.
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##### **Sacbrood**

Sacbrood is a viral disease affecting the brood but of minor importance compared to the other brood diseases. It usually affects only a small percentage of the brood and the adult bees detect and remove infected larvae quickly. Both worker and drone larvae are infected by sacbrood. Death usually occurs after the cell is sealed and the larva has spun its cocoon. Pupae may be killed occasionally, but adult bees are immune to the disease.

### ***Clinical Symptoms***

Larvae that have died of sacbrood become like fluid filled sacs with heads pointing upwards. They changes from pearly white to pale yellow and curls up as the body dries to a thin, dark brown scale lying along the bottom wall of the cell.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Diagnosis*

Clinical symptoms: larvae with sacbrood disease are easily removed intact from the cells, the contents are watery, and the scales are brittle and do not adhere to the wall.

### *Treatment & Prevention*

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#### **Management**

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##### Drug treatment

- There is not specific drug treatment

##### Prevention

- Maintain strong colonies and regular requeening
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### **Varroa Mite**

The Varroa mite *Varroa Jacobsoni*, is an external parasite that feeds on the hemolymph (blood) of adult bees, larvae and pupae. It is the most serious parasite of honeybees.

Adult female mites are found on young drone and worker adults. They are mostly concentrated on the top of the thorax at the point where the wings attach, between the head and thorax, between the thorax and abdomen or between overlapping segments of the abdomen where the mites can easily penetrate the exoskeleton of the honeybees.

The females lay eggs in the brood cells two days after the honeybees' eggs are capped. Thus bees emerging might develop disease. Varroa mites survive 2-3 months (5-8 months in fall) in the bees and only for five days out side bees.

Varroa mites have a definite preference for drone brood. The mites are spread by the movement of honey bee colonies, i.e.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

migratory beekeeping, the shipment of queens and package bees and movement of colonies for pollination or by beekeepers during normal apiary manipulations. Infestations are also spread as a result of drifting (especially drifting drones) and swarming bees.

### ***Clinical Symptoms***

Low-level varroa infestations: are difficult to detect.

Medium to high infestations: spotty brood pattern and malformed worker and drone adults with deformed wings and small abdomens which often crawl and unable to fly. Colonies become severely debilitated as mite populations reach extremely high levels.

### ***Diagnosis***

Brush approximately 300 bees into a large empty clear plastic or glass jar. Close the lid and tap the jar to settle bees to the bottom and examine as follows.

Method 1:

- Add one- or two-second squirt of an ether-based aerosol starter fluid (the type used to start cars in cold weather) to kill the adult bees. Shake the jar of bees hard for 15-20 seconds and roll on its side. The mites stick to the sides.

Method 2.

- Uncap and examine sealed brood, especially drone brood preferably with uncapping fork. Examine with a small 10x hand lens to observe the mites.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment & Prevention*

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#### **Management**

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- Fluralinate 10%, a synthetic pyrethroid strip, one strip for each set of five frames of bees during low brood rearing, leave for at least 42 days and not more than 45 days.
  - ✓ *Precaution:* do not use if surplus honey is produced; the operator should wear gloves during handling

or

- Coumaphos strips are also applied as above
    - ✓ *Precaution:* do not treat more than twice a year
- 

### **External Parasites**

#### **Bee Louse (*Braula coeca*)**

*Braula coeca* is a wingless bee louse that infests honeybees but cause little harm. The adults are small (slightly smaller than the head of straight pin), and reddish brown in color.

When hungry they move to the bees to the bee's head near its mouthparts that stimulates the bees to regurgitate a drop of nectar. The bee louse feeds on it.

#### ***Clinical Symptoms***

The louse lays its eggs on the capping of honey storage cells and upon hatching, the young burrow them. The adults can also burrow the comb. *Braula* adults are often found on queens but their damage to a colony of honey bees is limited.

#### ***Prevention***

Smoking of tobacco through hive entrance.

### **Tracheal Mites**

A second mite that infests honeybees in the honeybee is tracheal mite, *Acarapis woodi*. The adult mites penetrate the tracheal wall with their piercing mouthparts and feed on the bee blood. They are transmitted by drifting bees and swarms produced by infested colonies between apiaries.

#### ***Clinical Symptoms***

The symptoms are not specific. The lives of affected adult bees become shortened; flight activity is affected, and results in a large number of crawling bees that are unable to fly. They may exhibit dysentery and an excessive swarming tendency.

#### ***Diagnosis***

Microscopic examination of honeybees' tracheae of infected bees is confirmatory. The samples are taken from bees crawling around the hive entrance and placed in 70% alcohol or methyl alcohol.

#### ***Treatment & Prevention***

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##### **Management**

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Drug treatment

- Menthol crystals, 50 g in a small screen packet (packets made of window screen or a similar mesh material, perforated plastic bags, coffee filters, cloth packets or other substitutes) per bee colony, placed on top bars of the frame of the brood nest for 4 to 6 weeks. It could be reused if kept at freezing temperature
  - ✓ S/E, C/I: remove all surplus honey and empty supers. Honey for bee food may remain.
  - ✓ *Note:* All colonies in an apiary receive mite treatment at the same time.
-

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### **Wax Moth**

Larvae of the greater wax moth, *Galleria melonella* cause considerable damage to beeswax combs left unattended by bees particularly in weak or dead colonies and those placed in storage are subject to attack.

Wax moth larvae damage or destroy the combs by chewing through the beeswax cells as they feed on cocoons, cast skins, and pollen. They spin silken galleries for protection from bees that will remove the wax moth larvae if they get the chance. Beeswax combs are often reduced.

### ***Treatment & Prevention***

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#### **Management**

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##### Drug treatment

- Paradichlorobenzene crystals, in a small piece of paper between every fifth super in a stack repels wax moths, prohibit egg laying and kill and young larvae
- ✓ *Caution:* Mothballs and crystals made from naphthalene should not be used for wax moth control.

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##### Prophylaxis and prevention

- Maintain strong, healthy colonies, which can defend themselves against wax moths.
  - Stored equipment and comb honey off colonies must be protected from this pest.
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### **Predators**

#### **Ant**

Ants may enter bee colonies to search for food or establish nesting sites. Ants are typically found between the inner and outer covers of the hive and in pollen traps.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Treatment & Prevention***

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#### **Management**

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- Once ants are established in a colony they are difficult to control.
  - Maintain strong colonies and keep bottom boards raised off the ground and apply a fuel oil barrier
  - Remove brush rotten wood grass and weeds from around the colonies.
  - Ant problem may also be reduced by allowing the bees access to the space between the inner and outer covers.
- 

### **Beetle**

The small hive beetle (*Athina tumida*) is a small (about one-third the size of a bee), black and hairy insect that could damage the bees comb and honey bee eggs.

The beetle lays its eggs on or near beeswax combs. The larvae consume pollen and comb but also will eat larval honeybees. This beetle is not considered a serious pest but in heavy infestations, it is blamed for the quick collapse of strong colonies. It also defecates in the honey and in some way alters the honey causing it to ferment and run out of the combs. Most vulnerable are weak hives with stored honey or full honey supers either in storage or above bee escapes.

### ***Treatment & prevention***

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#### **Management**

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- There is no known treatment recommended except taking care of contamination with honey.
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## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Mice**

Adult mice move into bee colonies in the fall and usually nest in the corners of the lower hive body away from the winter cluster. Bee colonies located near fields or at the edge of wood lots where mice are common are especially vulnerable. Mice can successfully build a nest even in a strong colony. They move in and out of the colony while the bees are inactive, and their nests furnish additional protection. Their activity may disturb the bees but the greater damage is to combs and equipment from their nest building.

Mice are a serious pest of stored combs and active honey bee colonies during the fall and rainy months. These rodents chew combs and frames to make room for building their nests. If the mouse urinates on combs and frames, the bees are reluctant to use the combs.

### ***Treatment & prevention***

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#### **Management**

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- Protect the colony entrance from mice
  - Chase away any mice found inside a colony, then remove the nest and restrict the entrance.
  - If comb chewing is extensive, replace the frames.
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### **Skunks, Opossums and Raccoons**

In some localities, skunks are a serious threat to successful beekeeping, since they hamper the development of strong colonies. Being insectivorous (insect-eating), skunks will raid bee yards nightly, consuming large numbers of bees.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms and Diagnosis***

To capture bees, skunks scratch at the hive entrance and guard bees that come out to investigate the disturbance. A successful skunk will repeat the process several times and may feed at the hive entrance for an hour or more to rapidly depleting the bee population. Colonies visited by skunks may become defensive since skunks usually return night after night. Skunk predation can be detected by the front of the hive being scratched and muddy and the vegetation in front of the hive packed down or torn up.

In addition skunks leave behind small piles of chewed-up bee parts. The skunk chews the bees until all the juices are consumed, and then spits out the remains. These remains resemble cuds of chewing tobacco. Opossums and raccoons sometimes attack an apiary in a similar manner as skunks do. The feces of these animals also contain large amount of honey bee exoskeletons since this material cannot be digested by animals.

### ***Treatment & Prevention***

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#### **Management**

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##### Prevention

- Maintaining strong colonies is a partial deterrent to animal predation.
  - Skunks and mice may be discouraged by screens or queen excluders attached to the hive entrance. These devices hamper the skunk's efforts to scratch at the front entrance and if it climbs up the screen over the entrance its belly becomes vulnerable to stings.
  - Elevating the hives on stands (blocks bricks etc.) or fencing bee yard may also serve the same purpose.
-

### **Poisoning in Honey Bees**

"Pesticide" is a general term used for a chemical designed to kill target pests such as insects (an insecticide), mites (miticide), weeds (herbicide), and organisms which cause plant diseases such as bacteria (bactericide) and fungi (fungicide). Unfortunately, many agricultural pesticides may be toxic to bees.

### **Potential Factors for Honey Bee Damage**

Many factors involving insecticide application affect the potential for honey bee losses. The more important ones are described below.

*Plant Growth Stage:* Severe bee poisoning most often results from spraying insecticides directly on flowering plants, either the crop itself or flowering weeds within its margins.

*Relative Toxicity of the Chemical:* Pesticides vary in their toxicity to honey bees. Most fungicides, herbicides and miticides (Kelthane, Comite) are relatively nontoxic to honey bees and can generally be used around them without serious harm.

*Choice of Formulation:* Different formulations, even of the same pesticide, often vary considerably in their toxicity to bees. Dust formulations are typically more hazardous than sprays because they are picked up on bee hairs. A wettable powder such as Sevin 80S would usually remain toxic in the field for a longer time than Sevin XLR Plus, an emulsifiable concentrate. However, granular insecticides are less hazardous to honey bees. Microencapsulated materials such as Penncap-M are particularly dangerous to use around bees because 1) the capsules have a special tendency to adhere to bees due to their size and electrostatic charge; and 2) when contaminated pollen

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

collected by bees in treated fields is stored in the hive it remains toxic to bees for an extended period.

*Residual Action:* An insecticide which degrades within a few hours can generally be applied with minimum risk when bees are not actively foraging.

*Drift:* Sprays should not be applied if wind speed exceeds 10 mph and favors drift toward colonies.

*Temperature:* If temperatures following treatment are unusually low, insecticide residues can remain toxic to bees many times longer than if normal temperatures prevail.

*Distance from Treated Fields:* The most severely damaged colonies are usually those closest to fields where insecticides are being applied. However, during periods of pollen or nectar shortage, hives within five miles of the treated area can be injured.

*Time of Application:* Evening application of a short residual insecticide can greatly reduce any potential for bee damage.

### ***Prevention***

- Do not treat fields in bloom
- Examine fields and field margins before spraying
- Choose short residual materials and low hazard formulations
- Avoid spray drift.
- Apply insecticides when bees are not foraging
- Adjust spray programs in relation to weather conditions
- Contact local beekeepers and obtain locations of bee yards.
- Read the pesticide label.

### POISONING

#### **Plant Poisoning**

##### **Bracken Fern Poisoning**

Bracken fern, a plant common in the humid tropics, causes acute poisoning related to thiamine deficiency in monogastric animals and to bone marrow depletion in ruminants. It has been reported in the highlands and rift valley areas of Ethiopia. The toxic effects appear to be cumulative and may require 1-3 months or even years to develop, depending on the species of animal, quantity consumed, time of year, and other factors.

##### *Clinical Symptoms*

*Acute poisoning:* weakness, fever (41-43°C), reduced feed intake, digestive disorders, emaciation and haemoglobinuria followed by bleeding from the nose and the vagina, petechiae on the visible mucosae and oedema along the intermadibular space may occur.

*Chronic poisoning:* signs include intermittent hematuria, haemoglobinuria and animals try to urinate continuously.

##### *Diagnosis*

The acute hemorrhagic syndrome in cattle is distinctive but should be differentiated from other diseases showing haematuria.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

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#### **Management**

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##### Drug treatment

##### *Initial*

- Thiamine solution at 5 mg/kg, IV, q3hr, followed by IM injection for several days

##### *Maintenance dose*

- Oral supplementation of thiamine for an additional 1-2 wk or 100-200 mg, SC q24hr for 6 days.
  - Change pasture
  - Broad-spectrum antibiotics to prevent secondary bacterial infection.
  - Blood transfusions 2-4 L blood, IV, from a donor not grazing bracken may be appropriate.
- 

### **Crotalaria Poisoning**

Crotalaria is a nitrogen fixing leguminosa, which is normally avoided by livestock when grazing. However, cattle and horses may intentionally or unintentionally ingest the plant or seeds and succumb from poisoning. The seeds of *Crotalaria* species could also poison poultry.

#### ***Clinical Symptoms***

The signs may be acute or chronic. Lusterless coat, weakness, icterus, ascites, diarrhoea, tenesmus, prolapse of the rectum, lung emphysema, incoordination, aggressiveness, muscle spasms, refuse to eat and loss of weight are observed. Dry skin necrosis occurs in horses and the skin shrinks and pulled off. In the acute course, blood-tinged tar-like faeces and tenesmus, bloating, blood-tinged nasal secretion, incoordination, colic and icterus with /without haemoglobinuria are observed.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Diagnosis*

Tentative diagnosis could be made by clinical signs.

### *Treatment and Prevention*

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#### **Management**

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##### Drug treatment

- Liver damage should be handled
- Chronic cases: apply dextrose IV and Methionine

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##### Prevention

- Avoid livestock from grazing on *Crotalaria* species.
- 

### **Cyanide Poisoning**

Cyanogenic glycosides accumulate in some plants (e.g. Johnson grass, Sudan grass, Sorghum etc.) whenever their cycle of vegetation is interrupted; for example when they wither after a sudden removal of water, after application of herbicides or under special climatic influences. Cyanide interferes with oxygen transport to tissues.

### *Clinical Symptoms*

Excitement followed by staggering, dyspnoea with tachycardia, cattle stand with their mouths wide open; salivation & frothy foam, nystagmus, dilatation of the lacrimation, increased excitability, muscle tremors and finally tonic-clonic convulsions and vomiting and death.

### *Diagnosis*

Appropriate history, clinical signs, postmortem findings, and demonstration of HCN in rumen (stomach) contents or other specimens support a diagnosis of cyanide poisoning.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Treatment and Prevention*

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#### **Management**

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##### Drug treatment

##### *Initial*

- Sodium nitrite 10% (in distilled water or saline), 20 mg/kg, IV

##### *Maintenance*

- Sodium thiosulfate 20%,  $\geq 500$  mg/kg, IV.
- Sodium nitrite therapy may be carefully repeated at 10 mg/kg, q2-4 h or as needed.

or

- Sodium thiosulfate  $\geq 500$  mg/kg, IV *plus* 30 g/cow, PO, to detoxify any remaining HCN in the rumen; C/I: methemoglobinemia may be induced in sodium nitrite injection identical to that produced by nitrate poisoning. Antidote: methylene blue, IV, at 4-22 mg/kg induces methaemoglobin.

##### Control & Prophylaxis

Pasture grasses (eg, sudan grass and sorghum-Sudan grass hybrids) should be large enough to before grazing

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### **Gossypol Poisoning**

Gossypol poisoning, which is usually subacute to chronic, cumulative, and sometimes insidious, follows consumption of cottonseed or cottonseed products that contain excess free gossypol, a pigment found in this plant. All animals are susceptible, but monogastrics, immature ruminants, and poultry appear to be affected most frequently. Pigs, guinea pigs, and rabbits are reported to be sensitive. Dogs and cats appear to have intermediate sensitivity. Holstein calves to be the most sensitive of cattle breeds. Horses appear relatively unaffected.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

It is mainly due to hepatotoxicity or secondary to congestive heart failure. Reproductive effects include reduced libido with decreased spermatogenesis in males, and irregular cycling, luteolytic disruption of pregnancy, and direct embryotoxicity in females. Other signs include weight loss, weakness, anorexia, and increased susceptibility to stress. Young lambs, goats, and calves may suffer cardiomyopathy and sudden death; if the course is more chronic, they may be depressed, anorectic, and have pronounced dyspnea.

### ***Diagnosis***

History of dietary exposure to cottonseed meal or cottonseed products over a relatively long period; clinical signs, absence of response to antibiotic therapy; and the presence of significant free gossypol in the diet.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- There is no effective treatment.
- 

##### Control & prophylaxis

- If gossypol toxicity is suspect, all cottonseed products should be removed from the diet immediately.
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## **Lantana Camara Poisoning**

Lantana is a shrub that grows as scrambling and climbing vine.

### ***Clinical Symptoms***

Symptoms of Lantana camara poisoning depends on the amount and type consumed and intensity of light to which animals are exposed. Early symptoms include, head swaying side to side, loss of appetite, constipation, and frequent urination. After a

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

day or two the eyes and the skin of the nose and mouth start yellowing with jaundice and the muzzle becomes dry and warm. The eyes may become inflamed and have a slight discharge. The animals become increasingly sensitive to light. Finally the muzzle becomes inflamed, moist and painful (pink nose).

### ***Diagnosis***

It is based on clinical signs.

### ***Treatment and Prevention***

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#### **Management**

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Control & prophylaxis

- Cut and paint the plants with *Glyphosate* 360g/l or spray the entire plant with it.
  - Biological control e.g. leaf-mining beetle feed on the upper leaf surfaces
  - Basal dark spraying and cut stump methods.
- 

### **Sweet Clover Poisoning**

Sweet clover poisoning, an insidious hemorrhagic disease, occurs in animals that consume toxic quantities of spoiled sweet clover (*Melilotus officinalis* and *M. alba*) hay or silage resulting from toxic decoumarol that interferes with blood coagulation. In cattle, concentrations of 60 to 70 ppm results in clinical signs after 17 to 23 days.

### ***Clinical Symptoms***

Hemorrhages that result from faulty blood coagulation is common. These include stiffness and lameness, hematomas, epistaxis, or gastrointestinal bleeding. Massive hemorrhage or bleeding after injury, surgery, or parturition is observed. Abortion or stillbirth may occur in pregnant animals.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Diagnosis*

Determine blood-clotting time or demonstrate reduced prothrombin content of the plasma.

### *Treatment and Prevention*

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#### **Management**

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Drug treatment

- There is no effective treatment.

Control & prophylaxis

*First line*

Blood transfusion:

- 1 L of whole blood per 100 kg, IV (from an animal not being fed sweet clover).

*Alternative*

- Vitamine K1 (phytonadione), 1 to 3 mg/kg, IM in divided doses, with a small-bore needle.
- 

## **Herbicide Poisoning**

Herbicides are plant growth inhibitor chemicals which, when applied in the field may accidentally poison all livestock species and small animals. Animals are exposed to poisoning when feed and water is contaminated, if animals are allowed to graze in recently sprayed fields or when treatment of poisonous plants with herbicide leads to accumulation of harmful amounts of nitrate, cyanogenic glycosides, or other toxic plant constituents, or if normally unpalatable toxic plants are rendered palatable.

The most common herbicides are the following

### **Amides (bensulide, propanil)**

A lethal dose of bensulide for dogs is ~200 mg/kg. The prominent clinical sign is anorexia; other signs and lesions are not definitive. Hemolysis, methemoglobinemia, and

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*immunotoxicity* have occurred after experimental exposure to propanil. The half-life in catfish is  $\geq 15$  days.

### **Ammonium Sulfamate**

Ruminants apparently can metabolize this chemical to some extent. Large doses ( $>1.5$  g/kg b.w) induce ammonia poisoning in ruminants & the rumen becomes highly basic.

### ***Treatment and Prevention***

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#### **Management**

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- Weak acetic acid (vinegar), PO
  - Supply large amount of water
- 

### **Arsenicals**

Arsenicals are used as desiccants or defoliants on cotton, and residues of cotton harvest fed to cattle may contain toxic amounts of arsenic. Single toxic oral doses for cattle and sheep are 22-55 mg/kg b.w or or toxicity may occur after consumption of smaller doses on successive days.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- Large animals: Dimercaprol, 3 mg/kg, PO
  - Small animals: 2.5-5 mg/kg, IM, q4-6 h
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### **Bipyridyl Compounds (diquat, paraquat)**

Skin irritation and corneal opacity occur on external exposure to these chemicals, and inhalation is dangerous. Toxicity may occur if animals drink water with and old diquat containers.

Signs of diquat poisoning include anorexia, gastritis, GI distension, and severe loss of water into the lumen of the GI tract and in severe cases renal impairment, CNS excitement,

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and convulsions. Additional signs in praquat poisoning include incoordination and respiratory difficulty.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment:

- Vitamin E and selenium *plus* diuretics such as Mannitol 20% IV infusion at a maximum of 0.5 mg/kg/h and continue with 5% in Ringer's solution;
  - Furosemide, 1-5 mg/kg, IM, IV.
    - ✓ D/F: Injection, 50 mg/ml
    - ✓ D/I: Corticosteroids, acetazolamides, aminoglycosides, cephalothins and cephalosporins.
- 

**Dinitro Compounds** (dinoseb, 2,4-dinitrophenol, dinitrocresol, binapacryl, DNOC)

The dinitrophenol and dinitrocresol compounds are highly toxic to all classes of animals; eg, LD50 20-56 mg/kg b.wt. Poisoning occurs after feeding sprayed herbage or exposure of the skin or inhalation.

Clinical signs include fever, dyspnea, acidosis, tachycardia, and convulsions, followed by coma and death with a rapid onset of rigor mortis. Cataracts occur in chronic dinitrophenol intoxication. Skin, conjunctiva and hair may be stained yellow.

### ***Treatment and Prevention***

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#### **Management**

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Drug treatment

- Effective antidote is not known
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Control & prophylaxis

- Diazepam + Cool IV fluids + Vitamin A
- Emetics or gastric lavage or activated charcoal

**Caution:** Phenothiazine tranquilizers are contraindicated

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## Standard Veterinary Treatment Guidelines for Veterinary Clinics

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- Atropine sulfate, aspirin, and antipyretics should not be used.
- 

**Triazine Compounds** (atrazine, cyanazine, prometryn, metribuzin, simazine)

Although these herbicides are widely used, incidents of poisoning are uncommon. Toxic effects in sheep occur at doses of 500 mg of simazine/kg or 30 mg of atrazine/kg for 36-60 days. Generally, single doses >100-200 mg/kg body wt can be detrimental.

### ***Treatment:***

See, treatment for 2,4-D above.

## **Insecticide and Acaricide Toxicity**

Pesticide exposure, no matter how brief or small, results in some of the compound being absorbed and perhaps stored. Repeated short exposures may eventually result in intoxication. Thus every precaution should be taken to minimize human exposure.

## **Carbamate Insecticides**

### **Carbaryl**

The oral LD50 in rats is 307 mg/kg body wt and >500 mg/kg, dermally. A 2% spray is nontoxic to calves; 4% is nontoxic to mature cattle when applied dermally.

### **Carbofuran**

The oral LD50 is 8 mg/kg body wt in rats and 19 mg/kg in dogs. The minimum toxic dose in cattle and sheep is 4.5 mg/kg, becoming lethal at 18 and 9 mg/kg, respectively. Pigs have been poisoned after drinking water contaminated by this compound.

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### **Methomyl**

The oral LD50 in rats is 17 mg/kg body wt. Cattle have been reported to be poisoned after consumption of forage inadvertently sprayed with this compound.

### **Propoxur**

The oral LD50 is 95 mg/kg body wt in rats and >800 mg/kg in goats. Signs include hypersalivation, gastrointestinal hypermotility, abdominal cramping, vomiting, diarrhea, sweating, dyspnea, cyanosis, miosis, muscle fasciculations (in extreme cases, tetany followed by weakness and paralysis), and convulsions. Death usually results from hypoxia due to bronchoconstriction. Diagnosis usually depends on history of exposure to a particular carbamate and response to atropine therapy.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Atropine sulfate for cattle & sheep: 0.61 mg/kg, 1/4<sup>th</sup> IV and the remainder dose SC; repeat as needed

*plus*

- Alloxine, a cholinesterase reactivating compound, greatly improves recovery from carbamate poisoning if given with atropine.
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### **Organophosphates**

Organophosphates (OP) are insecticides used in animal and plant production. They vary greatly in toxicity, residue levels, and excretion. However, they produce little or no tissue and environmental residues.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Azinphos-methyl (or -ethyl)**

The maximum nontoxic oral dose is 0.44 mg/kg body wt for calves, 2.2 mg/kg for cattle and goats, and 4.8 mg/kg for sheep.

### **Carbophenothion**

Dairy calves <2 wk of age sprayed with water-based formulations showed poisoning at 0.05% and higher concentrations. Adult cattle have been poisoned by concentrations of 1%.

### **Chlorfenvinphos**

Adult cattle were poisoned by  $\geq 0.5\%$  sprays, while young calves were poisoned only when the concentration was raised to 2%. The minimum oral toxic dose appears to be  $\sim 22$  mg/kg for cattle of all ages.

### **Chlorpyrifos**

The oral LD50 is 500 mg/kg b.w. in goats and 97 mg/kg in rats. In comparison with calves, steers, and cows, bulls (particularly of the exotic breeds) are highly susceptible to a single dose of chlorpyrifos.

### **Coumaphos**

Coumaphos is used against cattle grubs and a number of other ectoparasites and for treatment of premises. At 0.5% of spray, it may be safely used on adult cattle, horses, and pigs; in young calves and all ages of sheep and goats the concentration must not exceed 0.25%; 0.5% concentrations may be lethal. Adult cattle may show mild signs at 1% concentrations.

### **Crotoxyphos**

Crotoxyphos is of rather low toxicity; however, European breed seem to be less susceptible; sheep, goats, and pigs all tolerate sprays containing crotoxyphos at 0.5% levels or higher. The

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

toxic dose appears to be in the 2% range, except for in Brahman cattle, in which 0.144%-0.3% may be toxic.

### **Diazinon**

When sprayed, young calves appear to tolerate 0.05% but are poisoned by 0.1% concentrations. Toxic levels: calves 0.88 mg/kg, PO, adult cattle 22 mg/kg; Sheep 26 mg/kg PO.

### **Dichlorvos**

Dichlorvos has many uses on both plants and animals. Because it is rapidly metabolized and excreted, residues in meat and milk are not a problem if label directions are followed. Toxic levels: young calves, 10 mg/kg; sheep and horses, 25 mg/kg PO. Flea collars that contain this compound may cause skin reactions in some pets.

### **Dimethoate**

Toxic levels: calves 48 mg/kg b.w., cattle above 1 year 22 mg/kg b.w., horses 60-80 mg/kg, PO. When applied topically, 1% sprays have been tolerated by calves, cattle, and adult sheep.

### **Dioxathion**

Concentrations  $\leq 0.15\%$  are generally used on animals. Dioxathion has killed young calves at 8.8 mg/kg, PO, and produced intoxication at 4.4 mg/kg.

### **Disulfoton**

The maximum nontoxic oral dose is 0.88 mg/kg body wt for young calves, 2.2 mg/kg for cattle and goats, and 4.8 mg/kg for sheep. Intoxication has occurred in cattle after consumption of harvested forages previously sprayed with this insecticide.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Fenthion**

The minimum toxic dose for cattle was 25 mg/kg body wt, PO; 50 mg/kg, PO, was lethal to sheep.

### **Malathion**

Malathion is one of the safest OP. Young calves tolerate 0.5% sprays, but 1% sprays are toxic; adult cattle tolerate 2% sprays. Given PO, Malathion is toxic at 100 mg/kg; young calves tolerate 11 mg/kg but are poisoned by 22 mg/kg. Malathion is excreted in the milk of cattle. Thus the public health risk is high.

### **Methyl Parathion**

The LD50 in rats from a single oral dose is 9-25 mg/kg body wt compared with 3-13 mg/kg for ethyl parathion. Microencapsulation of this compound decreases its toxicity, and the lethal dose in cattle has thus been increased from a 0.5% spray to a 2% spray.

### **Parathion**

Parathion is widely used for control of plant pests. Toxic levels: sprays in young calves, at a 0.02% concentration and occasional transitory signs at 0.01%; sheep at 22 mg/kg b.w, PO, but not at 11 mg/kg; young dairy calves, 0.44 mg/kg, old cattle, 44 mg/kg b.w. Parathion is used extensively in the control of mosquitoes and insects in the orchard and on truck crops. Normal application on land does not present particular hazard to livestock. Care must be taken to prevent accidental exposure. Parathion is not stored in animal tissues in appreciable amounts.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### **Phorate**

The minimum toxic dose was 0.25 mg/kg body wt in calves, 0.75 mg/kg in sheep, and 1 mg/kg in cattle. The oral LD50 in rats is 1-4 mg/kg.

### **Phosmet**

Toxic levels: adult cattle & calves, 25 mg/kg b.w., sheep, 50 mg/kg b.w.

### **Ronnel (Fenclorphos)**

Toxic levels: cattle, 132 mg/kg b.w. & mild signs are observed; severe signs occur at ~440 mg/kg; sheep, 400 mg/kg. Sprays at 2.5% do not produce poisoning of cattle, young dairy calves, or sheep. Poisoning usually occurs in two stages. The animal first becomes rather weak and, although moving about normally, may be placid. Diarrhea, often flecked with blood, may also be seen. Salivation and dyspnea then appear if the dose was high but probably not at the lower dosages. Blood cholinesterase activity declines slowly over 5-7 days.

*Public health risk:* Ronnel produces residues in meat and milk; therefore, strict adherence to label restrictions is essential.

### ***Treatment:***

Activated charcoal to remove residues already ingested.

### **Ruelene**

Ruelene is active both as a systemic and contact insecticide in livestock; it has some anthelmintic activity, and is of rather low toxicity. Toxic levels: dairy calves,  $\geq 44$  mg/kg b.w, PO; adult cattle 88 mg/kg; Sheep, 176 mg/kg show moderate toxicity; Angora goats were about twice as sensitive. Toxic levels in pigs, 11 mg/kg and horses by 44 mg/kg. Most livestock tolerate a 2% topical spray.

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### **Terbufos**

This soil insecticide is used to control corn rootworms. Toxic levels: Cattle and sheep, ~1.5 mg/kg b.w., PO

### **Tetrachlorvinphos**

Toxic level: pigs, 100 mg/kg.

### **Tetraethyl Pyrophosphate (TEPP)**

TEPP is one of the most acutely toxic of all insecticides. Cattle: at 0.33% TEPP emulsion were found all dead.

### **Trichlorfon**

As a spray, trichlorfon at a 1% concentration is tolerated by adult cattle. When given PO, it is tolerated by young dairy calves at 4.4 mg/kg body wt but produces poisoning at 8.8 mg/kg. Adult cattle, sheep, and horses appear to tolerate 44 mg/kg. Toxic levels: 88 mg/kg produces poisoning. Dogs were unaffected when fed 1000 ppm of trichlorfon for 4 months. Trichlorfon is metabolized rapidly.

### ***Clinical Symptoms of Organophosphate poisoning***

In general, organophosphate (OP) pesticides have a narrow margin of safety, and the dose-response curve is quite steep. The signs are mainly cholinergic overstimulation & groups as follows.

*Muscarinic effects:* hypersalivation, miosis, frequent urination, diarrhea, vomiting, colic, and dyspnea due to increased bronchial secretions and bronchoconstriction. They appear first.

*Nicotinic effects:* muscle fasciculations and weakness.

*The central effects:* nervousness, ataxia, apprehension, and seizure activity. Cattle and sheep commonly show severe depression. Stimulation in dogs and cats usually progresses to convulsions. Some OP (eg, amidothioates) do not enter the

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

brain easily, so that CNS signs are mild. Onset of signs after exposure is usually within hours but may be delayed for  $\geq 2$  days. Severity and course of intoxication is influenced principally by the dosage and route of exposure. In acute poisoning, the primary clinical signs may be respiratory distress and collapse followed by death due to respiratory muscle paralysis.

### *Diagnosis*

Lowered cholinesterase activity in blood and brain, but does not correlate with severity. Results of analyses performed after exposure may be negative because OP do not remain long as the parent compound in tissues. Chlorinated OP compounds appear to have greater potential for tissue residue.

Frozen stomach and rumen samples should be analyzed for the pesticide because OP is generally more stable in acids.

### *Treatment and Prevention*

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#### **Management**

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Drug treatment:

#### *Muscarinic blocking agents*

- Atropine sulfate Dogs and cats, 0.2-2 mg/kg q 3-6 h; Horses and pigs, 0.1-0.2 mg/kg, IV, q 10 min; Cattle and sheep, 0.6-1 mg/kg,  $\frac{1}{3}$ <sup>rd</sup> of the dose IV, the remainder IM or SC, repeated as needed. Stop treatment when pupils are dilated and not further.

*plus*

- Diazepam to reduce seizures

#### *Cholinesterase reactivators*

- Atropine is combined with the cholinesterase reactivators

*Initial*

- 2-pyridine aldoxime methchloride (2-PAM, pralidoxime chloride) 10%, 20-50 mg/kg, IM or by very slow IV injection, repeated as needed.
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## Standard Veterinary Treatment Guidelines for Veterinary Clinics

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Followed by:

- Oxime must be instituted within 24-48 hr because OP the response to 2-PAM decreases shortly after use.

Others include

- Emetics, cathartics and adsorbants to decrease further absorption
- If the OP compound was applied dermally, wash the body with detergent and water; if through the mouth, and within less than 2 hours, give emetic drugs (C/I: depressed animals);
- Oral administration of mineral oil decreases absorption of pesticide from the GI tract.
- Activated charcoal, 3-6 g/kg as water slurry, adsorbs OP and helps elimination in the feces; particularly recommended in cattle.
- Artificial respiration or administration of oxygen is advantageous.

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*Note:* Phenothiazine tranquilizers should be avoided. Succinylcholine should not be used for at least 10 days after OP exposure.

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### **Rodenticide Poisoning**

#### **Anticoagulant Toxicants**

Brodifacoum is the most commonly used and is the most toxic rodenticide, which has replaced the much safer warfarin-based coumarins.

#### **Zinc Phosphide and Aluminium Phosphide**

Both chemicals are rodenticides used in baits of bread, buns, soaked wheat, damp, rolled oats or sugar at concentrations of 5%. Aluminum phosphide is also used as grain fumigant for insect and rodent control. Both are unstable in water or acid.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Clinical Symptoms***

Zinc phosphide causes emesis, large doses cause death within 3-5 hours. Anorexia, lethargy, and rapid deep breathing are observed. In dogs, abdominal pain, ataxia, weakness, and recumbency may follow. Acidosis, hyperesthesia, seizures, hepatic and renal damage and acetolene (garlic, rotten fish) odor of breath are observed. Abdominal pain, colic in horses, and bloat in cattle.

### ***Diagnosis***

It depends on clinical signs, an acetylene odor to the breath, and opportunity for or better, evidence of exposure to zinc phosphide; frozen vomitus or gastric lavage fluid, and other organs including stomach contents, liver, and kidney should be examined.

### ***Treatment and Prevention***

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#### **Management**

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##### Drug treatment

- Emesis followed by aluminum plus magnesium hydroxide gel, PO.
  - Activated charcoal plus sorbitol
  - Sodium bicarbonate, IV
- 

### **Strychnine Poisoning**

Strychnine is a bitter tasting alkaloid used as pesticides to control Gophers, moles and rats. Its use is restricted in Ethiopia, but used for the same purpose under the veterinarian supervision for the control of stray dogs. Accidental poisoning might occur to animals and humans. The onset occurs from 10 minutes to 3 hours.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### *Clinical Symptoms*

The signs include anxiety, stiffness, violent titanic seizures, saw- stance, opisthotonus, persistent rigid extension of all four limbs, non-muscular movement and anoxia due to rigidity of muscles.

### *Diagnosis*

It depends on clinical signs and history of exposure and analysis of baits.

### *Treatment and Prevention*

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#### **Management**

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Non-drug treatment

- Artificial respiration
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Drug treatment

- Pentobarbital intubation
  - Methocarbamol, 150 mg/kg, IV, repeat doses of 90 mg/kg as needed
  - Inhalation anaesthetics for 48 hours. C/I: ketamine and morphine are contraindicated and should not be given.
  - Enterogastric lavage: activated charcoal and a saline or osmotic cathartic
  - Filudis: forced diuretics with 5% mannitol in 0.9% normal saline at 7 mg/kg/hr
  - Ammonium chloride, 100 mg/kg, q12h, PO; C/I, if the acidosis is from exertion or respiratory failure
- 

Prophylaxis

- Extreme care should be taken for handling of strychnine.
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### **Industrial Chemical Poisoning**

Many industrial chemicals are toxic if ingested or even exposed to the skin. The most common known to cause toxicity in animals are listed below.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### **Lead Poisoning**

In veterinary medicine, lead poisoning is most common in dogs and cattle but limited in other species due to reduced accessibility and selective feeding habits. The sources of lead include used oil and battery, paint, linoleum, grease, lead weights, lead shot, and contaminated foliage growing near smelters or along roadsides.

#### *Clinical Symptoms*

*Cattle:* acute course characterized by ataxia, blindness, salivation, spastic twitching of eyelids, jaw champing, *bruxism*, muscle tremors, and convulsions.

*Sheep and old cattle:* Subacute course characterized by anorexia, rumen stasis, colic, dullness, and transient constipation, frequently followed by diarrhea, blindness, head pressing, *bruxism*, hyperesthesia, and incoordination.

*Horses:* chronic course characterized by weight loss, depression, weakness, colic, diarrhea, laryngeal or pharyngeal paralysis (roaring), and dysphagia that frequently results in aspiration pneumonia.

*Avian species:* signs include anorexia, ataxia, loss of condition, wing and leg weakness, and anemia. *Dogs:* show gastrointestinal intestinal abnormalities, including anorexia, colic, emesis, and diarrhea or constipation. Anxiety, hysterical barking, jaw champing, salivation, blindness, ataxia, muscle spasms, opisthotonus, and convulsions may develop. CNS depression rather than CNS excitation may be evident in some dogs.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### ***Diagnosis***

Lead levels in various tissues and blood, hematologic abnormalities,  $\delta$ -aminolevulinic acid and free erythrocyte protoporphyrin levels are confirmatory.

### ***Treatment and Prevention***

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#### **Management**

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Non drug treatment

- Rumenotomy may be useful to remove lead from the GI tract

Drug treatment

- Calcium disodium edetate (Ca EDTA), 110 mg/kg/day, IV or SC, divided into two treatments q24h for 3 days; then repeated 2 days later
  - In dogs, similar treatment divided into four treatments; SC in 5% dextrose for 2-5 days; after one week rest, an additional 5-day treatment may be required if clinical signs persist.
  - Thiamine, 2-4 mg/kg/day, SC, alleviates clinical manifestations and reduces tissue deposition of lead
  - Combined Ca EDTA and thiamine treatment appears to produce the most beneficial response
  - D-penicillamine, 110 mg/kg/day, PO to dogs for 2 weeks; S/E, emesis and anorexia, not recommended for livestock
  - Magnesium sulfate, 400 mg/kg, PO
  - Barbiturates or tranquilizers may be indicated to control convulsions
- ✓ W/P: Milk and meat: several months
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### **Nitrate and Nitrite Poisoning**

Nitrates and nitrites are used in pickling and curing brines for preserving meats, certain machine oils and antirust tablets, gunpowder and explosives, and fertilizers.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

Many species are susceptible to nitrate and nitrite poisoning, but cattle are affected most frequently. Ruminants are especially vulnerable because the ruminal flora reduces nitrate to ammonia, with nitrite, which is ~10 times more toxic than nitrate, as an intermediate product. Ingested nitrates may directly irritate the GI mucosa and produce abdominal pain and diarrhea.

### ***Clinical symptoms***

Rapid, weak heartbeat; subnormal body temperature; muscular tremors; weakness; and ataxia are early signs of toxicosis. Brown, cyanotic mucous membranes develop rapidly. Dyspnea, tachypnea, anxiety, and frequent urination are common. Some monogastric animals, usually because of excess nitrate exposure from nonplant sources, exhibit salivation, vomiting, diarrhea, abdominal pain, and gastric hemorrhage. Affected animals may die suddenly without appearing ill, in terminal anoxic convulsions within 1 hr, or after a clinical course of 12-24 hr or longer. Some animals that develop marked dyspnea recover but then develop interstitial pulmonary emphysema and continue to suffer respiratory distress; most of these recover fully within 10-14 days. Abortion and stillbirths may occur in some cattle.

### ***Diagnosis***

Excess nitrate exposure can be assessed by laboratory analysis for nitrate in both antemortem and postmortem specimens.

### ***Treatment and Prevention***

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#### **Management**

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##### Treatment

- Methylene blue 1%, 4-22 mg/kg, slow IV, in distilled water or isotonic saline
- Rumen lavage with cold water and antibiotics may stop the continuing microbial production of nitrite.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### Prevention

- Feeding grain with high-nitrate forages may reduce nitrite production.
  - High-nitrate forages may also be harvested and stored as ensilage rather than dried hay or green chop
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## **VETERINARY VACCINES IN DISEASE CONTROL AND PREVENTION**

### **Introduction**

Among 15 list A and 72 list B diseases identified by the World Animal Health Organization (OIE), 7 and 20, respectively are confirmed to exist in Ethiopia. Diseases like FMD, PPR, LSD, Sheep and goat pox, Maedi-visna, Rabies, AHS, NCD, IBD, Fowl cholera, Marek's disease, CBPP, CCPP, Black leg, Anthrax, Brucellosis, Haemorrhagic septicemia, Ovine pasteurellosis, Fowl pox, Fowl typhoid, Pullorum have been observed in different forms. Most of these diseases are preventable by vaccination.

For vaccination to be effective, the following points have to be considered: the specific group of animals affected, the period at which outbreak occurs and their distribution in a certain geographic area.

### **General Description of Vaccines**

*Veterinary vaccines:* They are preparations containing antigenic substances which are administered for the purpose of inducing a specific and active immunity against disease provoked by bacteria, viruses, or other microorganisms, by parasites, or antigenic fractions or substances produced by these organisms and rendered harmless whilst retaining all or part of their antigenic properties.

*Vaccination:* It is the introduction of a vaccine into the body to produce immunity to a specific disease. The vaccine may be administered by subcutaneous, intradermal, or intramuscular injection, by mouth, by inhalation or by scarification.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### **Types of Vaccine**

#### Killed vaccines

Killed vaccines are produced by inactivating the infectious agent (so that it can't replicate in the host) without altering the immunogenicity of the protective protein(s). They induce predominantly humoral type of immunity, i.e. antibody-mediated. Generally they require two doses with an appropriate interval. These vaccines contain adjuvants that enhance the immune reaction. Booster doses of inactivated vaccines are often administered annually e.g. black leg, pasteurellosis.

#### Live vaccines

This type of vaccine could be prepared either by using less virulent or by attenuating highly virulent strain/type of an infectious organism. Attenuation is usually made by growing of an infectious organism under abnormal culture condition.

These type of vaccines induce complete type of immune response (both humoral and cellular) and confer higher level and longer period of protection than killed vaccines.

Live vaccine especially attenuated ones may revert to full virulence after inoculation into an animal and elicit disease e.g PPR, rinder pest, lumpy skin disease.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Toxoid Vaccines**

They are vaccines prepared from toxins obtained from microorganisms and has been treated by heat or chemical agents to destroy its deleterious properties without destroying its abilities to stimulate the formation of antibody e.g. tetanus vaccine.

### **Autogenous Vaccine**

It is a vaccine prepared from cultures of material derived from a disease lesion of the animal to be vaccinated e.g bovine papiloma.

### **Serovaccine**

It is a combination of antisera with a vaccine to produce passive and active immunity e.g. rabies.

## **Technical Basis of Vaccination**

### **Vaccine Combination**

Combination of polyvalent vaccines is commonly used in veterinary medicine. They consist of several serotypes, antigenic variants of the same organism, or different organisms. They may be live, killed, or sub-unit combinations. The number of vaccines administered at a time i.e. within one month should not exceed six. They are desirable from both convenience aspect and the cost-saving of reduced handling and vaccination time.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Routes of Vaccination**

#### **Subcutaneous injection (S/C)**

Subcutaneous injection is particularly convenient in small companion animals where the loose skin at the back of the neck is a commonly used route. Potential disadvantages are slower uptake of antigen as compared to a more vascular site such as muscle. Lower antibody response has been obtained with the S/C route as compared to intramuscular injection.

#### **Intramuscular injection (I/M)**

In theory, this route deposits vaccine into location of high vascularity and provides efficient exposure of antigen to the immune system. Attention must be paid to the anatomical choice of vaccination site to ensure adequate delivery and exposure to responsive cells.

#### **Intradermal injection (I/D)**

Intradermal injection is very efficient immunizing route due to antigen capture and lymphatic drainage to regional lymph nodes. Smaller doses of antigen are required to achieve responses equivalent to I/M injection.

#### **Oral route**

This route offers a convenient, powerful route for stimulating local immunity. Mass oral vaccination via drinking water has been used primarily in poultry.

#### **Intranasal vaccination**

Intranasal inoculation is an alternate mucosal route and has been advocated as a means of avoiding interference from maternal antibody.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Intraperitoneal vaccination (I/P)**

Intraperitoneal vaccination represents a serosal delivery and a method intermediate between mucosal and intramuscular/subcutaneous vaccination.

### **In ovo vaccination**

Chickens develop immunological responsiveness well before hatching, and early protection against infection, such as Marek's disease, Infectious bronchitis, Infectious bursal and Newcastle disease has been demonstrated.

### **Aquatic immersion**

Mass vaccination of small fish could be accomplished by immersion in vaccine baths.

## **Vaccination schemes**

### **Primary and Secondary Immune Response**

Initial immunization with a specific antigen induces 'primary immune response' with low levels of both Ig M and Ig G production evident by 7 days. When antigen is given again after 2 or more weeks, a more rapid and higher 'secondary immune response' is generated, with a rising Ig G antibody beginning 2-3 days.

### **Booster vaccination**

Booster vaccination needs to be given at intervals to ensure immunological memory for a rapid immune response to pathogens. The time may vary, depending on whether the vaccine is inactivated or living. Therefore for most killed vaccines yearly revaccination is recommended. There are some exceptions; for some diseases which have seasonal incidence vaccination should be planned for a time prior to the expected disease outbreak.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Age at vaccination**

The main obstacle to successful vaccination in young animals is the presence of blocking levels of maternally derived antibody, therefore, all vaccination schemes, whether they be for an individual animal or for a herd health vaccination program must be planned considering the presence and extent of maternal antibody.

### **Dam vaccination**

Dam vaccination schemes are especially beneficial for the protection of neonates in heavily contaminated environments. The strategy is to enhance neonatal immunity by augmenting colostrum titers. Vaccination of the dam, with a second dose just prior to parturition, maximizes colostrum antibody titers. Examples of such approaches are *E. coli*, rota and coronavirus vaccines in cows and heifers.

### **Husbandry Practices and Vaccination Schemes**

Management practices have a profound effect on the need for vaccines, the practical schedule of use and the success or otherwise of the vaccinations. Vaccination schedules, which follow a set of annual pattern, are most acceptable. It must be as convenient and straight forward as possible if it is to be reliably implemented.

### **Strategies for vaccine use**

#### **Epidemiology**

Strategies for the use and measurement of the success of vaccination in the control of animal disease have to be considered in the context of epidemiology of that specific disease.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

Among the animal diseases, those, which are not ubiquitous in nature, could be successfully controlled. They should also show a high case-fatality rate and if recovered, animals show long-lasting immunity. Persistent infections are uncommon, and the cycle of transmission can therefore be readily broken.

### **Vaccination in infected population**

The use of vaccine in endemically infected populations is strategically aimed at containment, elimination or eradication. Containment requires only a moderately effective vaccine used in a highest risk individual such as the young, or animals being introduced into a new population, such as entering the breeding herd or on arrival at the feedlot.

High standards of management, particularly maintaining completeness of the vaccination program, hygiene and quarantining of newly introduced animals, is vital.

Eradication requires highly efficacious vaccines administered intensively and widely. The proportions of the population, which must be vaccinated, can be estimated based on knowledge of the epidemiology of each agent but for highly contagious infections may be as high as 95%.

### **Group vaccination**

Vaccinating a high percentage of a population is desirable whether dealing with the control of disease in individual animal or herds or flocks.

### **Curative and/or preventive vaccination**

Vaccination is primarily given pre-exposure; however, postexposure vaccine is also administered for diseases with very long incubation period e.g. Rabies.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Effects of nutrition and environment on response**

Environmental and nutritional stress factors should be minimized for maximum protection.

### **Precautions and contraindication of vaccines**

- Sick animals shouldn't be vaccinated
- Animals under immunosuppressive drug treatment should not be vaccinated within three to four weeks
- Care should be taken in the use of antibiotics when a vaccine containing live bacteria is administered.
- During mass vaccination of multi-age group with live vaccines, the transmission of infection due to the organisms in the vaccine to susceptible young animals should be considered.
- The full vaccination course as recommended by manufacturer should always be administered
- Stressing of animals to be vaccinated should be avoided.
- Don't vaccinate through dirty, wet skin.
- Repeated use of needles and syringes within herd/flock is undesirable.
- Containers that have held live vaccines can be potentially hazardous and should be kept/disposed safe.
- Injectable vaccines should be stored and reconstituted as recommended by the manufacturer.
- Liquid preparations should always be adequately shaken before use to ensure uniformity of the material to be injected.
- Accidental self-injection with oil-based vaccines can cause intense vascular spasm, which may result in loss of limbs. Therefore when happened prompt medical attention has to be taken.

## **Standard Veterinary Treatment Guidelines for Veterinary Clinics**

### **Side effects of vaccines**

Some live vaccines may be able to cross the placenta and cause abortion or fetal abnormalities. In general inactivated vaccines are safer than active vaccines, but handling and vaccinating animals in late pregnancy is associated with risk.

### **Storage and handling**

Store under the conditions recommended by the manufacturer. Refrigerated store at 2°C to 8°C is usually necessary. Unless otherwise specified, some vaccines such as Marek's disease vaccine should be stored in solid carbon dioxide or liquid nitrogen. Live antigens may be inactivated by disinfectants or alcohol therefore these substances mustn't be used to sterilize syringes. Only sterile needles and syringes should be used for vaccination and injections given with aseptic precautions to avoid the possibility of abscess formation or the transmission of incidental infections.

### **Common Veterinary Vaccines**

The National Veterinary Institute (NVI) at Debre Zeit produces most vaccines used in livestock in Ethiopia. Vaccines for pets are mainly imported. The following are veterinary vaccines used in livestock and pets.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### Vaccines Used in Ruminants

#### **Anthrax vaccine**

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Description	Freeze-dried live bacterial vaccine produced by using Sterne 34 F <sub>2</sub> strain of <i>Bacillus anthracis</i> adjuvated with saponin 4% skimmed milk-stabilizer is produced at NVI, Debre Zeit. Each field dose contains 10 <sup>7</sup> viable spores.
Indication	For prevention or control of anthrax in domestic animals
Presentation	The freeze-dried vaccine is available in 20 ml vials of 100 doses.
Dosage and administration	Reconstitute the product in 100 ml of sterile saline water. Cattle & equines: 1 ml SC in the loose skin of the neck just in front of the shoulder. Sheep & goats: 0.5 ml SC in the loose skin or in the inner face of the thigh. The latter is preferable for goats.
Booster:	Vaccination should be carried out every year before the anthrax season.
Immunity	Develops in 10 days and lasts for one year
Side-effect	Swelling at the injection site. It normally disappears in 2-3 days
Precautions	Inject SC only & animals above 3 months of age. Pregnant animals should not be vaccinated. Antibiotic should not be given shortly before and 14 days after vaccination. Destroy empty bottles or if unusable by incineations.
Withdrawal period	Meat- for six weeks after vaccination
Storage	Store it in refrigerator at 4°C.

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### **Bovine pasteurellosis vaccine (hemorrhagic septicemia)**

Description	Prepared from a whole broth culture of <i>Pasteurella multocida</i> type B and <i>Mannheimia haemolytica</i> & <i>P. trehalosi</i> (20 <sup>8</sup> germs/ml), killed by 0.3% formalin and precipitated by 1% aluminium potassium sulphate (both final concentration).
Presentation	The vaccine is liquid suspension available in vials of 100 ml for 50 doses
Dosage and administration	For best results vaccinate animals at least 21 days before the hemorrhagic septicemia season. Shake the product vigorously before use; inject adult and calves with 2 ml SC.
Immunity	Immunity appears in 10 days after vaccination and lasts for 6 to 8 months. Revaccination is advised after 6 months.
Side-effects	Anaphylactic reactions may appear occasionally after vaccination of Zebus; serious in & very often on some European cattle breeds, particularly on animals, which have been vaccinated many times against foot-and-mouth disease, Blackleg or Anthrax. Thus sensitiveness should be checked in these breeds before use. In case of reaction, immediate injection of antihistamine is recommended.
Storage	At room temperature for 6 months; at +4°C for 1 year; avoid light and heat.

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### **Blackleg vaccine**

Description	This product contains a whole broth culture suspension of <i>Clostridium chauvoei</i> (local isolate) killed by formalin 0.5% (final concentration) and precipitated by 1% aluminium potassium sulphate (final concentration).
Indication	Control or prevention of blackleg disease in cattle.
Presentation	It is a liquid suspension vaccine available in 100 ml vials for 50 doses
Dosage and administration	Shake the product vigorously before use and vaccinate cattle including calves; inject 2 ml SC.
Immunity	Immunity develops in 10 days after vaccination
Booster	every year in endemic areas
Storage	At +20°C for 6 months; at +4°C for 1 year. Avoid light and heat.

### **Brucellosis**

Brucellosis vaccines mentioned hereunder are imported and not produced at NVI.

Description of the vaccine	Abortion and infertility in cattle caused by <i>Brucella abortus</i> can be very successfully controlled by vaccination. There are two vaccines available in the market, strain 19 (S19) and strain 45/20 (45/20).
Strain 19 vaccine <i>Description</i>	S19 is a live vaccine and is presented in freeze-dried form, which is reconstituted with diluent immediately prior to use.
Dosage &	The dosage is 5 ml given subcutaneously.

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administration	Cattle from two months of age are given though calf vaccination is ideal and lasts for seven years. Inoculation of adult cattle is very successful in controlling severe outbreaks of abortion. Bulls shouldn't be vaccinated with S19.
Side-effects	<i>Vaccination reactions:</i> localized swellings at the site of injection can occur, especially in adult cattle that is sterile, don't rupture and persist for many months as fibrous nodules. Generalized systemic reactions can also occur with high temperatures and loss of milk in lactating cows. Heavily pregnant cows have been known to abort and shouldn't be vaccinated.
Zoonotic risks	The vaccine is live and accidental injection into cattle handlers and veterinary surgeons can cause severe illness (undulant fever) and so great care must be taken when handling the vaccine.
Strain 45/20 vacc. Description	Strain 45/20 is a killed vaccine.
Dosage and administration	Two inoculations are given by subcutaneous injection to animals over six months of age. S/E: There are often large localized reactions at the site of injection.

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### **Contagious bovine pleuropneumonia (CBPP) vaccine**

Description	It is a freeze-dried live attenuated bacterial vaccine produced using T144 strain of <i>Mycoplasma mycoides</i> subspecies <i>mycoides</i> small colony (MmmSC). Each field dose contains at least $10^7$ viable mycoplasma organisms.
Indication	For the control or prevention of contagious bovine pleuropneumonia in cattle
Presentation	The freeze-dried vaccine contains 100 doses per vial.
Dosage and administration	Reconstitute the vaccine in 100 ml of cold and sterile saline water. Inject 1 ml of the reconstituted vaccine subcutaneously only. Vaccinate all animals above 6 months of age
Immunity	It develops 3 weeks post-vaccination
Booster dose	Annually
Side-effect	A rare case of post-vaccinal reaction (mild swelling at the site of injection) can occur. If it occurred, antibiotics like Tetracycline, Oxytetracycline, Erythromycin and Tylosin can be used.
Precautions	The reconstituted vaccine must be protected from light and heat and used immediately (the maximum limit is 1 hour when kept under cold condition).
Storage	At +4°C for 6 months; at -20°C for several years.

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### **Contagious Caprine Pleuropneumonia (CCPP)**

Description	It is an inactivated bacterial vaccine produced using F-38 Kenyan strain of <i>Mycoplasma capricolum capripneumoniae</i> (MccP). Well-grown <i>Mycoplasma</i> culture is inactivated by saponin, which has also an adjuvant effect. The minimum protein content in each field dose is 0.15 mg/ml.
Indication	To control or prevent CCPP in goat
Presentation	The vaccine is in liquid suspension, which is available in 100 ml for 100 doses.
Dosage and administration	Shake the vaccine before use and vaccinate 1 ml/goat subcutaneously (thoracic area is advisable).
Immunity	CCPP vaccine confers immunity for 1 year. Revaccination should be made after a year.
Side-effect	Slight edematous reaction is induced by the adjuvant, saponin, which disappears in 48 hours.
Storage	The vaccine should be stored at +4°C at least for 1 year.

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### **Ovine pasteurellosis vaccine**

Description	This product contains a whole broth culture of <i>Pasteurella multocida</i> type A (10 billion germs/ml), killed by 0.3% formalin and precipitated by 1% aluminium potassium sulphate (final concentration). Vaccine developed from <i>Mannheimia haemolytica</i> and <i>Pasteurella trehalosi</i> are recommended.
Indication	Control or prevention of pasteurellosis in sheep.
Presentation	The vaccine is in liquid suspension form and available in vials of 50 ml for 50 doses.
Dosage and administration	Shake the product vigorously before use; vaccinate 1 ml/sheep SC. For best results vaccinate according to regional conditions, at least 3 weeks before the rainy season.
Immunity	Immunity appears in 10 days after vaccination and lasts for 6 to 8 months.
Storage	At +20°C for 6 months, at +4°C for 1 year
Precaution	Avoid light and heat.

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### **Neonatal calf diarrhea vaccine**

Neonatal calf diarrhea vaccines are not locally produced and occasionally imported for use in dairy cattle. Under prevailing conditions demand is very low.

Description	The aetiology is multifactorial including bacteria and viruses, fungi and protozoa; e.g. <i>E.coli</i> , <i>Salmonella</i> spp., rotavirus, coronavirus, and there are vaccines and serovaccines available.
Presentation	The main vaccine available is a white oily emulsion containing inactivated bovine rotavirus and <i>E.coli</i> K99 antigens adsorbed on to aluminium hydroxide gel and emulsified in a light mineral oil.
Dosage and administration	Cows and heifers: 1 ml/head IM at the side of the neck, from 12 to 14 weeks before the expected calving date. Calves: must receive adequate colostrums within the first 6 hours of life Suckling calves: should receive colostrums and/or milk from vaccinated cows for the duration of the critical period. Bucket fed calves: pool the milk from vaccinated cows obtained from the first six to eight milkings and then fed to calves at a rate of 2.5-3.5 lit/day, according to size, for the first 14 days of life. Vaccinate all cows in a herd to reduce infection and the level of excretion is kept to a minimum.
Contra-indications	Only healthy animals should be vaccinated. Partly used vials of vaccine should be

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

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	discarded.
Side-effects	Occasionally, there is a reaction at the site of injection. Hypersensitivity reactions may occur.

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### **Enzootic pneumonia of calves vaccine**

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Description	This is a multifactorial disease associated with environmental <i>Mycoplasma</i> , viral and bacterial elements. In practice the parainfluenza 3 (PI <sub>3</sub> ) virus is usually involved and vaccination with PI <sub>3</sub> vaccine can be very successful. This type of vaccine is freeze-dried preparation containing live PI <sub>3</sub> virus strain.
Dosage and administration	The vaccine is administered intranasally. The calf is held with its head inclined upwards and the whole 2 ml dose is instilled into one nostril using special applicator. A short time is allowed for the vaccine to flow out into the upper respiratory tract. A single dose only is necessary for calves of 12 weeks of age or older but in young calves two doses should be given at three weeks and ten weeks old. Vaccination can commence at a week old.

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### **Lumpy skin disease vaccine**

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Description	Lyophilized live-freeze dried <i>Capripox</i> virus strain, cultured on Vero cells freeze-dried vaccine with a minimum titer of 3 TCID <sub>50</sub> per field dose.
Indication	Control or prevention of lumpy skin disease

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	in cattle, sheep and goat
Presentation	20 ml vials 100 dose of lyophilized vaccine.
Dosage and administration	Reconstitute the product in 100 ml of cool sterile saline water. Inject 1 ml SC in the inner surface of the thigh. This vaccine can be associated with freeze-dried anthrax vaccine.
Immunity	Eight days after vaccination and may last for two years.
Storage	Vaccine should be stored at a temperature of -20°C

### **Foot and mouth disease vaccine**

Description	A bivalent vaccine manufactured from locally isolated from A and O serotypes are produced by the NVI. The virus is propagated from cell culture. It is absorbed into aluminium hydroxide gel and inactivated with 0.3% formaldehyde and adjuved with saponin.
Indication	Control or prevention of Foot and Mouth Disease in cattle.
Dosage and administration	Shake the bottle before use and inject 4 ml/head of cattle SC, preferably in dewlap region. The first vaccination requires two injections at 6 months of interval.
Booster	Annually and consider the outbreak season
Immunity	2-3 weeks after vaccination and may last for one year.
Side-effects	Swelling may occur at the site of inoculation and persist for a few weeks.

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Precaution	After puncture of the stopper the whole bottle of the vaccine must be used within 24 hours. Don't vaccinate the cattle under 6 months of age. It is better not to associate other vaccination with FMD and not to make another vaccination one month before and after FMD vaccination.
Storage	Store the vaccine at +4°C.

### **Peste des Petits Ruminants (PPR) vaccine**

Description	Lyophilized virus vaccine PPR strain cultured on vero-cells. Freeze-dried vaccine with a minimum titer of 2.5 TCID <sub>50</sub> per field dose.
Indication	To control or prevent PPR in goat and sheep.
Presentation	20 ml vial of 100 doses of lyophilized vaccine.
Dosage and administration	Inject 1 ml of the diluted vaccine subcutaneously in both sheep and goat.
Precaution	Immunization before 6 months of age should be avoided since parental acquired immunity can interfere with the vaccination.
Immunity	Immunity can develop eight days after vaccination; immunity is life long.
Storage	Vaccine should be stored at a temperature of -20°C

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### **Rinderpest vaccine**

Description	Lyophilized virus vaccine Kebete-strain cultured on Vero-cells freeze-dried vaccine with a minimum titer of 2.5 TCID <sub>50</sub> per field dose. (TCID = tissue culture infectious dose)
Indication	To control or prevent rinderpest in ruminant; but for its epidemiology and current status of the disease, <i>see</i> Diseases of Cattle: Rinderpest.
Presentation	20 ml vials 100 doses of lyophilized vaccine
Dosage and administration	Reconstitute the product in 100 ml of cool sterile saline water and injection of 1 ml of diluted vaccine subcutaneously is recommended for all cattle, regardless of size. Early immunization before 6 months of age can interfere with parental acquired antibodies that inhibit the development of active immunity. Annual vaccination is recommended for the young animals during consecutive years.
Immunity	Immunity develops eight days after vaccination and may last for life. The vaccination against rinderpest can be associated with the vaccination against-blackleg, anthrax, pasteurellosis and CBPP vaccines.
Side-effect	Post-vaccination fever may occur in exotic breeds.
Storage	Vaccine should be stored at a temperature of -20°C

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### **Sheep and goat pox vaccine**

Description	Lyophilized live freeze-dried <i>Capripox virus</i> strain; cultured on Vero-cells. Freeze-dried vaccine with a minimum titer of 2.5 TCID <sub>50</sub> per field dose.
Indication	To control or prevent sheep and goat pox.
Presentation	20 ml vials of 100 doses of lyophilized vaccine
Dosage and administration	Reconstitute 20 ml of the product in 100 ml of cool and sterile saline water and inject 1 ml of diluted vaccine subcutaneously on the inner face of the thigh. This vaccine can be associated with freeze-dried anthrax vaccine.
Immunity	Eight days after vaccination and lasts for 2 years.
Storage	Vaccine should be stored at a temperature of 20°C.

### **Tetanus toxoid vaccine**

Description	Tetanus toxoid vaccine for Equidae is a filtrate of a culture in a liquid medium, or materials derived therefrom, of a suitable strain or strains of <i>Clostridium tetani</i> inactivated in such a manner that toxicity is eliminated and immunogenic activity is retained. The vaccine contains suitable adjuvant. Currently the vaccine is not produced locally; however, different types of vaccines are imported and are available in the market.
Dosage & administration	Varies from vaccine to vaccine hence it is important to follow the respective vaccine application guidelines of the manufacturers

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### **Vaccines Used in Equine**

#### **Anthrax vaccine**

The vaccine and application is similar to ruminants (*see* Vaccines used in Ruminants: Anthrax).

#### **African horse sickness vaccine**

Description	Lyophilized virus vaccine containing neurotropic type 9-strain cultured on Vero-cell with a minimum titer of 4.3 TCID <sub>50</sub> per field dose.
Indication	To control or prevent African horse sickness.
Presentation	20 ml vials of 20 doses of lyophilized vaccine.
Dosage and administration	Reconstitute the product in 20 ml of cool and sterile saline water and inject 1 ml of diluted vaccine subcutaneously for horses, donkeys and mules regardless of body size and age.
Immunity	Appears one month after vaccination and may last for one year.
Storage	Vaccine should be stored at a temperature of +4°C.
Precaution	Vaccinate animals above six months old. Vaccinated animals should be rested for 15 days after vaccination. The vaccine should not be freezed!
Side-effect	Hypothermia can occur at 48 hours, or between the seventh and fourteenth day after vaccination

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### **Tetanus toxoid vaccine**

The indications, dosage and administration and precautions during application of this vaccine in equine species is similar to cattle (*see* Vaccines used in ruminants: Tetanus toxoid vaccine).

### **Vaccines Used in Poultry**

#### **Avian coccidiosis vaccine**

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Indication	To avoid problems related to drug resistance and the continuous use of medication to control <i>Eimeria species</i> in domestic birds.
Dosage and administration	The vaccine is given in the drinking water as a single dose at between 5 and 9 days of age. A single dose is sufficient to protect broilers and replacement layer pullets.

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#### **Fowl pox vaccine**

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Description	It is a live freeze-dried vaccine produced on the chicken fibroblast, cells of embryonated specific pathogen free (SPF) eggs using modified fowl pox virus. Each vaccine dose contains $10^{3.5}$ EID <sub>50</sub> /dose.
Indication	To control or prevent fowl-pox infection in poultry.
Presentation	Each 20 ml vial contains 100 doses of freeze-dried vaccine.
Dosage & administration	Reconstitute the 100 doses with 2 ml of sterile cold-buffered solvent and vaccinate by transfixation of inner side of the wing membrane of each bird dip the stylet before vaccination into the viral suspension so that the groove is filled. Take care to touch the

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	needle against the inside of the vial in order to remove adhering drops. The stylet is inserted from beneath through the wing web and care should be taken to push the feathers side so as to avoid damaging the blood vessels. The wing web should be slightly stretched.
Vaccination program	Free environment: Vaccinate from the 8 <sup>th</sup> week of life with an annual booster vaccination. Contaminated environment: Vaccinate from the 3 <sup>rd</sup> week of life; booster 3 months later and then annual buster vaccinations.
Storage	The vaccine can be stored at +4°C

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### **Fowl tyhoid vaccine (live vaccine)**

The NVI has not produced fowl typhoid vaccine; thus this refers to standard imported product available locally.

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Description	It is a live, freeze-dried vaccine against fowl typhoid in chicken. Each vial contains $5 \times 10^7$ CFU of <i>Salmonella gallinarum</i> strain.
Indication	To control or prevent fowl typhoid in poultry.
Presentation	The vaccine is available in vials of 20 ml with 100 doses.
Dosage and administration	Reconstitute the vaccine in 50 ml cool sterile distilled or saline water. Inject 0.2 ml of the reconstituted vaccine by subcutaneous injection into the lower part of the neck. A single dose vaccine should be given at 6 weeks of age followed by a booster dose at 12 weeks of age.

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Immunity	It appears in about 10 days. The vaccine confers protection for 6-8 months after two injections.
Storage	The vaccine can be stored at +4°C for 6 months and at 20°C for several years.

### **Marek's disease vaccine**

Indication	Against Marek's disease in poultry
Dosage form	Powder for reconstitution
Dosage & administration	Chickens are ideally vaccinated at day-old in the hatchery, and also chickens up to 3 weeks of age may be vaccinated. Occasionally revaccination is done at 2 to 4 weeks of age. The vaccine is injected intramuscularly at 0.2 mg/chick.

### **Newcastle disease vaccine**

#### **A. Live Vaccines**

##### Lasota and Hitner B1

Description	Lyophilized virus vaccine Hichner b1/Lasota strain cultured on embryonated SPF eggs. It is a freeze-dried vaccine with a minimum titer of $10^7$ ELD50. (ELD = embryonic lethal dose)
Indication	To control or prevent Newcastle disease in poultry
Dosage and administration	<i>Ocular route:</i> use an eyedropper. To calculate the volume of water required: Measure 1 ml of water to the dropper; count the number of drops in this 1 ml of water; calculate the

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volume of diluents required to dilute the number of doses of the vaccine per vial with the eyedropper in use.

Volume of diluents (ml) = No. of doses of vaccine per vial

per ml

Example: how much diluents should be added to a vial containing 250 doses of NCD vaccine

Volume of diluents (ml) =  $\frac{250 \text{ doses per vial}}{50 \text{ drops per ml}}$   
= 5 ml per vial given

that 1 ml of water in the eye-dropper yielded 50 drops.

*Oral drench:* dissolve the 200 doses in 200 ml, the 100 doses in 100 ml and the 50 doses in 50 ml. administer by oral drench 1 ml of dissolved vaccine squirting into the beak of each bird using a clean plastic syringe.

*Drinking water:* the quantity of water generally required per bird for the drinking water vaccination is as follows:

For 10 -14 day-old birds	10-15 ml
For 3 - 8 week-old birds	20-30 ml
For other birds	40 ml

To calculate the volume of water required to dilute the vaccine, multiply the number of doses of the vaccine per vial by the amount of ml required per bird according to the above table.

Example: to dilute 500 doses of vaccine for 8 week-old birds, multiply 500 by 30, that means one needs 15 liters of water to dilute

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	the 500 doses of vaccine per vials.
Vaccination program	<p>The parent flocks vaccinated but not infected, so their progeny could respond to vaccination from 14 days. Parent flocks recently been infected with virulent virus; in this flock, levels of antibody known to interfere with vaccination until 42 days. In situation of this kind, approximately 60% of birds will respond at about 21 days, while the remaining 40% are refractory until approximately 42 days.</p> <p>While vaccination at one day of age may give active protection to chicks with lowest levels of antibody, vaccination at this age may be largely ineffective in the majority of chicks and hence should be regarded as a preliminary step rather than a recognized protective procedure.</p> <p>In the case of broilers in low risk areas, revaccination at 14 days of age will prove adequate protection. In high risk areas application of vaccine at this age only may be inadequate. Therefore, it must be necessary to revaccinate at 42 days of age using the Lasota vaccine by the drinking water.</p> <p>In the case of layers, further boosting of immunity is necessary after 10 weeks of age. This is to protect the birds from the disease during the remainder of the growing period, and to provide at point of lay an immune level that will effectively protect the pullets with the minimum of revaccination during the laying period.</p> <p>If the time interval between the primary and secondary vaccination is &lt; 21 days, the</p>

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antibody produced by the first dose of vaccine is more likely to interfere with the multiplication of the second dose of virus. An interval during which no further vaccine is given should be allowed until the final dose of vaccine is administered about two weeks before the birds come into egg production. Therefore, the following vaccination program is recommended.

Day of vaccination	Type of vaccine	Route of administration
Day old	HB1	Intraocular
Day 21	Lasota	Intraocular
Day 42	Lasota	By the drinking water
Between 10 and 12	Inactivated	Intramuscular (0.5 ml/bird)
At point of lay	Inactivated	Intramuscular (0.5 ml/bird)

**Precautions:** The water used for reconstitution must be free from antiseptics. The chicken will not be given drinking water the evening before vaccination

**Storage** Vaccines should be stored at +4°C.

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### A. Newcastle thermo-stable vaccine

#### **Description**

It is a live viral vaccine produced in an embryonated specific pathogen free (SPF) eggs using the relatively heat stable variant strain, developed at Queensland University of Australia. Each field dose contains at least log 10<sup>7</sup> ELD<sub>50</sub> viral particles

#### **Indication**

To control or prevent Newcastle disease in poultry.

#### **Presentation**

The vaccine is available in vials of 250, 100 and 50 doses.

Storage

#### **Dosage and administration**

##### *Ocular route*

Use an eyedropper. To calculate the volume of water required to dilute the vaccine into the recommended dose per vial, follow the instructions below.

Measure 1 ml of water to the dropper. Count the number of drops in this 1 ml of water. Calculate the volume of diluents required to dilute the number of doses of the vaccine per vial with the eyedropper in use.

Volume of diluents (ml) =  $\frac{\text{No. of doses of vaccine per vial}}{\text{No. of drops formed per ml}}$

Example, how much diluents should be added to a vial containing 250 doses of NCD vaccine given that 1 ml of water in the eyedropper yielded 50 drops.

Volume of diluents (ml) =  $\frac{250 \text{ doses per vial}}{50 \text{ drops per ml}}$   
= 5 ml per vial

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### *Oral drench*

Dissolve the 200 doses in 200 ml, the 100 doses in 100 ml and the 50 doses in 50 ml. administer by oral drench 1 ml of dissolved vaccine squirting into the beak of each bird using a clean plastic syringe.

### *Drinking water*

The quantity of water generally required per bird for the drinking water vaccination is as follows:

For 10-14 day-old birds 10-15 ml

For 3-8 week-old birds 20-30 ml

For other birds 40 ml

To calculate the volume of water required to dilute the vaccine, multiply the number of doses of the vaccine per vial by the amount of ml required per bird according to the above table.

Example, to dilute 500 doses of vaccine for 8 week-old birds, multiply 500 by 30 that means one needs 15 liters of water to dilute the 500 doses of vaccine e per vial.

### **Vaccination program**

First vaccination: day old and above (preferably up to 10 days)

Second vaccination: at 4 weeks of age

Third vaccination: at 3-4 months of age; repeat every 3-4 months

### **Storage**

Since thermo-stable minority populations present in the relatively heat stable strain 12, the vaccine can be stored at +4°C.

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### **B. Inactivated oil emulsion Newcastle disease vaccine**

Description	The vaccine is prepared in embryonated eggs injected with the lentogenic strain Lasota, containing at least $10^8$ EID <sub>50</sub> inactivated and suspended in light mineral oil adjuvant. It is selected for its long-lasting immunity.
Indication	To control and prevent Newcastle disease in poultry.
Dosage and administration	The inactivated type of vaccine is recommended for flocks of laying and breeding birds. Shake well before and during use. Inject 0.5 ml vaccine per bird subcutaneously at the back of the neck or intramuscularly in the breast muscle. Only health poultry should be vaccinated.
Vaccination program	First vaccination should be given at 10-12 weeks of age; While Second vaccination at point of lay. Best immunity is obtained when birds are vaccinated with live Newcastle vaccines prior to the application of inactivated vaccine.
Storage	Store the vaccine from +4°C - 8°C until it is used. Allow the vaccine to reach the room temperature (20°C) before use.
Side-effect	Accidental injection of this vaccine to the vaccinator can cause localized reaction; in such occasion <i>seek</i> physician assistance.

### **Vaccines Used in Dogs and Cats**

The four essential vaccines used in dogs against diseases that pose serious health threats to susceptible dogs are rabies, canine parvovirus, canine distemper and infectious canine hepatitis.

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Except for rabies, which is an inactivated vaccine, the other three types of vaccines are modified live vaccines. Other vaccines such as canine parainfluenza virus, *Leptospira icterohaemorrhagiae*, *L. canicola*, *L. Pomona*, *Bordetella bronchiseptica* and *Borelia burgdorferi* are also in use; but they are not discussed here.

### **Canine adenovirus**

Indication	Prevention infectious canine hepatitis in dogs
Presentation	Inactivated and modified live virus vaccines, separately one dose vials
Dosage & administration	Primary vaccination: first vaccination at 6-8 weeks old with inactivated vaccine; one dose 2 to 4 weeks later with modified live virus vaccine; Booster vaccination: at 9-11 weeks, followed by vaccination at 12-14 weeks of age.
Booster	Annual re-vaccination
Precautions	

### **Canine distemper vaccine**

Canine distemper vaccine is not produced locally. It is available in combination with other canine vaccines namely, or alone.

Indication	To prevent canine distemper infection in dogs
Presentation	One dose in a single vial in powder form
Dosage & administration	Reconstituted and injected IM or SC
Precautions	Puppies under 6 weeks of age should not be vaccinated.

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### **Canine parvovirus vaccine**

Indication	Against canine parvovirus infection.
Dosage form	Vial of 1 dose powder for reconstitution
Dosage and administration	Subcutaneous or intramuscular injection of 1 dose. Puppies are vaccinated at 2 to 4 weeks interval from 6 to 8 or 18 weeks of age. Although immunity following modifier live vaccine administration is probably of long duration, annual booster vaccination is recommended.
Precautions	Avoid vaccination of puppies less than 6 weeks of age.

### **Rabies vaccine**

Many types of imported vaccines for use in domestic animals are in use locally. The safest vaccine produced on cell culture is mentioned here. The National Institute of Health and Nutrition under the Ministry of Health produces an old type of vaccine. However, because of its obsolete technique and not recommended by WHO, it will not be discussed here.

Description	An inactivated culture of Rabies virus, cloned out of strain Pasteur, grown on BHK-21 cell line and inactivated with beta-propiolactone. The virus is suspended in an aqueous aluminium phosphate suspension.
Indication	Prevention and treatment of rabies in dogs and cats
Presentation	Single dose or multiple dose of 10
Dosage and administration	Primary vaccination: dogs/cats, at 3 months and cattle/horse at 6 months.

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	1 ml SC or IM
Booster	Every three years
Precautions	After SC administration, a nodule may occasionally occur
Storage	+2 to +8°C; Avoid freezing!

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## APPENDICES

### APPENDIX A

#### **Weight and Fluid Equivalents (British)**

<i>Conversions</i>			
1000 mcg	1 mg	17 minims	1 ml
65 mg	1 grain(gr)	28.4 ml	1 ounce
1000 mg	1 gram	5 ml	Teaspoon
15	1 gram	15 ml	Tablespoon
1000	1 kilo gram	100 ml	305 ounce
30g	1 ounce	480 ml	1 pint
454 gm	1 lb pound	2 pints	1 quart
2.2 lb	1 kg	1.75 pints	1 liter
1000 kg	Ton (imperial)	32 ounce	1 quart
1% (w/v)	1gm/100 ml	1000ml	1 liter

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## APPENDIX B

### **Average Normal Rectal Temperatures**

<b>Animal</b>	<b>°C±0.5 °C</b>
Horse	38.0
Cow	38.5
Sheep	39.5
Goat	39.0
Pig	39 .0
Dog	39.0
Cat	38.5
Rabbit	39.3

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### APPENDIX C

#### **Normal Pulse (Rates per minute)**

<b>Animal category/spp.</b>	<b>Pulse/min.</b>	<b>Animal category/spp.</b>	<b>Pulse/min.</b>
<b>Foal, newborn</b>	128	Sheep/Goat, yearling	85-100
• 1-2 days	100-128	• adult	70-80
• 1-2 weeks	80-120	• old	55-60
• 3-6 month.	64-96	Piglets, newborn	130-140
• 6-12 month.	48-72	Piglets, 12-14wk.	110-115
• 1-2 year	40-56	Pig	
Horse, adult,		• adult sow	85-95
• Stallion	28-32	• boar	60-70
• Mare/MC*	33-40	Dog,	
Ass/Mule,		young	110-120
• young	65-75	adult, 5m	80-120
• Adult	45-60	adult, 1 year	60-80
Calf, newborn	115-140	Cat, young	130-140
• 1-2 weeks	108	Cat, adult	100-120
• 1-2 months	100-105	Rabbit	120-150
• 3-6 months	95-100	Camel	30-50
• yearling	90	Elephant	25-30
Cow, adult	40-60	Chicken	180-440 (312 average)
Ox*, adult	35-70	Lamb/kid	110-120

\* male castrate

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### APPENDIX D

#### **Normal Respiratory Rates (Numbers per minute)**

<b>Animal category/spp.</b>	<b>Rates per minute</b>	<b>Animal category /spp.</b>	<b>Rate per minute</b>
Foal	14-15	pig	10-12
Horse, adult	9-10	Dog, young	20-22
Calf, newborn	56	old	14-16
2 wks	50	cat	20-30
5 wks	37	Rabbit	50-60
6 mo	30	Guinea-pig	100-150
yearling	27	Camel	5-12
Cattle, adult	12-16	Chicken	15-30
Lamb/kid	12-20	turkey	12-16
Sheep/Goat, adult	12-15	Duck	16-28
Old	9-12	Goose	12-30

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### APPENDIX E

#### **Anaesthetics, Analgesics and Sedatives**

##### **1. Anaesthetics and Analgesics used in Cattle**

<b>1. Anaesthesia</b>	<b>Dose &amp; route of administration</b>
Banamine (Flunixin)	1.1 – 2.2 mg/kg
Isoflurane Halothane Sevoflurane	3-4% induction, 1-2% maintenance; inhalation. Note: Precision vaporizer, adequate ventilation or scavenging essential
Ketamine	Local injection to effect.
Lidocaine (Procaine)	Local injection to effect.
Xylazine	20-40 mg IV
<b>2. Analgesia</b>	
Acepromazine	0.02-0.05 mg/kg, IV; 0.05-0.2 mg/kg, IM
Pentobarbital	390 mg (50 mg) per 10 lbs.

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### **2. Anaesthetics and Analgesics used in Sheep**

<b>1. Anesthesia</b>	Dose & route of administration
Isoflurane	3-4% induction, 1-2% maintenance; inhalation.
Halothane	
Sevoflurane	
	<i>Precaution:</i> Precision vaporizer, adequate ventilation or scavenging essential
Propofol	4.0-6.0 mg/kg IV for induction 20-25 mg/min/35-65 kg, IV Route: infusion.
<b>2. Analgesia</b>	
Buprenorphine (Buprenex)	0.0005-0.01 mg/kg BW IM
Butorphanol (Torbugesic)	0.1-0.5 mg/kg BW SC

### **3. Anaesthetics and Analgesics used in Pigs**

<b>1. Anesthesia</b>	Dose & route of administration
Isoflurane	3-4% induction, 1-2% maintenance; inhalation.
Halothane	
Sevoflurane	
	<i>Precaution:</i> Precision vaporizer, adequate ventilation or scavenging essential
Ketamine	15-25 mg/kg BW IV
Lidocaine (Procaine)	Local injection to effect.
Thiopental (Pentothal, Sodium Pentobarbital)	24-30 mg/kg BW IP 5-19 mg/kg BW IV
Tiletamine (Telazol)	6.6-11 mg/kg BW IM
Acetylppromazine	
<b>2. Analgesia</b>	
Acepromazine	10 mg/cc (Dose at 1 cc/kg)

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

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Maleate	
Aspirin	10-20 mg/kg BW PO q4h Up to 6 hours of analgesia; use enteric-coated tablet
Atropine	0.05 – 0.5 mg/kg
Buprenorphine (Buprenex)	0.0005-0.01 mg/kg BW IM, IV Up to 12 hours of analgesia

---

### **4. Anaesthetics and Analgesics used in Camels**

---

<b>1. Anesthesia</b>	<b>Dose and Route</b>
Ketamine	IM (Locating venous blood vessels is difficult, thus IV is not used)
Propofol	2 mg/kg IV in premedicated camels with Xylazine and diazepam; duration 30-60 minutes

---

<b>2. Analgesia</b>	
Xylazine	0.1 mg/kg IM <i>plus</i> Lidocaine local anesthesia and opioids
Butorphanol	0.02 mg/kg – 0.03 mg/kg, IM or IV
Lidocaine	12-15 ml of 2% in the caudal epidural space

---

### **5. Anaesthetics and Analgesics used in Chicken**

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<b>1. Anesthesia</b>	<b>Dose and Route</b>
Avertin (Tribromoethanol)	0.06-0.1 ml IP
Pentothal (Thiopental)	90 mg/kg IP

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### **6. Anaesthetics and Analgesics used in Equine**

---

<b>1. Anesthesia</b>	<b>Dose, Route and Comments</b>
Atropine	0.002-0.01 mg/kg IV
Diazepam	0.02-0.1 mg/kg IV as minor tranquilizer

---

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

Glycopyrrolate	0.001 – 0.005 mg/kg IV
Guaifenesin	55mg/kg in 5% dextrose IV, followed by ketamine ( <i>see below</i> )
Ketamine	1.7 mg/kg IV with Xylazine 2.2 mg/kg IM

---

### **2. Analgesia**

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Acepromazine	0.025-0.1 mg/kg 0.04 mg/kg IV premedication dose
Butorphanol	0.02-0.05 mg/kg IV, given with other tranquilizers, gives adequate analgesia for minor procedure
Xylazine	0.5-1 mg/kg IV, horse may be sensitive to touch & may kick

---

### **7. Anaesthetics and Analgesics used in dogs**

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#### **1. Anaesthesia Dose, Route and Comments**

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Atropine	0.75-5 mg/kg IM
Benzocaine	0.1 – 0.2 mg/kg
Halothane	3-4% induction, 1-2% maintenance;
Isoflurane	Route: inhalation.
Sevoflurane	<i>Precaution:</i> Precision vaporizer, adequate ventilation or scavenging essential.
Ketamine	10-100 mg/kg
Lidocaine (Procaine)	Local injection to effect.
Propofol	5-6 mg/kg IM
Thiopental (Pentothal, Sodium Pentothal)	6-12 mg/lb BW IV; lower dose with preanesthetic tranquilization 10-18 mg/kg IV

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## Standard Veterinary Treatment Guidelines for Veterinary Clinics

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Telazol	6-12 mg/kg IM, SC 3-6 mg/kg IV
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<b>2. Analgesia</b>	
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Acepromazine	0.1-0.5 mg/kg BW IV, IM, SC
Maleate	0.25-1.0 mg/lb BW PO prn
Aspirin	10-20 mg/kg BW PO q12h
Buprenorphine	0.01-0.02 mg/kg BW SC q12h
Butorphanol (Torbugesic)	0.2-0.4 mg/kg BW SC, IM, IV q2-5h Between 2 -5 hours of analgesia
Carprofen	4.4 mg/kg PO, SC Note: As long as needed, guideline of 3-4 days for soft tissue surgery and 8- 10 following orthopedic procedures.
Xylazine	0.5 mg/lb BW IV 1 mg/lb BW IM, SC

---

## Standard Veterinary Treatment Guidelines for Veterinary Clinics

### **8. Anaesthetics and Analgesics used in cats**

<b>1. Anesthesia</b>	<b>Dose, Route and Comments</b>
Isoflurane	3-4% induction, 1-2% maintenance; inhalation.
Halothane	
Sevoflurane	Note: Precision vaporizer, adequate ventilation or scavenging essential.
Xylazine	0.5 mg/lb BW IV 1 mg/lb BW IM, SC
<b>2. Analgesia</b>	
Acepromazine Maleate	0.1 – 0.2 mg/kg BW IM, SC 0.5–1.0 mg/lb BW PO prn
Buprenorphine	0.005-0.01 mg/kg BW SC, IM q12h 0.005-0.01 mg/kg BW IV, SC q8-12h
Butorphanol	0.4 mg/kg BW SC, q6h 0.22 mg/kg BW IM 0.4-1.5 mg/kg BW PO q48h 0.4 mg/kg BW SC q3-4h
Ketamine	10-30 mg/kg BW IM, IV
Telazol (Tiletamine/zolazepam)	7.5 mg/kg BW IM and 7.5 mg/kg BW IM

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