

## Quadrant II – Transcript and Related Materials

**Programme: Bachelor of Science (Third Year)**

**Subject: Zoology**

**Course Code: ZOC 110**

**Course Title: Parasitology**

**Unit: 05**

**Module Name: Biology of Ticks**

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**Notes:**

### **INTRODUCTION**

Ticks are the most significant blood-sucking arthropods worldwide and an ancient group of obligate bloodsucking ectoparasites that has evolved over millions of years. They transmit various pathogens that can cause disease and death in people, domesticated animals, and wildlife. They belong to class Arachnida. Two general types of ticks are evident today on the basis of the difference in body proper: argasid or soft ticks belonging to the family Argasidae, and ixodid or hard ticks belonging to the family Ixodidae.

Ticks are separated from other arachnids by the possession of a distinct gnathostoma (an anterior capitulum bearing mouth parts) and by the absence of a recognizable division between the cephalothorax and the abdomen. Ticks are large mites with leathery skin and in general ticks are parasites of animals. All of them feed on vertebrate blood. Most species have a long life span, may be 5 years or more. The reproductive potential is high. Some species may deposit as many as 18,000 eggs.

### **MORPHOLOGY**

The body is segmented and is divisible into two regions-the **capitulum** borne on **gnathosoma** (head) and the **idiosoma** (body proper) which contains the legs, digestive tract, and reproductive organs. The capitulum is movable having rostrum enclosing pair of toothed

chelicerae and toothed hypostome. A pair of pedipalps arise from the antero-ventral margin of the capitulum. The hypostome acts as stabilizer and helps to anchor the tick's mouthparts to the host. The chelicerae are appendages specialized for cutting and piercing into the host's skin while palps are leglike appendages that are sensory in function. Many of the larger mites have close resemblance with ticks, but mites are smaller with unarmed hidden hypostome, whereas ticks are larger with exposed hypostome armed with teeth or hooks.

There are three pairs of walking legs in larvae and 4 pairs of prominent, slender legs with two claws and pad in nymphs and adults. The legs sometimes bear sensory or tactile hairs. In addition to locomotion, the tarsus of leg that bears a unique sensory structure, **Haller's organ**, is used to detect odors and chemicals emanating from the host, as well as for sensing temperature and air current variations. Haller's organ is also used to perceive infrared light emanating from a host. When stationary, their legs remain tightly folded against the body.

As in other arthropods, the tegument consists of an outer cuticle and a single layer of epithelial cells that secrete it. The cuticle, may be membranous or leathery, and has hard plates or shields. Hard ticks have a hard upper surface called a **shield or scutum** that covers the entire back of the male but only partly covers the female and the mouthparts are visible from dorsal side. Whereas, soft ticks do not possess a shield, so the sexes look alike. Their mouthparts are beneath the anterior end of the body and are not visible from above. Most ticks appear brown or reddish brown in colour. However, some species have distinctive white patterns on the scutum.

### **LIFE STAGES OF TICKS**

Life cycle proceeds in four stages namely, Eggs, Larvae, Nymphs and Adults. Engorged female lays eggs off the host body, which hatch into six-legged larva that moults into a eight legged adult.

**Eggs:** eggs are often deposited as masses, on the ground, in cracks and crevices, burrows, etc.

**Larvae:** Thousands of larvae, commonly known as “**seed ticks**,” hatch from an egg batch and crawl randomly in search of a host. These six-legged larvae acquire other two legs by moulting

into the nymph stage only after a blood meal. During feeding, the host wanders and the tick is transported to a new location where, when engorged, it drops off.

**Nymphs:** After moulting, nymphs climb grass leaves or plant stems and await a host. Because they are higher than ground level, they tend to attach to larger hosts than before. After several days of feeding, they drop off and again moult.

**Adults:** Ticks sometimes wait for months or more than a year for a suitable host. When finally engorged, they drop off to oviposit. Ticks that tend to feed on the same host species at each stage are referred to as 1-host ticks, whereas those that feed on different hosts may be 2 or 3-host ticks.

### **Feeding**

Mostly, ticks seek their hosts by climbing vegetation and awaiting vibrations or shadows to announce the arrival of a host. The first pair of legs is extended to grasp the host when contact is made. This behaviour is known as **questing**. They detect heat or carbon dioxide released by host and climb onto the host as it passes.

When feeding, the **chelicerae** (teeth) are used to cut the host's skin and then the **hypostome** (feeding tube) is inserted. It has many rows of recurved barbs that become cemented in and anchor the tick to its host (making it very hard to withdraw by external force). Blood is pumped by a muscular pharynx (pump), and the salivary glands produce an **anticoagulant** that allows long periods of feeding without the host's blood coagulating. The tick usually moves to the highest part of the host to attach and feed on the head or ears.