

Sem – II (PG)
Paper ZOO-203
Group B: Parasitology

Prepared by Anindita Das

Vector biology - Ticks

Ticks transmit a wide variety of pathogens to vertebrates including viruses, bacteria, protozoa and helminthes. Tick-borne pathogens are believed to be responsible for more than 100,000 cases of illness in humans throughout the world. Ticks are considered to be second worldwide to mosquitoes as vectors of human diseases, but they are the most important vectors of disease-causing pathogens in domestic and wild animals.

Disease transmission:

Many arthropods, especially ticks, have evolved as ecto-parasites of warm blooded animals. Only a minority of tick species with a wide host range transmit



diseases to domestic animals and humans. The biology of ticks has been extraordinarily favourable to transmit agents (bacteria, virus, protozoa etc.): ticks attach securely to their hosts, facilitating not only effective transmission of infectious agents, but also the spread of microorganisms to different geographical habitats. Pathogens ingested by ticks can be spread transstadially (the same feeding

tick acquires the infection or started the pathogen's activation process, moves to another host, and then transmits the infection without molting) and/or transovarially (spreading though mother's ovary). Female ticks are extremely fecund (up to 5000 eggs), which allows an effective dissemination (action of spreading something) of infectious agents. (Fig: *Ixodes ricinus*).

Some tick vectors, with description:

Table: Description of tick-borne pathogens, diseases, tick vectors, geographical distribution and host affected:

Pathogens	Disease with symptoms	Tick vectors	Distribution	Host affected
Protozoa: genus <i>Babesia</i>				
<i>B. bovis</i>	Cattle babesiosis (fever, anorexia, dark colored urine, separate from herd & weakness)	<i>Boophilus</i> spp.	Africa, America, Asia, Australia	Cattle, buffalo
<i>B. major</i>		<i>Haemaphysalis</i> spp.	Europe	Cattle
<i>B. divergence</i>		<i>Ixodes</i> spp.	Europe	Cattle, human
<i>B. canis</i>	Dog babesiosis (sudden collapse with systemic shock to a haemolytic crisis – hemolysis, dark urine, fever, weakness)	<i>Rhipicephalus sanguineus</i> , <i>Dermacentor reticulatus</i> , <i>D. marginatus</i>	Tropical and semi-tropical	Dogs
<i>B. ovis</i>	Sheep babesiosis (fever, anemia, hemoglobinuria, icterus)	<i>Rhipicephalus bursa</i> , <i>R. turanicus</i>	Africa, Asia, Europe	Sheep
<i>B. motasi</i>		<i>Haemaphysalis</i> spp.	Europe	Sheep
Protozoa: genus <i>Theileria</i>				
<i>T. ovis</i>	Sheep theileriosis (hemolysis, anemia, weakness)	<i>Hyalomma</i> spp., <i>Rhipicephalus bursa</i>	Africa, Asia	Sheep
<i>T. equi</i>	Equine biliary fever (fever, anemia, brown or red urine)	<i>Dermacentor</i> spp., <i>Rhipicephalus</i> spp., <i>Hyalomma</i> spp., <i>Boophilus</i> spp.	Southern Europe, Africa, Asia	Horses, mules, donkeys
Protozoa: genus <i>Hepatozoon</i>				
<i>H. canis</i>	Hepatozoonosis (fever, emaciation, lethargy, anorexia, lymphadenopathy, anemia, muscle pain)	<i>Rhipicephalus sanguineus</i> , <i>Haemaphysalis longicornis</i>	Southern Europe, Africa	Dogs
<i>H. americanum</i>		<i>Amblyomma maculatum</i>	Southern USA	Dogs
Bacteria: genus <i>Rickettsia</i>				
<i>R. rickettsii</i>	Rocky Mountain spotted fever (fever, headache, altered mental status, rash)	<i>Dermacentor andersoni</i> , <i>D. variabilis</i> , <i>Amblyomma cajennense</i> ,	America	Human, dog

		<i>A. aureolatum</i> , <i>Rhipicephalus sanguineus</i>		
<i>R. conorii conorii</i>	Mediterranean spotted Fever (chills, high fever, muscular and articular pains, severe headache, photophobia)	<i>Rhipicephalus sanguineus</i>	Europe, Africa, Asia	Human, dog
<i>R. coronii indica</i>	Indian tick typhus (fever, regional adenopathy, maculopapular rash on extremities)	<i>Rhipicephalus sanguineus</i>	India	Human
<i>R. japonica</i>	Oriental or Japanese spotted fever (fever, rash, headache)	<i>Ixodes ovatus</i> , <i>Dermacentor taiwanensis</i> , <i>Haemaphysalis longicornis</i> , <i>H. flava</i>	Japan	Human
<i>R. africae</i>	African tick-bite fever (fever, headache, muscle aches, swollen lymph nodes)	<i>Amblyomma hebraeum</i> , <i>A. variegatum</i>	Africa, West Indies	Human
<i>R. marmionii</i>	Australian spotted fever (high fever, severe headache, rash)	<i>Haemaphysalis novaeguineae</i> , <i>Ixodes holocyclus</i>	Australia	Human
Bacteria: genus Ehrlichia				
<i>E. chaffeensis</i>	Human monocytic Ehrlichiosis (high fever, headache, muscle ache, chills, fatigue)	<i>Amblyomma americanum</i> , <i>Dermacentor variabilis</i>	USA	Human, other mammals
<i>E. canis</i>	Canine ehrlichiosis (anemia, bleeding episodes, lameness, eye problems, swollen limbs)	<i>Rhipicephalus sanguineus</i>	Southern USA, Africa, Eastern Asia	Dogs
Bacteria: genus Anaplasma and Coxiella				
<i>Anaplasma phagocytophilum</i>	Human granulocytic anaplasmosis (fever, headache, vomiting, weight loss, chills, nausea)	<i>Ixodes scapularis</i> , <i>I. pacificus</i> , <i>I. ricinus</i> , <i>I. hexagonus</i>	USA, Europe	Human, various mammals
<i>Coxiella burnetii</i>	Q fever (fever, cough, nausea, fatigue, chills)	Various	Worldwide	Human, various mammals
Bacteria: genus Borrelia				
<i>B. burgdorferi</i>	Lyme disease (influenza-like illness, fever, chills, headache, fatigue, muscle & joint pain. Arthritis may	<i>Ixodes pacificus</i> , <i>I. persulcatus</i> , <i>I. ricinus</i> , <i>I. scapularis</i>	USA, Canada, Europe, Asia	Human

<i>B. garinii</i> , <i>B. afzelii</i>	develop up to 2 years of onset).	<i>Ixodes persulcatus</i> , <i>I. ricinus</i>	Europe, Asia, northern Africa	Human
<i>B. valaisiana</i> , <i>B. spielmani</i>		<i>Ixodes ricinus</i>	Europe, Asia	Human
<i>B. japonica</i>		<i>Ixodes ovatus</i>	Japan	human
<i>B. persica</i>	Persian relapsing fever (flu-like symptoms, muscular pain, joint pain, painful urination, rash)	<i>Ornithodoros tholozani</i>	Asia	Human
Viruses:				
Bunyaviridae, Nairovirus	Crimean-Congo Hemorrhagic Fever (fever, muscle ache, neck pain & stiffness, backache, headache, vomiting, abdominal pain etc.)	<i>Hyalomma marginatum</i> , <i>Hy. a. anaticum</i> , <i>Hy. truncatum</i> , <i>Amblyomma variegatum</i> , <i>Haemaphysalis punctata</i> , <i>Ixodes ricinus</i> , <i>Dermacentor spp.</i> , <i>Rhipicephalus spp.</i>	Africa, Asia, Europe	human
Reoviridae, Orbivirus	Colorado tick fever (high fever, chills, muscle ache, skin tenderness, nausea)	<i>Dermacentor andersoni</i> , <i>D. occidentalis</i> , <i>D. albipictus</i>	Nearctic	Human
Flaviviridae, Flavivirus	Tick Borne Encephalitis (high fever, severe headache, vomiting, back pain, CNS damage)	<i>Ixodes ricinus</i> , <i>I. persulcatus</i> , <i>Haemaphysalis concinna</i> , <i>H. punctata</i>	Europe, Asia	Human
Asfaviridae, Asfavirus	African Swine Fever (high fever, red skin lesions, diarrhea, vomiting, difficulty breathing)	<i>Ornithodoros moubata</i> , <i>O. erraticus</i> , <i>O. turicata</i> , <i>O. coriaceus</i> , <i>O. puertoricensis</i> ¹⁶	Africa, Brazil	Domestic pigs
Nematode:				
<i>Acanthocheilonema viteae</i>	Acanthocheilonemiasis (skin rash, abdominal & chest pain, muscle & joint pain, neurological disorder, skin lumps)	<i>Ornithodoros tartakovskyi</i>	Asia	Rodents