Lecture No.39 PARASITOLOGY DR. Raad H.H.

**Class Arachnida**

**Subclass Acarina (ticks and mites)**

**Characters**:

1. segmentation reduced so that body divided into 2 main portions in spiders and scorpion or single body mass in ticks and mites.
	1. prosoma (cephalothorax)
	2. opisthosoma (abdomen; essentially the area posterior to the legs)
2. nymph and adults usually with 4 pair of legs
3. **larvae** 3 pair of legs
4. no antenna
5. **4-stage life cycle, egg-larva-nymph-adult**
6. other terminology as follows
	1. capitulum (gnathosoma) is an area anterior to the body and carries the feeding appendages
		1. hypostome (part of the mouthparts made up of the fused coxae of the pedipalps
		2. pair of pedipalps (palps; segmented second pair of arthropod appendages)
		3. pair of chelicerae
	2. idiosoma (entire body excluding capitulum)
	3. Haller's organ (depression on the 1st tarsus, which functions as a humidity/olfactory receptor)





* 1. classification of the subclass: Acari
		1. order: Ixodida (Metastigmata) (= Parasitoformes)
			1. ticks; relatively large in size
			2. hypostome with teeth and usually exposed anteriorly
			3. Haller's organ present, on first tarsi
			4. pair of spiracles near coxae of 4th pair of legs in adults
			5. all parasitic
			6. 2 families
				1. family: Ixodidae (hard ticks)
				2. family: Argasidae (soft ticks)
		2. order: Mesostigmata (= Acariformes) **(free-living,       predaceous, and parasitic mites)**
			1. mites; small
			2. hypostome without teeth and and hidden ventrally
			3. Haller's organ absent
			4. pair of spiracles between second and fourth coxae
			5. both free-living and parasitic members
		3. order: Prostigmata (chiggers , follicle mites *Demodex* sp., Trombiculid mites)
			1. mites; small
			2. hypostome without teeth and and hidden ventrally
			3. Haller's organ absent
			4. pair of spiracles sometimes present and, if present, paired and either between chelicerae or on dorsal surface near center of body
			5. both free-living and parasitic members
		4. order: Orbatida (Cryptostigmata) (= Acariformes)
			1. mites; small
			2. hypostome without teeth and and hidden ventrally
			3. Haller's organ absent
			4. spiracles absent
			5. all free-living
		5. order: Astigmata **(house dust, storage & scabies mites)**
			1. mites; small; poorly sclerotized
			2. hypostome without teeth and and hidden ventrally
			3. Haller's organ absent
			4. spiracles absent
			5. both free-living and parasitic members

**FAMILY: Ixodidae (hard ticks) (= Parasitoformes)**





1. most species are dioecious, and females usually require a blood meal prior to egg production
2. copulation usually on the host
3. females usually drop off the host, and lay eggs in the soil
4. 6-legged larval stages hatches, and requires a blood meal to molt
5. 8-legged nymph is the next stage, and requires a blood meal to molt
6. nymph molts into adult
7. different host seeking strategies
	1. one-host ticks spend all life-cycle stages on the same host(e.g. *Boophilus*)
	2. two-host ticks generally spend the larval and nymphal stages on one host, but the nymph drops off to molt and the adult seeks a second host(e.g. *Hyalomma marginatum*)
	3. three-host ticks represent the majority of species, and all stages of ticks drop off the host prior to molting, and the next stages needs to seek a new host (e.g. *Hyalomma anatolicum ; Ixodes)*
8. although some species are host specific, many are generalists
9. can survive for months and sometimes for many years without taking a blood meal
10. dorsal surface is covered by a sclerite termed a scutum; in adult females the scutum does not cover the entire dorsal surface so that engorging may occur
11. some species possess eyes on the scutum whereas other species have no eyes
12. genera
	1. *Ixodes* spp.
		* 1. about 40 species
			2. *Ixodes dentatus* (rabbits)
			3. *Ixodes scapularis* (Black-legged tick; commonly on deer in eastern and southeast Kansas; sometimes canids, humans)
			4. *Ixodes sculptus* (burrowing mammals; skunk)
		1. no festoons
		2. anal groove extends anterior to the anus
		3. tend to be dark ticks, with females often larger than males
		4. mouthparts of females more elongate than those of the males
	2. *Amblyomma* spp.
		1. festoons present
		2. anal groove extends posterior to the anus
		3. secondary palp segment elongate
		4. species
			1. *Amblyomma americanum* (Lone star tick; occurs in the eastern and southern potion of the state; on many mammalian species and is the second most commonly encountered tick in eastern Kansas; female with white of pink spot at base of scutum; males smaller than females and with 2 inverted half circles at margin of scutum)
			2. *Amblyomma maculatum* (Gulf coast tick; occurs in southern and eastern portions of the state; relatively rare; on multiple mammalian species including ruminants and cervids)
	3. *Dermacentor* spp.
		1. festoons present
		2. anal groove extends posterior to the anus
		3. all three palp segments short
		4. species
			1. *Dermacentor albipictus* (Winter tick; throughout Kansas; mainly on large mammals such as deer and ruminants in the Fall; dark brown to grey in color with little ornamentation)
			2. *Dermacentor parumapertus* (Rabbit dermacentor; rabbits)
			3. *Dermacentor variabilis* (American dog tick; throughout Kansas; on many mammalian species and the most common tick encountered in the state; varigated white ornamentation on scutum pronounced)
	4. *Haemaphysalis* spp.
		1. festoons present
		2. anal groove extends posterior to the anus
		3. secondary palp segment flared laterally
		4. species
			1. *Haemaphysalis cordelius* (Bird tick; probably widespread in Kansas)
			2. *Haemaphysalis leporispalustris* (Rabbit tick; unknown distribution in Kansas)
	5. *Rhipicephalus sanguineus* (Brown dog tick)
		1. festoons present
		2. anal groove extends posterior to the anus
		3. basis capitulum laterally pointed, so that capitulum appears hexagonal
		4. tend to be brown and ornamentation not colorful (indistinct)
		5. throughout Kansas; introduced along with canids throughout the world; mainly on canids
	6. *Hyalomma*
		1. festoons present or absent
		2. inornate or ornate
	7. *Boophilus*
		1. Inornate
		2. festoons present
13. Some sample diseases transmitted by hard ticks
	1. Babesiosis (protozoan; *Babesia* spp.) transmitted by multiple species and genera of ticks, depending upon the protozoan species
	2. East coast fever (*Theileria parva*) in cattle by *Rhipicephalus appendicularis* in Africa
	3. Ehrlichiosis (bacterium; *Ehrlichia* spp.) transmitted by multiple species and genera of ticks, depending upon the bacterium species
	4. Lyme disease (bacterium; *Borrelia burgdorferi*) transmitted especially by *Ixodes scapularis*
	5. Q-fever (rickettsia); respiratory infection typically caused by *Dermacentor* spp.
	6. Rocky mountain spotted fever (rickettsia) transmitted especially by *Dermacentor andersoni*; also *Haemaphysalis leporispalustris* between rabbits, *Rhipicephalus sanguineus* between canids; *Amblyomma americanum*
	7. Texas cattle fever (*Babesia bigemina*) transmitted by *Boophilus annulatus*
	8. Tick paralysis (not a pathogen); ticks (  *Ixodes* *scapularis* ; *Dermacenter andersoni*; *Aargus* ; *Ornithdorus* ) that bite near base of skull can sometimes induce a gradual, and reversible, paralysis due to the salivary secretions
	9. Tularemia (bacterium) transmitted especially by *Dermacentor andersoni* (and other *Dermacentor* spp.)
	10. **Crimean-Congo hemorrhagic fever**

**Factors Accounting for High Vector Potential of** Ticks

**1.**Persistent hematophagous feeders

2. Relatively slow feeding time allows time for pathogen transfer

3. Typically have a wide host range

4. Longevity increases chances of acquiring and transmitting a pathogen

5. Transovarial transmission of some pathogens

6. Few natural enemies, highly sclerotized (resistant to environmental stress)

7. High reproductive potential - up to 18,000 eggs and parthenogenesis in some species

**Tick Control**

1. Natural predators
2. Repellents/toxicants for human use

      I. DEET (n, n-diethyl-m-toluamide) (apply to skin)

      II. Pyrethroids (apply to clothing)

1. Cultural/mechanical control
* remove shelters for hosts/ticks
* destroy wild hosts
* pasture rotation (one-host only)
1. Resistant livestock breeding

1. Anti-tick vaccine
2. Chemical control on animal host, or    acaricide in habitat
3. Wear light-colored clothing to allow you to see ticks that are crawling on your clothing.
4. Tuck your pants legs into your socks so that ticks cannot crawl up the inside of your pants legs.