

less, because they produce special anaesthetic matter and their attachment to the host is not visible and asymptomatic.

Control, prevention.

Ixodid ticks may be eliminated by exterminating their rodent hosts and destroying their habitats. The infested grounds, houses, and animals may be sprayed with diazinon, chlordane, dieldrin, or BHC. BHC and diazinon have the most rapid immobilizing action but less residual toxicity than the others, giving good control within a few days and preventing reinfestation for a month or more. Sprays and 5% to 10% dusts are equally effective. Suspensions and emulsions are preferable to oil solutions. Effectiveness depends upon the amount and the thoroughness of distribution. It is advisable to start spraying in the spring, but a subsequent treatment at the peak of population in the summer is necessary. Ticks may be brought into houses on clothing or animals, and the dog tick.

6. FAMILY ARGASIDAE (SOFT TICKS).

Morphology.

The argasid ticks are more primitive, are less constantly parasitic, produce fewer progeny, and infest the habitat of the host.

The soft ticks are primarily ectoparasites of birds, less commonly of mammals and humans. They have a cosmopolitan distribution but are more abundant in warm climates. The sexes are similar; there is no dorsal plate, the capitulum is not visible dorsally, the spiracles lie in front of the third pair of coxae.

Coxal glands between the first two coxae secrete a tenacious fluid during feeding and copulation by some of the soft ticks. This material contains spirochetes (Borreliid) in infected vectors. They are nocturnal feeders and seldom travel far from their local habitat.

Ornithodoros moubata of Africa, an oval, yellowish-brown, tuberculated, leathery tick, 8 to 9 mm, is the best known parasitic species of this genus. This tick inhabits the cracks in the floors of native huts and bites its victims at night. The bites of both nymphs and adults produce hard, red wheals that remain painful for 24 hours. It is an important vector of endemic relapsing fever.

Several other species of *Ornithodoros* are vectors of local types of relapsing fever throughout the world.

Life – cycle.

Both sexes of hard and soft ticks are bloodsuckers. The female increases greatly in size after an engorgement of blood. It then drops off the host to deposit, in 14 to 41 days, 2000 to 8000 small, oval, brown eggs and dies in 3 to 36 days after oviposition.

The soft ticks lay 100 to 200 eggs in several batches following successive

Diagnosis.

The important diagnostic reminder is simply to think of the possibility of tick paralysis when faced with a clinical picture such as this and to search for the tick, especially in the area of the neck covered by hair. The paralysis subsides after the removal of the tick.

The ticks may be removed from the skin by gentle traction after applying chloroform, ether, alcohol, gasoline, kerosene, glycerol, ethyl chloride or a glowing match or cigarette to the tick. A high-school student has offered the following simple but ingenious method of tick removal. Allow two drops of clear fingernail polish to fall from the brush and completely cover the tick. It will release its bite and can easily be wiped from the skin in seconds. Care should be taken not to break off the capitulum in the wound. Early removal is indicated in order to prevent tick paralysis. Paralysis, if present, soon subsides after the removal of the tick.

Control, prevention.

Argasid ticks are best combated by destroying their nests or lairs. Infested native huts should be burned, or the floors and walls should be plastered to eliminate the crevices and then sprayed with BHC or the less effective diazinon. More than one application is required, since these insecticides are ineffective against the eggs. Rodent-proofing of buildings is desirable. Inhabitants should avoid sleeping on the floor.

Control of mites in their habitats is difficult. (1) The breeding grounds may be destroyed by burning and clearing the tall grasses and underbrush, by cultivation, and by sheep grazing, and (2) the rodent hosts may be destroyed. Chlordane or lindane sprays are effective. Ground sprays with chlorpyrifos or ultra-low-volume sprays of propoxur can also be used. Persons may be protected by boots and closely woven clothing with tight-fitting edges or, better, by clothing impregnated with repellents.

Treatment.

For the irritating dermatitis caused by chiggers, a hot soap-and-water bath is followed by the application to the affected skin of a 10% sulfur ointment containing 1% phenol. Palliative treatment includes the application of alcohol, ammonia, baking soda, alcoholic iodine, camphor, or a saturated solution of salicylic acid in alcohol with a little sweet oil. Pyogenic infections are treated with 30% ammoniated mercury ointment or an appropriate antibiotic.

- body makes an angle (45^0) with the surface.

Diseases, clinical features.

1) In biting, the piercing apparatus probes beneath the skin until a blood supply is tapped, at which time feeding may take place from the blood vessel or from the extravasated blood. The intermittently injected saliva may contain substances that stimulate capillary dilation or slow coagulation.

Some bites cause little irritation and others a considerable amount. The ordinary bite is followed by erythema, swelling, and itching. Vesicular bullae may appear, and secondary infections may result from scratching. Salivary antigens elicit immediate allergic as well as delayed-type skin reactions.

2) Mosquitoes serve as **biologic** or **mechanical vectors** of bacterial, helminthic, protozoan, and viral diseases of humans and lower animals.

In addition, some day-flying and day-biting mosquitoes carry the eggs of the myiasis-producing warble fly to the skin of humans and other mammals. The species that are important vectors are listed under the respective diseases.

Aedes carries virus-like bacteria which are responsible for causing **yellow fever** and **dengue**. Yellow fever confined to South America and Africa.

Culex, **Anopheles** and **Aedes** are responsible for carrying of the infective stage of *W. bancrofti* which is the causative agent of filiriasis, elephantiasis.

Aedes, *Culex* and *Psorophora* mosquitoes are associated with encephalitis and dermatobia.

3) *Anopheles* females carry the causative agent of malaria - Plasmodium.

The only vectors of human malarial malaria are anopheline mosquitoes, while both anopheline and culicine mosquitoes carry avian malaria.

Many species of *Anopheles* may be infected experimentally, but relatively few are important natural vectors. Some 110 species have been associated with the transmission of malaria, of which 50 are of general or local importance.

The aptitude of a species for transmitting malaria is determined by:

- 1) its presence in or near human habitations,
- 2) its preference for human rather than animal blood, although when animals are scarce, zoophilic species may feed on humans,
- 3) an environment that favors its propagation and provides a life-span sufficiently long for the plasmodia to complete their life cycles,
- 4) physiologic susceptibility to infection.

The suitability of a species as a potential vector may be determined by recording the percentage of infected mosquitoes after feeding on a malarial patient, but its importance as a vector is ascertained by obtaining the index of natural infections, usually from 1 to 5%, in female mosquitoes collected in houses in a malarial district.

Control.

Mosquito control requires knowledge of the habits of the particular species, the climate of the country, and the habits and socioeconomic status of the population.

feeding, thereby coming into contact with the insecticide. But almost as fast as new insecticides have been introduced, resistant strains of mosquitoes have been selected out and emerged. Thus, the effort of human beings to control insect vectors goes on—a never-ending battle.

Another complicating factor has been the increasing awareness of nature lovers and environmentalists of the actual and potential damage to other elements of the biologic chain of life by the indiscriminate and widespread use of insecticides.

The problems associated with insecticide use have also stimulated new approaches to vector control. These involve biologic methods and include such measures as introduction of larva-eating fish (*Gambusia* spp.) in lakes and ponds, use of hormones that inhibit insect growth and development, other hormones that attract insects (pheromones), and toxins produced by bacteria (*Bacillus thuringiensis*). These biologic methods of control are still in their early development.

c) Destruction of adults and protection from mosquitoes.

The protection of humans against mosquitoes comprises:

- mosquito-proofing of buildings with 18-mesh wire screening;
- mosquito nets over beds;
- protective clothing, such as head nets, gloves, and high boots;
- and repellents applied to skin and clothing.

Effective repellents, such as butopyronoxyl (Indalone), dimethyl phtalate, Rutgers 612, and diethyltoluamide (Off), are effective for several hours.

MUSCA DOMESTICA.

Phylum - Arthropoda

Class - Insecta

Order - Diptera

Genus - *Musca domestica* (housefly)

The common housefly *M. domestica* infests human habitations throughout the world. The eggs are laid in lots of about 100 in manure or refuse.

The entire life cycle occupies 7 to 10 days, and the adult fly lives about a month. Its larvae are responsible for an occasional intestinal and genitourinary myiasis.

The adult fly feeds indiscriminately on anything from feces or garbage to dinner on the table.

Therefore, it may serve as a mechanical vector of pathogenic bacteria, protozoa, and helminthic eggs and larvae, especially of enteric disease organisms. The extent of disease transmission by flies under natural conditions is difficult to determine.

Control is a community measure, since flies travel considerable distances, but screening and trapping protect the individual home.

Adequate control involves the elimination of breeding places by the disposal or chemical treatment of animal excrement, garbage, and decaying vegetation, and spraying of the interiors of houses and barns with appropriate residual insecticides.