Module 9

Crimean-Congo Haemorrhagic Fever (CCHF) - Vectors

At the end of the module, the participant will be able to understand:

- Disease Transmission
- Vectors of CCHF
- Biology
- Life Cycle
- Vector Surveillance
- Entomological Indicators
- Adult Vector Control
- Larval Vector Control

Crimean Congo Haemorrhagic Fever

Crimean-Congo haemorrhagic fever (CCHF) is caused by infection with a tick-borne virus (Nairovirus) of the family Bunyaviridae. The disease was first described in 1944 during World War II in a group of Soviet soldiers in the Crimean peninsula. The virus was also isolated from the blood of a febrile patient from Congo in 1956. Finally identified in 1967 and was named CCHFV. Crimean-Congo haemorrhagic fever is found in Eastern Europe, particularly in the former Soviet Union, throughout the Mediterranean, in northwestern China, central Asia, southern Europe, Africa, the Middle East, and the Indian subcontinent.

In India the first confirmed case of CCHF was reported during a nosocomial (infections caught in hospitals) outbreak in Gujarat, Ahmedabad in January 2011. Subsequently, outbreaks were reported from different districts of Gujarat every year. From 2011 to 2020, 125 confirmed cases and 53 deaths (case fatality rate 42.40%) were reported from India. Cases were documented from 12 districts of Gujarat (Ahmedabad, Rajkot, Surendranagar, Amreli, Kheda, Jam Nagar, Patan, Kutch, Aravalli, Botad, Morbi and Bhavnagar), 3 districts of Rajasthan (Sirohi, Jodhpur and Jaisalmer) and Moradabad district of Uttar Pradesh.

Transmission

Ixodid (hard) ticks, especially those of the genus, Hyalomma, are both reservoirs and vectors for the CCHF virus. In India, *Hyalomma anatolicum* is incriminated as the vector of CCHF and is found distributed throughout India. Numerous wild and domestic animals, such as cattle, goats, sheep and hares, serve as amplifying hosts for the virus. Transmission to humans occurs through contact with infected ticks or animal blood. CCHF can be transmitted from one infected human to another by contact with infectious blood or body fluids. Documented spread of CCHF has also occurred in hospitals due to improper sterilisation of medical equipment, reuse of injection needles, and contamination of medical supplies.

Signs and Symptoms

The onset of CCHF is sudden, with initial signs and symptoms including headache, high fever, back pain, joint pain, stomach pain, and vomiting. Red eyes, a flushed face, a red throat, and petechiae (red spots) on the palate are common. Symptoms may also include jaundice, and in severe cases, changes in mood and sensory perception. As the illness progresses,

large areas of severe bruising, severe nosebleeds, and uncontrolled bleeding at injection sites can be seen, beginning on about the fourth day of illness and lasting for about two weeks. In documented outbreaks of CCHF, fatality rates in hospitalised patients have ranged from 9% to as high as 50%. The long-term effects of CCHF infection have not been studied well enough in survivors to determine whether or not specific complications exist. However, recovery is slow.

Risk of Exposure

Animal herders, livestock workers, and slaughterhouse workers in endemic areas are at risk of CCHF. Healthcare workers in endemic areas are at risk of infection through unprotected contact with infectious blood and body fluids. Individuals and international travellers with contact with livestock in endemic regions may also be exposed.

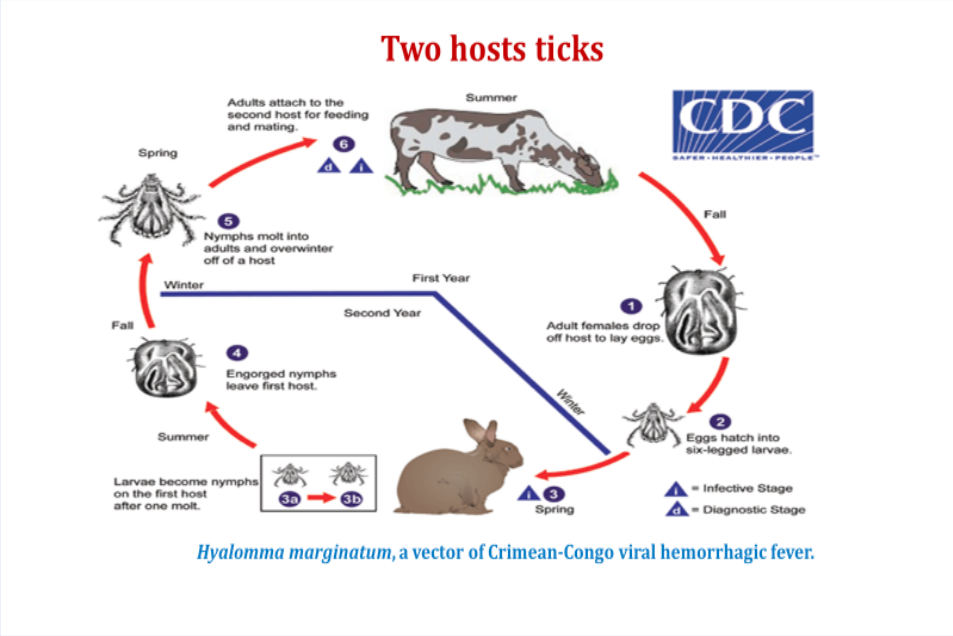

Figure 31.Life Cycle of CCHF Vector (Hyalomma spp.) (Source - CDC)

Vector Surveillance

Vector surveillance is necessary to detect actual or potential breeding populations of vectors and pests in order to make sound recommendations for their prevention or elimination. Such surveillance involves operating light traps, locating and mapping breeding sources, making landing and biting counts, taking population estimates, making sanitary inspections, and collecting specimens in their resting stations.

Tick Surveys

a. Tick surveys are conducted to determine the following: species of ticks present in an area, infested area boundaries, necessity for control, and effectiveness of control operations. Ticks are more commonly found in brushy, wooded areas where wild or domestic animals are available for food. Such areas include training and manoeuvre areas.
b. There is no easy or simple method to conduct a survey. As “in all entomological surveys, tick surveys require practice and experience in order to perfect techniques. One of the most successful techniques has been the use of the “tick drag.” A “tick drag” is a one-yard square piece of white flannel cloth reinforced at both ends by a rod or stick. A string is attached to each end of one of the rods to allow you to drag the cloth behind you. There are three methods by which the drag or white cloths may be used.

1. Pull the drag over a predetermined distance, usually 50 yards or 50 steps. Then stop and collect the ticks that have attached themselves to the cloth. Ticks may be collected with forceps or by rolling the drag with a disposable adhesive-type lint roller.
2. Place the drag on the ground and sit on it for 5 to 10 minutes. Then collect the ticks that crawl onto the cloth. Clothing should be thoroughly examined for ticks and rolled with a lint roller to remove ticks. When clothing is removed, the body should be checked for ticks attached to the skin, particularly the legs and the nape of the neck. Any ticks found attached to the skin should be carefully removed with forceps by grasping the tick as close to your skin as possible and using slow, steady traction to pull their mouthparts from the bite wound.
3. Place the drag on the ground and place a block of dry ice (2 to 3 inches on a side) on an inverted, disposable pie tin in the centre of the drag. Collect ticks as they crawl across the drag or next to the dry ice. The dry ice should be wrapped in paper to avoid damaging the tick specimens.

$$\text{Prevalence rate of Hyalomma spp.} : \frac{\text{Tick species collected}}{\text{Total number of ticks collected}} \times 100$$

$$\text{Infestation rate:} \frac{\text{Total positive livestock for ticks}}{\text{Total livestock surveyed/ investigated}} \times 100$$

$$\text{Tick index:} \frac{\text{No. of ticks collected}}{\text{Total Numbers of Host Positive}} \times 100$$

Ticks Control

Area-wide application of acaricides (chemicals that will kill ticks and mites) to control tick habitats (e.g. Leaf litter and brush). Applying acaricides to rodents by using rodent-baited tubes, boxes and feeding stations in the areas where these pathogens are endemic.

Essentially involves clearing vegetation allowing the area to dry for a few weeks and then being sprayed with malathion especially when outdoor camping of troops etc. are to be chiggers bites repellents can be used before venturing for activity inside forest areas.