PART B: Distribution biology and control of *Anopheles stephensi A. culicifacies, Aedesaegypti, A. albopictus, CulexpipionsfatgansMansonia sp., C. tritaenorhynchus, Ctenocophalidescheopie* and*Pediculus.*Histopathological changes in organs in relation to diseases such as liver cirrhosis, nephrosis, tumors and cancer.

[Academic Script]

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PART B: Hello friends nice to meet once again and happy to see that you might have enjoyed the first part about pathogenic arthropods and their effect on human health and now you are interested in the second part as well. Here in this part B, we will study about distribution biology and control of the previously mentioned vectors. We will also focus on histopathological changes in organs in relation to diseases such as liver cirrhosis, nephrosis, and tumor-cancers. Few of the Arthropods as vectors include:

Anopheles stephensi*and *Anopheles culicifacies:

Distribution Biology:
There are approximately 3,500 species of mosquitoes grouped into 41 genera. Human malaria is transmitted only by females of the genus *Anopheles*. Of the approximately 430 *Anopheles* species, only 30-40 transmit malaria (i.e., are "vectors") in nature. *Anopheles* is found worldwide except Antarctica. Malaria is transmitted by different. *Anopheles* species is depending on the region and the environment. *Anopheles* can transmit malaria and are found not only in malaria-endemic areas, but also in areas where malaria has been eliminated. The latter areas are thus constantly at risk of re-introduction of the disease.

Control:A variety of ways of dealing with them are possible.
Vectors can be drained or filled so as permanently to remove them as breeding sites. This approach has been applied in industrialized areas in India. Breeding in water tanks can be prevented by screening them - this is legally compulsory in Bombay, India.

Under some conditions irrigation can be carried out according to a carefully regulated intermittent schedule so that fields are dried once a week and thus larval life cycles cannot be completed.
The organophosphate insecticide temephos ("Abate") can be applied. This can safely be done even to potable water and there are few places in the world where *Anopheles* mosquitoes are resistant to it.
The breeding sites may be stocked with larvivorous fish. These are to some extent self-propagating, but sites need to be checked at intervals and those where the fish have died out need to be re-stocked from a fish rearing facility.
In some parts of Asia, Grass Carp (*Ctenopharyngodonidella*) have been used in rice fields which provide a crop of edible fish as well as mosquito control and improvement of rice yields.
The bacterial toxin from *Bacillus thuringiensisisraelensis* (*Bti*) can be sprayed into breeding sites as a highly specific agent against mosquito larvae. This is extensively used against larvae of nuisance mosquitoes. Unfortunately the toxin is not self-propagating or long lasting in natural breeding sites and frequent re-treatment is unaffordable in most low income countries where the malaria problem exists.
There is considerable interest among biologists, including molecular biologists, in the idea of rendering mosquito populations genetically harmless by introduction of genes which make them non-susceptible to *Plasmodium* or divert them from being strongly attracted to biting humans

Histopathological changes in organs:
Target organ RBC and Liver: A resultant Liver dysfunction and Necrosis to RBCs as a result of malaria is uncommon and usually only occurs in

those with other liver condition such as viral hepatitis or chronic liver disease. The syndrome is sometimes called malarial hepatitis. While it has been considered a rare occurrence, malarial hepatopathy has seen an increase, particularly in Southeast Asia and India. Liver compromise in people with malaria correlates with a greater likelihood of complications and death. "Yellowish" and the common Greek suffix -sis meaning "condition") is a result of advanced liver disease. It is characterized by replacement of liver tissue by fibrosis (scar tissue) and regenerative nodules (lumps that occur due to attempted repair of damaged tissue). These changes lead to loss of liver function. Cirrhosis is the most commonly cause but has a possible cause due to infections of plasmodium by *Anopheles* mosquito vector. Some cases are idiopathic (of unknown cause).

Aedesaegypti*and*Aedesalbopictus:

Distribution Biology: The yellow fever mosquito has a cosmo-tropical distribution annually, and spreads to more temperate regions during the summer months. Originating in Africa; *Ae.aegypti* is now present globally in tropical and sub-tropical regions.
In the early 1900s, *Ae.aegypti* distribution extended from the southern United States down to Argentina. The mid-1900s saw the development of a fairly successful *Ae. aegypti* eradication program throughout its range in North and South America as a method to control yellow fever through education, adult mosquito control, and manipulation of container breeding sites. Though initially successful, *Ae.aegypti* has reestablished in most of the pre-eradication range due to lack of commitment and financial backing necessary to

maintain the eradication program. The program is no longer operational today.
Aedesalbopictus is native to tropical and subtropical regions, they are successfully adapting themselves to cooler regions. In the warm and humid tropical regions, they are active the entire year long; however, in temperate regions they hibernate over winter. Eggs from strains in the temperate zones are more tolerant to the cold than ones from warmer regions. They can even tolerate snow and temperatures under freezing. In addition, adult tiger mosquitoes can survive throughout winter in suitable microhabitats.

Control:
Wear long-sleeved clothing and long trousers when outdoors during the day and evening
Spray permethrin or DEET repellents on clothing, as mosquitos may bite through thin clothing
Use mosquito netting over the bed if the bedroom is not air conditioned or screened, and for additional protection treatment to mosquito netting with the insecticide permethrin is given.
Spray permethrin or a similar insecticide in the bedroom before retiring.
Mosquito control is currently the best method for disease prevention. This primarily includes source reduction, pesticide spraying or "fogging", or the use of mosquito traps like the lethal ovitrap.

Histopathological changes in organs:
Histopathological changes occurs in the liver, lungs, brain, gastrointestinal tract, capillary tubes, kidney, skin layer and heart if there is an occurrence of Dengue Haemorrhagic Fever. The liver is often affected. When liver function declines, the skin and eyes become yellow, a condition known as jaundice, and the body's ability to form blood clots is compromised. Difficult-to-control

bleeding may occur from area such as the intestines. Damage to the heart, brain, and other vital organs can cause shock, coma, and increased susceptibility to bacterial infections. If a person survives a severe infection, it may take several months to fully recover.

CulexpipionsfatgansMansonia sp.

Distribution Biology:*Wuchereriabancrofti*, the causative agent of lymphatic filariasis is transmitted by mosquito species belonging to *Anopheles, Aedes, Culex*and*Mansonia* depending on the geographic area. In East Africa, *Anopheles* and *Culex*species are known vectors but in West Africa only *Anopheles* species are the reported vectors of the disease.

Control:
Personnel hygiene and practices for precautions of mosquito bite.
Filariasis can be controlled and treated by the following drugs.
- An arsenical preparation is effective in destroying adult worms.
- Diethylcarbamazine is effective to kill microfilariae.
- Para melaminylphenylstibonate is drug used for infective larvae and immature adults.

Histopathological changes in organs: Chronic or Obstructive lesions take 10-15 years. This is due to the permanent damage to the lymph vessels caused by the adult worms, the pathological changes causing dilation of the lymph vessels due to recurrent inflammatory episodes leading to endothelial proliferation and inflammatory granulomnatous reaction around the

parasite. Initially, it starts with pitting oedema which gives rise to brownyoedema leading to hardening tissues. Still late, hyper pigmentation, caratosis, wart like lesions are developed.Eg. Hydrocele (40-60%), Elephantiasis of Scrotum, Penis, Leg, Arm, Vulva, Breast, Chyluria and Haematuria

Culextritaenorhynchus

Distribution Biology: Endemic in temperate and tropical regions of Asia, Reduced prevalence in Japan. It has not occurred in U.S. In India it is epidemic. Formerly in temperate regions, but now limited primarily to high elevations in the subtropics and tropics.

Control:

Sanitary Prophylaxis- Housing of animals in-doors in screned stabling can provide protection from mosquitoes especially during active outbreaks and peck vector activities.

Vector control reduces transmission

Spraying should cover vegetation around houses, breeding sites and animal shelters.

Use of mosquito net should be advocated.

Histopathological changes in organs: Severe rigors may mark the onset of this disease in humans. Leads to neck rigidity, cachexia, hemiparesis, convulsions, central nervous system involved disorders, swelling of testicles, infertility and abortion as well.

Fever, malaise, head and muscle ache, cough, and general weakness. Blotchy rash spreads from the abdomen to chest to rest of body, but rarely to hands and feet. Severe disease includes prostration, delirium, very low blood pressure, and coma. The death rate can be very high during epidemics.

Ctenocophalidescheopie

Distribution Biology: It has been carried around the world by ships' black rats (*Rattusrattus*) and now has a cosmopolitan distribution. It is frequently also found on the brown or common rat (*Rattusnorvegicus*). There are approximately 2,500 species of flea worldwide, of which 62 are found in Great Britain. 95% of flea species are parasitic to mammals. The remainder is bird parasites.

Control:

- Keep rodent populations under control
- Use flea prevention on your pets such as topical treatments and/or flea collars
- Keep floors clean by vacuuming regularly
- If flea infestation occurs: Use insecticides to kill fleas in your home
- Wash anything and everything that has been exposed to the fleas
- Sprays or bombs can be used to kill the fleas as well

Histopathological changes in organs:

- The symptoms of Bubonic plague include enlarged, tender lymph nodes (called buboes), fever, chills and severe exhaustion.
- A condition caused by the invasion of bacteria into the bloodstream may lead to bleeding from your mouth, nose, or rectum, or under your skin, blackening and death of tissue (gangrene) in your extremities, most commonly your fingers, toes, and nose.
- Tiny broken blood vessels (called petechiae) is a common histopathological change.

***Pediculus* sp.**

Distribution Biology: The louse *Pediculushumanus* is an ectoparasite of the human head or body. The head louse variant is common in the western world, the louse feeding on blood of its human host. Infection rates exceeding 20% reported from selected primary schools in Australia, the UK and USA. About 6–12 million people, mainly children, are treated annually for head lice in the United States alone. High levels of louse infestations have also been reported from all over the world, including Israel, Denmark, Sweden, UK, France, and Australia. Head lice can live off the head, for example on soft furnishings such as pillow cases, on hairbrushes, or on coat hoods for up to 48 hours.

Control: There is no product or method which assures 100% destruction of the eggs and hatched lice after a single treatment. However, there are a number of treatment modalities that can be employed with varying degrees of success. These methods include chemical treatments, natural products, combs, shaving, hot air, and silicone-based lotions. The pharmacological treatment of pediculosis includes use of crotamiton applied twice at 24 hour interval and washed off day after that. Benzyl benzoate also can be used when combined with lindane

Histopathological changes in organs: Besides headache, sustainable fever, cough, rash, severe muscle pain, chills, falling blood pressure, stupor, sensitivity towards light, delirium and if not death, it may cause a severity of disorder and dysfunction of circulatory system and a fatal disease called Brill-Zinsser may occur with disorder and dysfunction in lymph nodes as well. In severe cases, complications of illness may include kidney

failure and brain inflammation (encephalitis). It is a fatal disease very rarely a cure is observed.

SUMMARY:

Friends hope you might have enjoyed both the parts and thanks for your cooperation in going through the lecture about pathogenic arthropods. We have come to one conclusion in the part A about pathogenic arthropods that how one should prevent and be free from each of these dangerous arthropod diseases. In the same way here we get an idea about control on the histopathological changes in organs in relation to diseases such as liver cirrhosis, nephrosis, and tumor-cancer by proper control measures in considering the distribution biology i.e. the habitat from where the arthopods as vector survives so that specific causative agent will be killed or will get no chance to procreate further and thence the disease too. We thus focus on to the destruction of arthopods and get rid of vectors considering its habitat as well so that there would be lesser effects to vital organs of individual and effectively epidemic and/or endemic causation of the disease as well. Thank you.