

ARTHROPODS OF MEDICAL IMPORTANCE IN OHIO

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It is rather difficult to state with authority that arthropods, which make up about 86 percent of the world's animal species, are not of medical importance in the state of Ohio. Public health workers know only too well that man is susceptible to many diseases, and when the causative organisms are present in an area inhabited by host animals and vectors as well as by man, troubles very often result. This was demonstrated very nicely in Aurora, Ohio, in 1934 when the causative organism of malaria was brought into that region. The other three necessary factors were already there (Hoyt and Worden, 1935).

When one considers that many centers of infection of some of the world's most serious human illnesses are now only hours away by plane, he can't help but wonder what the situation is in Ohio, relative to these other necessary factors. The opening of northern Ohio ports to foreign shipping also suggests the possibility of the introduction of unusual organisms. This is an approach to that particular aspect.

The phylum Arthropoda is divided into five classes of animals: Insecta, Crustacea, Chilopoda (centipedes), Diplopoda (millipedes), and Arachnida (spiders, scorpions, mites, and ticks). Representatives of these various groups which are found in Ohio and which might have some medical significance will be discussed.

There are nine species of mosquitoes breeding in the state of Ohio which are of medical interest. These are as follows: *Anopheles quadrimaculatus*, the vector of malaria in eastern United States, is not only common in weedy Ohio ponds but seems to be increasing in number. *A. punctipennis*, which is equally as abundant, is not a natural vector of the malaria parasite but adults have been infected in the laboratory. *Culex tarsalis* has been reported in Ohio by H. A. Crandell of the Toledo Area Sanitary District. It is the most important vector of both Western Equine and Eastern Equine Encephalitis in the United States. Other mosquito species have been incriminated, but *C. tarsalis* is the principal vector in the West.

Culiseta melanura seems to be rather rare in Ohio but it has been collected in central Ohio. It is a natural vector of Eastern Equine Encephalitis. *C. inornata*, on the other hand, is quite common in Ohio and is a serious pest. Specimens have been found to be naturally infected with the virus of Western Equine Encephalitis and it has been demonstrated that it can transmit the virus.

Other species of Ohio mosquitoes which are associated with the transmission of the various strains of Equine Encephalitis are *Culex pipiens* which is breeding in open dump areas in large numbers, *Mansonia perturbans* which is especially abundant in shaded areas close to water bodies containing much emergent vegetation, and *Aedes vexans* which is the worst pest species in the entire state.

Aedes triseriatus, a tree-hole breeder and a fierce biter, has been mentioned as a possible vector of Dengue. It is a major pest in some areas and is widely spread throughout the state.

At least five species of fleas of medical importance are found in Ohio. Two of these are commonly found on the Norway Rat, *Rattus norvegicus*. They are as follows: *Xenopsylla cheopis*, the Oriental Rat Flea, and *Nosopsyllus fasciatus*, the Northern Rat Flea. The Oriental Rat Flea is the principal vector of *Pasteurella pestis*, the bacillus which causes plague and *Rickettsia typhi* which causes murine typhus in man.

Pulex irritans, the human flea, too, is found in Ohio as it is elsewhere in the world. Since it feeds on other animals such as hogs and dogs as well as chipmunks and others, it is very often encountered on farms. Some infections of plague to humans may come about because of feces being deposited on the skin of man.

Ctenocephalides felis, the cat flea, and *C. canis*, the dog flea, are commonly distributed in

Ohio. They are the species usually implicated in the transmission of the tapeworm, *Dipylidium caninum*, from dogs or cats to children who accidentally swallow the flea.

There are three species of lice which are parasitic on man, *Pediculus humanus capitis*, the head louse, *Pediculus humanus humanus*, the body louse, and *Phthirus pubis*, the crab louse. All of these, of course, are found in Ohio. Only the body louse transmits the causative organisms of diseases as follows: louse-borne relapsing fever, trench fever, and murine strain of typhus, bubonic plague, and epidemic typhus.

Among the flies which are domestic to Ohio, many are capable of, or actually do carry the organisms of disease. *Musca domestica*, the house fly, is the common carrier of *Shigella dysenteriae*, which produces bacillary dysentery in man. Its ability to transmit other organisms pathogenic to man is well known. Some of these are as follows: *Vibrio cholerae* which causes cholera, *Endamoeba histolytica* the producer of amoebic dysentery, and *Salmonella typhosa* the causative organism of typhoid fever.

Chrysops discalis, the deer fly, reported from Ohio is a proven carrier of tularemia to man.

Fannia spp., the lesser house fly, are of less importance as a disease vector than the house fly, but there are records of this genus producing myiasis in man and they are certainly capable of producing digestive disorders in man.

Stomoxys calcitrans, the stable fly, is the "house fly that bites" in Ohio. It may easily be a mechanical transmitter of anthrax because of its habit of flying from animal to animal to feed. There may be some connection between this species and human conjunctivitis. The fly larvae, however, definitely do produce myiasis in man.

Muscina spp., false stable flies, are common in Ohio and transmit many of the organisms producing digestive disorders. Where there are cases of human intestinal myiasis, this particular genus is usually suspected. The flesh flies of the family Sarcophagidae are also capable of producing human intestinal myiasis.

Calliphoridae, the family of bottle and blow flies, certainly can not be overlooked. Usually they do not invade houses in Ohio, but in the fall in many rural areas they crawl through cracks of houses probably as a means of seeking shelter from the cold nights and eventually release themselves indoors. They are especially annoying to housewives because of their clumsy habits of flight and rest. There are reports of an existing connection between this group and polio but not too much is known. The larvae produce myiasis in man.

Oestridae, Cuterebridae, and Gasterophilidae are families of bot flies of some public health significance in Ohio as well as elsewhere. Myiasis of various parts of the human body such as the eye, nasal passages, and frontal sinuses are caused by the larvae of these flies.

Chloropidae (Oscinidae), the eye flies, are very troublesome in parts of Ohio. Infectious materials may be easily transmitted from man to man by this fly. Hence it is a ready carrier of any organism causing conjunctivitis and possibly others.

Other flies which may be of lesser importance are as follows.

Family	Vectors of
Ceratopogonidae (Biting midges, punkies)	Human filariasis
Simuliidae (Black flies)	Blinding filariasis, and tularemia
Tabanidae (Deer flies, Horse flies)	Mechanical vectors of anthrax and tularemia.

Bees and wasps, because of their venomous stings, are certainly more than nuisances. Case histories of persons having anaphylactic reactions are well known. As in all of the other states, Ohio is well populated with these insects.

Triatoma sanguisuga, of the subfamily Triatominae, are found mostly in parts of southern Ohio. They are known to harbor *Trypanosoma cruzi*, the causative organism of Chagas Disease. *Triatoma lectularius*, another vector, is commonly found throughout the southern United States including all of Kentucky and might well be established in southern Ohio.

Cimex lectularius, the bed bug, has not been associated with the transmission of human diseases but occasionally causes severe bites to some people and contributes to nervous disorders.

Tenebrio molitor, the yellow mealworm, a common Ohio farm pest, has been known to carry *Hymenolepis diminuta*, the rat tapeworm, to man. It has also transmitted *Hymenolepis nana*, the dwarf tapeworm of the house mouse to man. Obviously, many of the enteric diseases of man can be transmitted by these insects.

Epicauta pennsylvanica, the "blister beetle" or "old fashioned potato bug" is common throughout the state. An oil known as cantharidin is contained within the bodies of the adults and will blister the skin of humans if the insects are crushed and rubbed into it.

Periplaneta americana, the American cockroach, is so very common it is sometimes not taken very seriously but it is definitely a carrier of the organisms causing dysentery, diarrhea, typhoid, and food-poisoning. They have also been found naturally infected with organisms of human polio. Other roaches which are almost as serious and found in Ohio are as follows: *Blattella germanica*, the German cockroach, *Supella supelleetricilium*, the brown-banded cockroach, *Blatta orientalis*, the Oriental cockroach, and *Parcoblatta* spp., the wood roaches. Cockroaches are also known to carry *Hymenolepis diminuta*, the rat tapeworm, to man.

Among the arachnids there are many which are of public health importance. *Latrodectus mactans*, the black widow spider, has been repeatedly found in Ohio but is not too common. Actually, although extreme pain results from the bite of this spider, very few deaths have been reported.

Rhipicephalus sanguineus, the brown dog tick, is native to Ohio. It has been found to contain the toxin which produces tick paralysis in humans and easily transmits the various tick-borne typhuslike diseases. It is commonly associated with dogs and rarely bites man.

Amblyomma americanum, the lone star tick, is common over most of the state of Ohio. It is a transmitter of the spotted fever organism and other rickettsial disease agents as well as the bacillus *Pasteurella tularensis* which causes tularemia. Goats, sheep, dogs, and deer seem to be the principal hosts. Recently the tick has been shown to be the vector of *Coxiella burnetii*, a rickettsia which causes Q fever.

Dermacentor variabilis, the American dog tick, is commonly found throughout Ohio and is brought into homes by dogs. These are the primary transmitters of tularemia. They have also been shown to be carriers of the St. Louis strain of equine encephalitis. A disease with many of the clinical symptoms of dengue has been reported from New York with its causative organism, a virus, isolated from *D. variabilis*. The tick has also been shown to be responsible for tick paralysis and the transmission of *Rickettsia rickettsia*, the causative organism of spotted fever.

Laelops echidninus, the spiny rat mite, is found on the common Norway rat, *Rattus norvegicus*, and is suspected as being a carrier of tularemia.

Ornithonyssus sylviarum, the northern fowl mite, is common in Ohio chicken houses, and of course on chickens. It will bite man readily but never causes anything more serious than a rash.

Dermanyssus gallinae, the chicken mite, found in Ohio chicken houses in large numbers, bites humans causing a rash but nothing more.

Glyciphagus prunorum, the fruit mite, is commonly found on certain dried fruits such as raisins or prunes in grocery stores, and produces a rash known as "grocers itch" after biting.

Pyemotes ventricosus, the grain itch mite, found on infested straw in Ohio sometimes causes fever, intense itching, and secondary infections among humans coming in direct contact with the straw.

Sarcoptes scabiei, the itch mite, is found in Ohio and seems to be represented by many different forms. They are found on domestic animals and very often cause a short-lived case of mange in humans.

Allodermanyssus sanguineus, the house mouse mite, can be found living in association with the house mouse, *Mus musculus*, common throughout Ohio. The mite serves as a reservoir for *Rickettsia akari*, the causative organism of rickettsialpox in humans.

Trombicula spp., the common chiggers, are a pest in many places in Ohio usually biting the ankles, areas of the waistline, and armpits. In America they are not known to carry diseases but in Asia they are important vectors of the causative organisms of scrub typhus. Obviously, much work has to be done with the mites in order to learn their true public health significance.

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