

DETERMINATION OF COMPLICATIONS DECREASE THE RISK FACTOR IN CATTLE INFECTED BY LUMPY SKIN DISEASE VIRUS IN DIYALA PROVINCE, IRAQ

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ABSTRACT: *The present study was conducted on 150 cattle of different breed in Diyala province. Their age ranged from 1 month 15 years of different sexes. All suspected animals were clinically examined and the infected animals were classified according to the severity of clinical status into mild and severe forms. Effect of breed, sex and age of infected animals, were studied. The study show the LSD is more sever in crossbreed and frezian cow than native cow and more sever in small age groups than adult result in edema in the brisket and skin cellulites and eruption of nodules which facilitate to screw worm infestation . The hematological examination of LSD revealed to slight decrease of total RBCs. Blood smears were revealed presence of blood parasite infestation as Babesia, Theileria and Anaplasma. The main target of treatment trials to save the animal life and to prevent LSD complications.*

KEYWORDS: Lumpy Skin Disease, Babesiosis, Theileriosis, Anaplasmosis

INTRODUCTION

Lumpy skin disease (LSD) is an infectious viral disease of cattle caused by a virus (LSDV) of the family *Poxviridae* and genus *Capripoxvirus* characterized by pyrexia and sudden eruption of skin nodules (Tuppurainen and Oura, 2012).

Transmission: LSDV is thought to be transmitted primarily by biting insects. The virus was detected in mosquitoes of the genera *Aedes* and *Culex* and *Ixodid* ticks during some outbreaks (Chihota *et al.*, 2003; Tuppurainen *et al.*, 2011). Disease incidence is highest in wet and warm weather. Incidence decreases during the dry season, which is possibly linked to decrease in insect vector (occurrence/numbers). Minor sources of infection could include direct and indirect contact (e.g. through infective-saliva contaminated feed and water). Other potential transmission routes include the milk of lactating cows and the semen of infected bulls, since the LSD virus can persist for extended periods of time in both (Irons *et al.*, 2005 ; Osuagwuh *et al.*, 2007).

Epidemiology: LSD was first described in Northern Rhodesia in 1929 by Morris (1930). Since then disease has spread over most of Africa in a series of epizootics as previously recorded by Davies (1991) and House (1990). The most recently affected countries include Kuwait in 1986-88 as mentioned by Anonymous (1988), and Israel in 1989 as previously recorded by Shimshony (1989). The diseases reappeared in Egypt at the summer of 1989 and, in a period of five to six months, it had been spread to 22 out of 26 Egyptian governorates. The disease also spread to Asia and appeared in non-African countries (Yeruham *et al.*, 1995; Brenner *et al.*, 2006; Body *et al.*, 2012). Since 2000, LSD outbreaks have been reported across the Middle East and it is highly likely the disease will become endemic at least in parts of the Region. In subsequent years Bahrain, Kuwait, Oman, Yemen and the West Bank also reported LSD

incursion. Lebanon and Jordan joined LSD affected countries in 2012 and 2013, and most recently Turkey reported the disease in October 2013. In 2014 LSD appeared in Iraq after excessive importation of cattle from other neighboring countries of Iraq.

Clinical signs: The incubation period in natural cases is thought to be between two to five weeks (Carn and Kitching, 1995; Tuppurainen *et al.*, 2005). The disease appears clinically as acute, subacute or subclinical. The acute disease is characterized by pyrexia, lymphadenopathy, skin nodules with subsequent sit-fasts and occasional orchitis and mastitis (Brenner *et al.*, 2006). Other lesions observed at post-mortem examination include necrotic plaques in the body mucosa, chiefly of the upper respiratory tract, the oral cavity and rumen.

The pathology of LSD: Viral replication in pericytes, endothelial cells and probably other cells in blood vessels and lymph vessels walls causes vasculitis and lymphagitis in some vessels in affected areas (Lindsay and Thomas, 2013). In severe cases pannicular infarction that were seen recently in some LSD biopsies (Ali *et al.*, 1990 ; El-Neweshy, *et al.*, 2013).

Treatment and control of LSD

There is no specific antiviral treatment available for LSD infected cattle. Sick animals may be removed from the herd and given supportive treatment consisting of local wound dressing to discourage fly worry and prevent secondary infections. Systemic antibiotics may be given for skin infections, cellulitis or pneumonia, and food and water should be made readily available. Local applications of insecticides to infected cattle have been made in an attempt to reduce further transmission, but to no apparent benefit (Allen *et al.*, 2010; Davies, 1981).

Effective control of the disease depends on immunization of the animals and in South Africa effective vaccines are produced from the Neethling strain virus. In other countries effective vaccines are produced from sheep pox and goat pox viruses. However, the use of these latter vaccines would probably only be feasible in countries where goat and sheep pox is endemic. All susceptible animals should be vaccinated annually. Calves born from vaccinated cows should not be vaccinated before 6 months of age, but calves from unvaccinated cows should be vaccinated before 6 months of age. (Jaargang and Mapham ,2008 ; Lindsay and Thomas, 2013).

In May of 2014, outbreak of LSD was recorded in several district areas of Diyala province for first time. All age groups and both sex of Diyalian cattle were infected with severe and serious complications. Clinical signs, epidemiological characters, and pathological features of LSD in this outbreak were recorded in this study. Clinical diagnosis was done.

This study aims to determinate the complications after LSD infection which includes brisket oedema, skin nodules eruption mostly followed by miyasis(screw worm infestation) , sever enlargement of prescapular and femoral lymphnodes, in some cases blood in urine(red water) was observed , generalized anemia and loss of appetite result in recumbency and death .

MATERIALS AND METHODS

The present study conducted in different district areas of Diyala province (East-northern of Iraq). The total number examined 50 cattle in different age, breed and sex. The animal

examination was focused on physical status , temperature, superficial lymph node and skin lesions according to (Rodostits *et al.*, 1995).

Blood sample collected from jugular vein after disinfection of area by alcohol 70%. 5ml of blood sample collected and put in a vials containing sodium ethylenediamine tetracetic acid (Na₂ EDTA) sufficient for 5 ml of blood to prevent coagulation. The tubes were gently rotated to ensure proper mixing of the blood with the anticoagulant without damaging the integrity of the cells and were transported to the laboratory. Evaluation of red blood cells count (RBC), hemoglobin concentration (Hb), packed cell volume (PCV) and blood smear were done.

RESULTS

The severity of the disease as measured by number of lumps and occurrence of complications. The infected animals were classified according to the severity of clinical status into:

Mild form: It was only observed in native cattle and some crossbreed which, appeared as 3 or 6 lumps. Some cases showed detached lumps leaving ulcer. Depression, anorexia, excessive salivation, lachrymation, nasal discharge, dispnoea and emaciation were also noticed. Nodular lesions were seen on the animal body especially in the skin of the muzzle, nares, nasal and oral mucosa, back, legs, scrotum, udder, perineum, eyelids, lower ear and sometime in the tail.

Severe form: The severe form was recorded in all ages and both sex in crossbreed, Frezian cattle and some native cattle which firstly suffered from fever (40.5C°-41.5C°) that persisted for 6-12 days. The number of lumps about 60-200 lumps or more than which was a variable in size and cover whole the animal body. Swelling of brisket, face and one or four legs was observed and displayed in the figures (1A,2A) respectively. Big ulcer behind knee joint was common. Subcutaneous nodules were painful and enlargement of prescapular and prefemoral lymph node had been observed and displayed in the figure (3).The nostrils and muzzle were crusted with mucopurulent discharge and the mucous membranes were congested. Unfortunately the nares orifice of calf was closed with mucoupurulant and lumps and displayed in figure(4) . Decrease in milk production also observed. On the other hand some of cows suffered from abortion .



Fig.(1;A):Calf suffered from edematous swelling in face ,under eye and present lumps around muzzle. before treatment .

Fig.(1;B) :Calf healing from the edematous swelling and lumps after treated by prednisolone drug .recover stage show no nodules eruption.



Fig.(2;A): Cow affected by LSD suffered from edematous swelling in the brisket and diffusion of lumps along body. Before treatment.

Fig.(2;B): Cow treated by prednisolone drug affected by LSD suffered from cutaneous edema in brisket show recovery stage and disappear of edema.



Fig(3): revealed the enlargement of prescapular lymphnodes be in contingent with theileriosis certified by blood smear examination.

Blood smears examination show the presence of three blood parasite as *Babesia* , *Theileria* and *Anaplasma spp.* displayed in the figures(5,6 and 7) respectively.



Figure(4): reveals the closure of nasal orifices of infecte calf during period of LSD infection

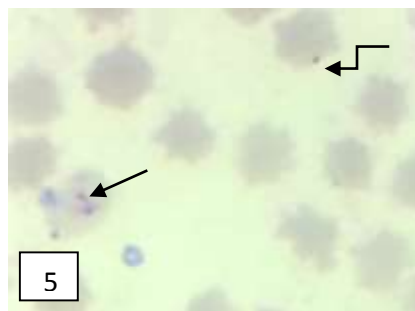


Figure-5:Red blood cell reveals mixed infection by *Theileria*

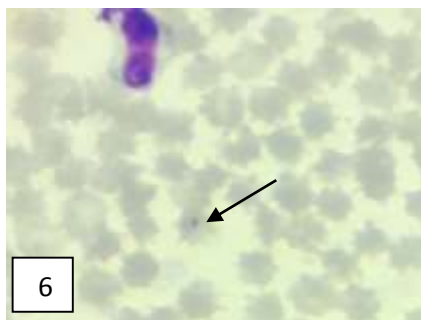


Figure-6: Red blood cell infected by *Babesia spp.*

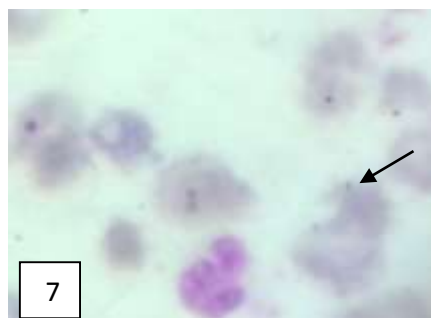


Figure-7: Red blood cell infected by *Anaplasma marginale*

The table(1) represent the blood values of diseased animal since the clinical signs appeared till recover in comparison with healthy animals.

Table (1). Effect of LSD on blood values of infected animals

Blood parameter	Before treatment M.+S.D	Since recover M.+S.D	Normal value
Packed cell volume (PCV) %	25.3 ± 2.0	26.6 ± 3.888*	30-45
Hemoglobin concentration (Hb) g/dl	8.2 ± 0.678	8.4 ± 1.019*	10-15
Red blood cells count (RBC) Per/ μ l	4.510.063 ± 257173.7	4.649.937 ± 826383.9	5-10million/ μ l
Platelets Per/ μ l	950.656* ± 230.659.2	794.900 ± 143.947.5	300-800

(P < 0.05)*

The table(2) was revealed the total number of examined cattle and the rate of infection by LSD and blood parasites.

Table (2). Represent the total number of infected cattle by LSD and blood parasites.

The age of infected cattle by LSD	No.	Infected by <i>Babesia</i>	Infected by <i>Theileria</i>	Infected by <i>Anaplasma</i>
1-12 month	13	1	4	-
13 month- 5 years	26	3	5	1
6 -10 years	9	2	-	2
11-15years	2	1	-	1
	50	3.5%	4.5%	2%

DISCUSSION

Lumpy skin disease (LSD) is an economically important disease of cattle and can produce a chronic debility in infected cattle comparable to that caused by foot and mouth disease (FMD). Mortality rates as high as 40 percent or more have been encountered but they are usually lower. Severe and permanent damage to hides results from the skin lesions. Lesions in the mouth, pharynx and respiratory tract commonly occur, resulting in a rapid deterioration in condition and sometimes severe emaciation, which can persist for months. Serious economic losses can follow outbreaks that have a high morbidity(Allen *et al.*,2010). Some cows infected by LSD were passing from mixed infection with blood parasite as babesiosis , theileriosis and rickettsial infection(anaplasmosis) had been diagnosed.

Blood values were refer to significant differences in the rate of packed cell volume(PCV) and the concentration of hemoglobin (Hb). No significant differences in the total RBC count had been noticed, but less than the normal value. The total number of the platelets remain in normal value.

When infected cow by LSD was dead and, the post mortem examination of the carcass refers to some diseases caused by blood parasites as enlargement of the liver and spleen and retention of the bile in gall bladder that refer to babesiosis . Another cow show icterus mucous membrane, and bulging eye with petechial hemorrhage this a signal for theileriosis displayed in the figure(8).



Figure-8: Reveal icterus mucous membrane, and bulging eye.

These medical concepts and the incidence of the outbreak in May 2014 with it's progression till November 2014 with presence of heavy infestation of ticks could be translated to the presence of mixed infection by blood parasites. So the results in table(2) refer to my expectation about the mixed infection by blood parasites so, the rate of infection by *Babesia spp.* reach to 3.5% and , 4.5% by *Theileria spp.* and 2% by *Anaplasma spp.* .

The main target of treatment trials was to save the animal life and to prevent LSD complications .The Prednisolone drug was firstly used to treat the edema due to vasculites and cellulites correlated with LSD at 40 mg of prednisolone for three days is recommended for severe cases(Greaves and Sabroe ,1998). Prednisolone is a corticosteroid drug with predominant glucocorticoid and low mineralocorticoid activity, making it useful for the treatment of a wide range of inflammatory and auto-immune conditions (Czock *et al.*,2005) , cluster headaches, vasculitis, acute lymphoblastic leukemia and autoimmune hepatitis,(Lambrou *et al.*,2009) systemic lupus erythematosus, Kawasaki disease(Miura *et*

al.,2011) and dermatomyositis. Corticosteroids inhibit the edema, fibrin deposition, capillary dilation, leukocyte migration, capillary proliferation, fibroblast proliferation, deposition of collagen, and scar formation with inflammation. Prednisolone can activate and influence biochemical behaviour of most cells (AMH,2010 ;Rang *et al.*,2003).

When the edema was inhibited ,there is no skin eruption , no myiasis result in fast improvement in animal condition and the figure(1A and B) reflect one of multiple cases. The figure(9) was revealed nasal erupted nodule in cow didn' t treated with prednisolone exposed to screw worm infestation.



Figure-9: Represent nazal orifice of cow infected by LSD virus exposed to myiasis after nodules eruption.

The figure(2A) was revealed another type of edema in the brisket and, this type more dangerous because it is oozed from the chest when the virus systemically affected internal organs as nasopharynx ,trachea descending to the lungs result in hard respiration due to pleurisy when the secondary infection was possible. This sequel agree with Coetzer (2004) , Geering (1995) and Davies (1981) whose report the inflammation of mucous membrane of the mouth , larynx, trachea, and the lungs resulting in primary and secondary pneumonia.

By using prednisolone and antibiotic as Oxytetracycline the edema was degraded followed by fast improvement of animal condition. Oxytetracycline is drug of choice for treatment of anaplasmosis and supportive drug to treat secondary causes in theileriosis but, the Buparvaquone is the drug of choice against theileriosis (Derakhshanfar *et al.*,2008). Diminazene diacetate used to treat babesiosis.

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