

### XIX. SOME NOTES ON THE PARASITE FAUNA OF OKLAHOMA

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The study of parasites has been very limited in Oklahoma. Aside from a few scattered records practically no work has been carried on with our parasite fauna. For that reason this paper is an appeal for more observers and more interest in this field of work,—that of medical zoology. We are situated geographically so that we are on the dividing line, so to speak, between the north and the south, where the two faunas overlap thus making interesting fields from the standpoint of ecology, distribution and taxonomy.

The importance of diseases due to animal parasites is not generally appreciated. This is largely due to the fact that these diseases and their parasites are not thoroughly understood. People in general are more or less familiar with diseases due to bacteria. They understand that bacteria are small and that special apparatus is necessary for their detection. Such terms as bacteria, germs, microbes, and infections are almost by-words with some of us and we speak of them whether we know whereof we speak or not. We know they exist and consequently are on our guard against them. No such understanding exists in the case of the worm parasites. These intruders do not thrust themselves upon the attention of the casual observer, therefore, it is more or less assumed that parasites are comparatively rare and of interest only to a specialist, or to persons far removed from us geographically. As a matter of fact, parasites which are comparatively common and large enough to be readily seen may easily be overlooked.

One reason why people in this country fail to understand the nature and importance of parasitism is that there are so few students of the subject in the United States. There are very few American specialists in this field and coupled with that fact is the additional one that our physicians and veterinarians pay less at-

tion to this subject than do the European scientists. The same condition prevails here as elsewhere, that where there is a lack of accurate information there is an abundance of inaccurate belief, among others, a belief in the infrequency and harmlessness of parasitic infection. One factor which favors this condition of affairs is the difficulty in many cases with which parasitic infection may be detected from its lack of clinical symptoms. Many times diagnosis must be made through the examination of feces, urine, blood and sputum, or even the examination of the flesh, as in the case of infections with trichinae or certain bladder worms.

It is encouraging to know that there is a growing interest in the field of parasitology. The unusually large part which parasites play in the field of tropical medicine has compelled our physicians and veterinarians to devote some attention to this branch of zoology. In the southern states, and also in our Island possessions, we are devoting much effort to campaigns against malaria and yellow fever, and to the problems of hookworm eradication. Stockmen over the country are learning to know of the effects of worm infestation in their herds. We know something of the Texas fever tick, which is gradually being eliminated from the United States. Sheep men have learned that we have the stomach worm and nodular worm which will destroy the sheep industry unless the problem is attacked systematically. Swine raisers know that worms stand second in importance to cholera as a disease. Dog fanciers are learning that they must keep their kennels free from worms, lice and scab. Poultry men also have their problems with worm eradication.

A few of the parasites which infest human beings and domestic animals in Oklahoma will be briefly mentioned in this paper. These are taken up according to groups and discussed from that standpoint.

#### Protozoa

The parasitic protozoa which are commonly found here are of great importance. Unfortunately, our records are so incomplete we know practically nothing about their occurrence or distribution so we can touch upon them only very briefly. This group, however, is so closely associated with bacteria that the two groups are usually classed together.

*Entamoeba pyorrhalis*, an organism which is present and probably pathogenic, is more or less commonly associated with certain types of pyorrhea. *Entamoeba histolytica*, the cause of amoebic dysentery, has been reported (verbal) to the writer but has not been verified by a written record. Other amoebae are undoubtedly pre-

sent in Oklahoma, but since so little is known of this group in this locality we cannot take it up farther here.

Other protozoa attacking man are *Giardia (Lambia) intestinalis* and species of *Trichomonas*, causing severe irritations and inflammations of the intestine. *Balantidium coli* is a ciliate protozoan which causes a severe type of dysentery in man and sometimes in hogs. This form is very common in hogs in some localities and it is undoubtedly more common in man than most of us realize.

Among the most common protozoa living in the blood we have *Plasmodium malariae* and *Piroplasma bigemina* with which the most of us are more or less familiar. The *P. malariae* is the causative organism of malaria and is common in certain parts of this state where the *Anopheles* mosquito is present to transmit it from one person to another. There is also a malarial parasite common in certain birds but it is not pathogenic for man. *Piroplasma bigemina* is the causative factor in Texas-fever in cattle and is transmitted by the bite of the Texas-fever tick. Other species of blood protozoa are present without doubt but the writer has no available record of their occurrence. There are some species of coccidia which attack cattle, dogs and poultry, producing several types of coccidiosis, of which the entero-hepatitis or "black-head" of turkeys, and coccidial enteritis of young chicks deserve special mention.

#### Trematodes (Flukes)

The writer is not aware of any records of trematodes occurring in man in Oklahoma, however, *Fasciola hepatic* and *F. magna*, liver flukes of sheep and cattle have been reported. These cause the disease known as liver-rot, or "leech-liver," and have been reported from man many times in other countries. No records are available for any other trematodes occurring in our domestic animals. Water-birds, frogs and fishes harbour several species of trematodes. Some of these are of considerable economic importance.

#### Cestodes (Tapeworms)

Tapeworms are generally common in nearly all species of animals in this state. From man we have *Taenia saginata*, the common beef tapeworm, and *T. solium*, the pork worm. Both species occur only occasionally, the former being more common than the latter. This is undoubtedly due to the fact that more raw beef is consumed than raw pork. Recently the writer has found *Cysticerci cellulosa*, the bladder worm stage of *T. solium*, in pork from several localities of the state. *Dipylidium caninum*, a common dog tapeworm, has been reported from children a great many times in recent years. The writer has no record of its occur-

rence in children in Oklahoma but the parasite is very common in the dogs of the state. The intermediate stage of this tapeworm is in the dog flea. In every case where this worm has been found in children they have had dogs for companions. The children probably accidentally swallow infested fleas and thus become infested.

Sheep are commonly infested with *Monexia expansa*, and occasionally with *Thysanosoma actinoides*, the fringed tape worm. Their life histories are unknown. Both cause considerable loss among lambs. Sheep harbour the intermediate stages of at least two species of dog tapeworms, i. e., *Taenia marginata*, the bladder stage being located in the liver or mesenteries, and *Multiceps multiceps*, the larval stage being a coenurus located in the brain and is known as the gid parasite.

Cattle as a rule are not as seriously affected with tapeworms as are sheep. The common tapeworm of cattle being *Taenia planissima*.

Most Oklahoma dogs which are allowed to roam at will are infested with tapeworms, very often more than one species being present in a single animal. *Multiceps serialis*, *M. multiceps*, *Taenia serrata*, *T. marginata*, *T. echinococcus*, and *Dipylidium caninum* are the common species. *T. marginata* and *Multiceps multiceps*, as mentioned before are transmitted through the offal from sheep. *M. serialis* and *T. serrata* are transmitted through eating the flesh of rabbits, while *D. caninum*, as mentioned above is transmitted through dog fleas. *T. echinococcus* is transmitted through the flesh of hogs. The larval stage has also been frequently recorded from man in various parts of the world.

Domestic cats also have their tapeworms, the common species being *Taenia crassicolis*. This species is transmitted through eating rats and mice. *D. caninum* is also frequently found in cats.

The chickens of Oklahoma are infested with four species of tapeworms, i. e., *Davainea cesticillus*, *D. tetragona*, *Hymenolepis carioca* and *Choanotaenia infundibuliformis*. The writer has examined hundreds of chickens during the past three years and very few birds did not harbour at least one species of these cestodes. All of the four above named species may be transmitted through flies, *Musca domestica* (common house fly) and *Stomoxys calcitrans* (stable fly). Several species of tapeworms are present in the rodents of the state. Those especially infested are rabbits, gophers, and rats. The wild birds are also more or less heavily infested.

#### Nematodes, or Roundworms

When we speak of "worms" in animals we usually refer to members of this group. They are the most numerous and may infest

almost any organ in the body. The ascarids are among the largest of the group and nearly every species of animal has its special variety. The human species, *Ascaris lumbricoides*, is now considered as identical with *A. suum* of the pig. The adults live in the intestine but the larval stages cause many systemic disorders, especially of the lungs. It is known that some of the lung symptoms manifested along with "worms" in children are due to larval ascarids as they migrate to the lungs during a part of their life cycle. In pigs many of the cases of "thumps" are caused by larval ascarids during their course of migration from the intestine, through the lungs, windpipe, pharynx and down the esophagus a second time to the intestine where they grow to maturity. It is agreed that ascarids of other animals go through the same course of migration.

Human hook worms (*Necator americanus*) are present in some localities. Their prevalence may be ascertained from the fact that approximately 6% of the men in the army camps from Oklahoma and Texas were infested. Very few dogs in the vicinity of Stillwater are free from hookworms (*Anclystoma caninum*). Many cats also harbour them. Sheep and cattle also have another species.

Children are rather commonly infested with the pin worm (*Oxyurus vermicularis*). Species of *Oxyurus* also infest horses and cattle. The stomach worm (*Haemonchus contortus*) is very destructive to cattle, sheep and goats. Various species of lung worms attack sheep, cattle, horses and hogs and all are more or less of economic importance to the live stock industry. Numerous other species of round worms attack man and his domesticated animals so that this group of parasites is the most important from the economic standpoint.

#### Insects and Arachnids

We have numerous types of lice, mites and fleas, which live on the exterior of man and animals. Certain insects are free living as adults but their larvae are parasitic. We may mention the horse bot-fly, the ox-warble fly or "heel fly" of cattle, and the nose-fly or gad fly of sheep. These are of extreme economic importance, especially the nose-fly of sheep. The larvae live in the nostrils and frontal sinuses of sheep and often cause very serious losses.

Just a word might be said in regard to the number of parasites that may be present in an individual animal and the degree of infestation in a group of animals. The writer has removed 3120 stomach worms, 319 hook worms, 150 nodular worms, and 31 tape worms from a single lamb. More than 5000 worms of several species were taken from one horse. A bull dog yielded 355

tapeworms and 20 hook worms. It is not an uncommon occurrence to remove from 300 to 400 worms from a single chicken. Most flocks of sheep in the state are infested more or less with stomach worms. In some flocks every animal is infested and the losses among lambs are often serious. Hogs are generally infested with worms, as are horses. This applies to the state as a whole. Chicken flocks are nearly all more or less severely affected. Thus we may have some idea of the prevalence of parasitism in our state. We have many species and many times the infestation is very heavy, not only with internal parasites but also with external forms as well.

The tendency is toward an increase in parasitism as the environment becomes more contaminated with eggs and larval worms by being inhabited with various animals. Thus we must be on the alert and guard against any possible chances for increase by instituting sanitary measures to prevent the spread of such diseases. The appeal that it is hoped the foregoing remarks will bring forth is, that we many have more interest in this field and more workers to bring this matter before the public. The public must be informed in order that it might know of methods of keeping down parasitic infection and lessen chances for parasitic diseases.