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Common Internal and External Parasites of Poultry

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COLUMBIA, MISSOURI

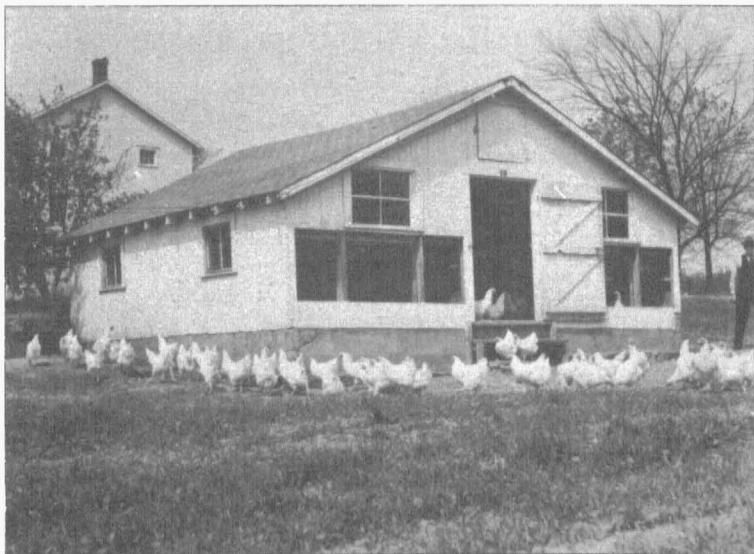


Fig. 1.—A modern, well planned, well ventilated poultry house with concrete floor. Note the open front, cover crop on the yard, and cleanliness of surroundings.

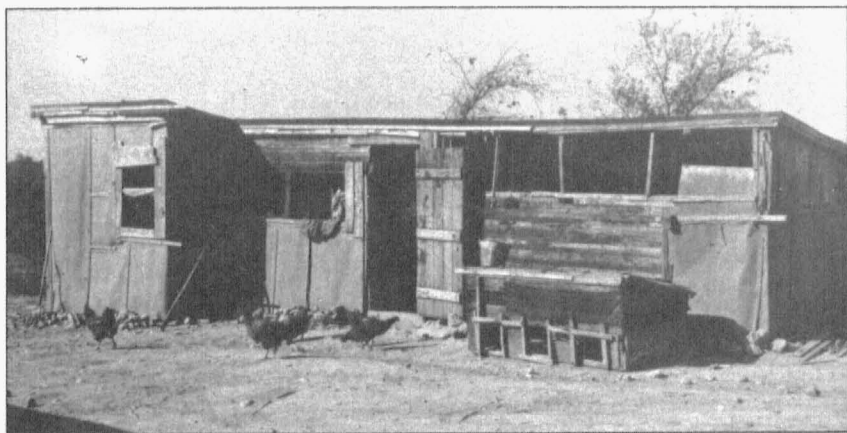


Fig. 2.—A "poorly" constructed poultry house. Note the bare yard and makeshift shelter construction. This house does not have a concrete floor.

NOTE: All of the illustrations in this bulletin are original photographs by members of the University of Missouri Photo Service cooperating with the authors.

Common Internal and External Parasites of Poultry

H. C. McDOUGLE AND A. J. DURANT

Internal and external parasites of poultry cause untold annual losses to the poultryman, or to the farmer who may be raising poultry as a sideline. As poultry raising has become more artificial and as the poultry population has become more concentrated, it is reasonable to expect a greater concentration of parasites and disease-producing organisms in the poultry plants or yards. With intensified poultry farming disease control in the flock is a major problem. In many cases flock owners give very little thought to prevention, but unfortunately rely upon patent remedies and various "medicines" suggested by other poultrymen for disease control.

Birds making up the flock are usually of little monetary value as individuals and the occasional loss of one or two birds is usually regarded as "bad luck" by the ordinary poultry grower. The occasional loss should be a warning that some disease is probably beginning in the flock, and that every precaution should be made to stop the disease rather than to wait until drastic measures must be instituted.

Disease prevention, which includes parasite control in poultry flocks, is fundamental for successful poultry farming, and the poultryman should put into practice those methods which will best control poultry diseases.

The Missouri College of Agriculture, the Bureau of Animal Industry, and the veterinarians of Missouri have been of unlimited value to the poultryman. These groups have brought about better housing and equipment, improved rations and methods of feeding, flock improvement through breeding and culling programs, and have outlined means for disease prevention and control.

DISEASE PREVENTION IN THE FLOCK

The best poultry management will not produce a healthy flock unless healthy chicks are secured for foundation stock. Day-old chicks are preferable to started chicks, as started chicks may be affected with some of the protozoa and may have developed various forms of respiratory diseases.

The brooder house should be in readiness before the chicks are purchased; this means that the house should be thoroughly cleaned and scrubbed with some disinfectant, such as lye water—one can

of lye to twelve gallons of cold water. If coccidia have been present use the lye water hot, near the boiling point. Feeders, waterers, and other equipment in the house should be cleaned and disinfected. Chilling or overheating the chicks may be avoided by regulating the source of heat some time in advance of the arrival of the chicks.

Movable brooder houses make it possible for the poultryman to move the house to clean ground each year, or better still, the house should be moved every time a new group of chickens is brooded therein. If the ground area is limited and the house cannot be moved, sun porches and range shelters will, in a measure, solve the problem.

Growing chicks should always be kept apart from the adult birds and should not at any time be allowed to range with adult birds.

In the fall the healthy pullets which have been raised on a clean range may be placed in a laying house which has been as scrupulously cleaned as was the brooder house. Healthy pullets should *never* be placed with *the rest* of the previous laying flock, as the old birds may be, and often are, carriers of various parasites and disease-producing organisms. Broken eggs may be a problem in the pullet flocks, and since disease may be spread by eating broken eggs, an abundance of nests should be supplied.

Screened dropping boards or dropping pits under the roosts are indications of good management. Waterers and feeders so constructed as to prevent dropping contamination are ideal; these may be placed on screened frames to prevent birds from feeding over damp and contaminated litter.

A "broody" coop often used as a hospital in the poultry house is usually a box-like arrangement with a slat or wire mesh floor below. A poultry hospital should approximate the modern standard of sanitation. A clean, ventilated, well lighted building for this purpose is very desirable. Birds will more quickly regain their health under these conditions than under those in the hospital coop, woodshed, or coal bin where sick birds are often hospitalized. Unless sick birds can be kept in a house under better than average conditions it is much better to dispose of them immediately.

It is not necessary to build a poultry fence which will turn livestock, and therefore a light fence which can be readily moved is more desirable. When the yards are being cultivated for growing a cover crop, the fence can be moved with very little trouble and the fence rows cultivated at the same time. Trees in the poultry yard may be trimmed so that no branches touch the ground and so that the sun will at some time during the day shine on all of the ground surface under the trees. Dense shrubbery or sprouts may be removed, as they may harbor sources of infection. Free flying

birds, such as sparrows, and pigeons, should not be allowed to feel at home in the poultry house or yard, as they may be carriers of diseases or parasites.

It is very desirable and important to quarantine for at least forty-five days any birds that are to be introduced into the flock; this means birds that have been to fairs, egg laying contests, male birds for breeders, or additional pullets. The practice of returning birds to the flock is often a means of introducing diseases.

Poultry shipping crates should be sterilized before being brought on a farm; this is true concerning truck beds in which poultry has been hauled. Never allow offal from dressed birds to be thrown to the birds in the poultry lot. Poultry should never be allowed to range with hogs.

It is very desirable and economical to provide an adequate, well balanced ration for the flock at all times. However to secure the most economical production of eggs or meat the birds should be kept reasonably free of parasites. Unless the young growing pullets and cockerels are isolated they usually become parasitized. Infestation with parasites is almost sure to occur if the young birds are allowed to range with old birds or if the young birds are allowed to use the range which was recently used by the adult birds. If a clean range cannot be supplied for the growing stock then sun porches and range shelters must be used. Parasites cause unthriftiness and mortality in the growing flock. Mature birds seldom need be treated for the removal of worms unless they are present in such numbers as to cause distinct symptoms.

Internal parasites are easily recognized, and if they are present in growing birds, treatment for their removal is indicated. It is not unusual to find heavily parasitized pullets which are coming into production being placed in the laying house. However production soon stops and the birds become unthrifty. A careful diagnosis is of utmost value before any treatment is administered. Then if parasites are present treat *only* the birds that are *out* of production.

FOR LABORATORY EXAMINATION OF SICK BIRDS

Put two or three of the sick birds in an orange crate, apple basket, egg crate, or stout pasteboard box. Try to select the birds characteristic of general symptoms in the flock. Ship the birds by *prepaid* express to the Veterinary Department, University of Missouri, Columbia, Missouri. It is best to accompany the shipment with a letter explaining general symptoms, feeding and housing methods, number of birds sick, and number of birds dead. Mention other facts that may be helpful to complete the history on the flock.

COMMON INTERNAL PARASITES

Life Cycles

Roundworms.—Most of the roundworms mentioned in this bulletin have a simple life cycle; that is, the cycle is completed by the adult worm laying eggs which pass from the bird with the droppings; under favorable conditions, the eggs embryonate and are picked up by the same or other birds, establishment or reinfestation takes place which completes the life cycle. Some roundworms do require an intermediate host; that is, they must spend part of their life cycle in an invertebrate host. Some of the worms with direct life cycles may spend part of their growth in insects, earthworms, etc., but this is not always necessary for their completion.

Tapeworms.—Practically all tapeworms require intermediate (usually invertebrate) hosts for completion of their life cycle. In poultry, part of the cycle may be spent in flies, snails, sow bugs, slugs, earthworms, beetles, etc. Eggs are laid by the adult worm, or segments are shed, which pass out with the bird's droppings. The eggs or segments may be taken in by some of the intermediate hosts mentioned, where development takes place in their bodies. These hosts are then eaten by chickens, after which the parasites develop into adult worms, thus completing the cycle.

Explanation of life cycles Figure 3.—The two life cycles, numbers 1 and 2, illustrate two types of roundworm life history. Number 1 is a direct cycle, whereas Number 2 is more complex. The egg passes through an intermediate host, such as the earthworm. The earthworm may then be taken in by birds. Number 3 illustrates the complex cycle of the tapeworm and its passage to the fly or other intermediate hosts. The infected intermediate host may then be taken in by birds.

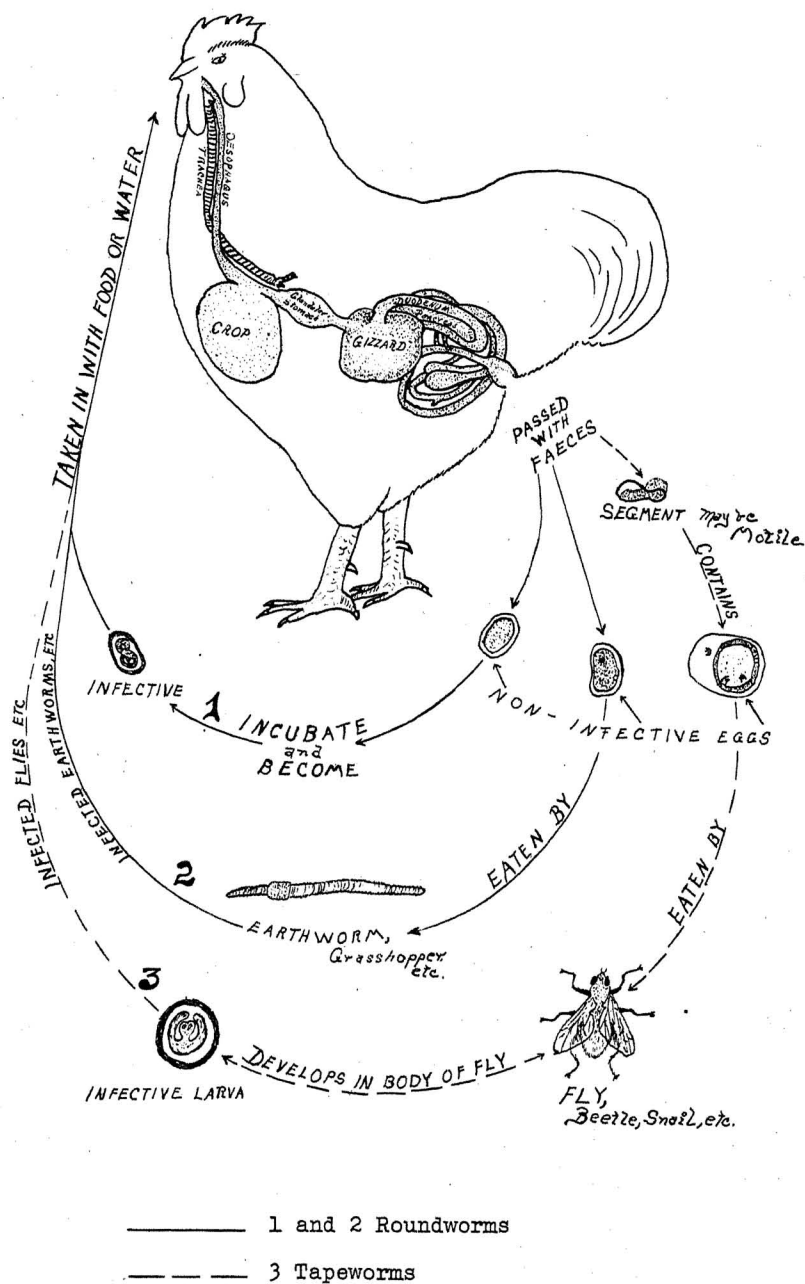


Fig. 3.—Diagrammatic representation of the life cycles of tape and roundworms.

THE LARGE ROUNDWORM

This parasite is usually referred to as the "roundworm of poultry." They are frequently seen in the fresh droppings about the poultry house and yard. There are many kinds of roundworms; however, this is the largest of the roundworm group.

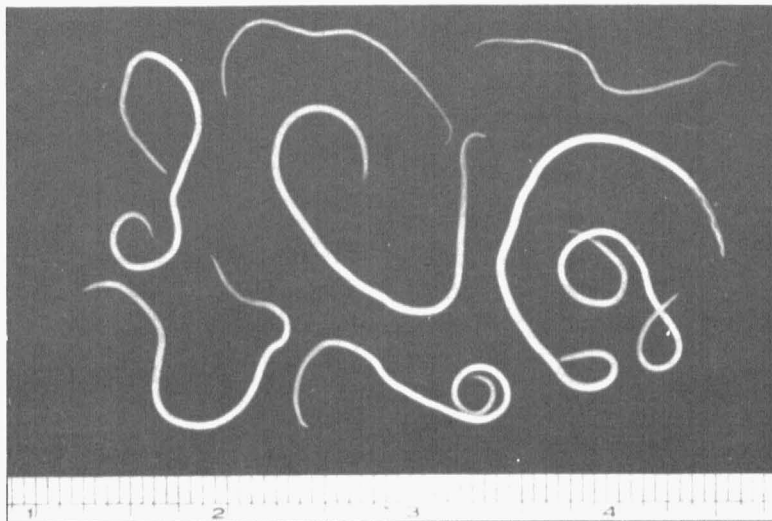


Fig. 4.—This is a rather large parasite as shown by the scale in inches at the bottom of the picture. The shapes assumed by the parasites in this photograph are typical. The two smaller worms at the top are males.

Symptoms.—It is not unusual to find several of these large roundworms in adult birds, and unless the worms are present in large numbers few symptoms will be noticed. Young growing birds on the range are most severely affected. Paleness of the comb and wattles associated with loss of weight, and sometimes paralysis of the legs are the most common symptoms. In the house or on the range these parasites may occasionally be found in the droppings.

Description.—The color of this parasite is white, yellowish-white, or light tan. In shape they are cylindrical or round and are 2 to 4 inches long and $\frac{1}{32}$ to $\frac{1}{16}$ of an inch in diameter. The worms taper to a blunt point at the anterior end and are quite pointed at the other. The females are much larger than the males. (See figure 4).

Habitat.—The large roundworm is found free in the intestine, usually from the duodenal loop to the junction of the ceca with the intestine. The adult worms are *not* attached in any manner to the inner lining, and may be present in such large numbers that the intestine is plugged.

Control.—Sanitation and prevention.

Treatment.—Medical measures for affected birds are quite reliable. Many drugs have been used and several may be recommended.

1. *Flock Treatment.*—Tobacco dust in the mash, as recommended by the California Experiment Station is very successful. The tobacco dust should contain 1½ to 2 per cent nicotine, and it is mixed with the mash as follows:

Tobacco dust	1 pound
Mash	50 pounds

It is best to mix only enough mash containing the tobacco dust for three or four days feeding, as exposure to the air causes the tobacco dust to lose its effectiveness.

The birds may be kept on this mash for 10 to 14 days, then feed mash without the tobacco dust for an equal number of days, then repeat the tobacco dust mash.

2. *Individual Treatments.*—These are given by placing the drug far back in the mouth with the index finger. Fluids and powders are best given in gelatin capsules. Push the capsule down the oesophagus with the thumb and index finger on the outside of the neck, sliding the capsule down the oesophagus to the crop.

Tetrachlorethylene 1 c. c. or nicotine sulphate in pellets may be used for adults.

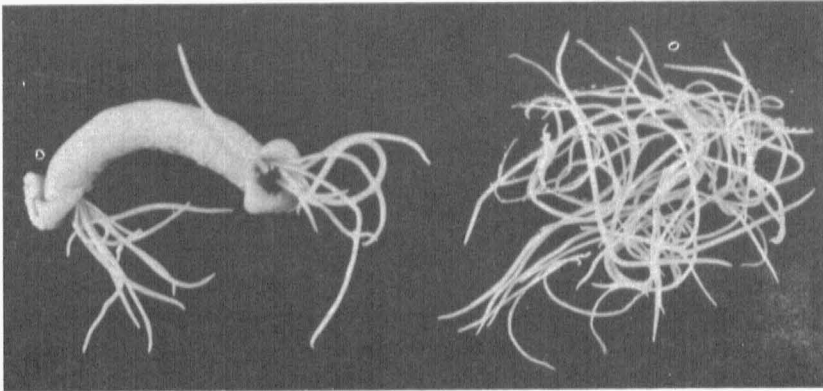


Fig. 5.—Left: A section of intestine "plugged" with large roundworms. Right: A mass of large roundworms removed from the same bird. When infestation is exceedingly heavy the birds may pass such masses of worms with the droppings.

Phenothiazine has been recommended for the control of cecal worms. (McCulloch, E. C., and Nicholson, L. G.: *Vet. Med.* Vol. 35, No. 7:398) have shown it to be non-toxic in 500 times its effective dose. There was no effect on egg production, or the flavor of the poultry meat. For flock treatment of 1000 birds use 1 pound of phenothiazine thoroughly mixed in 60 pounds of mash. Moisten the mash just before feeding to form a moist crumbly mass. Put the mash out in sufficient hoppers so it will be accessible to all birds.

The Cecal Worm

These parasites are commonly called "pin worms of poultry." They are rather small and are found in the blind pouches or ceca.

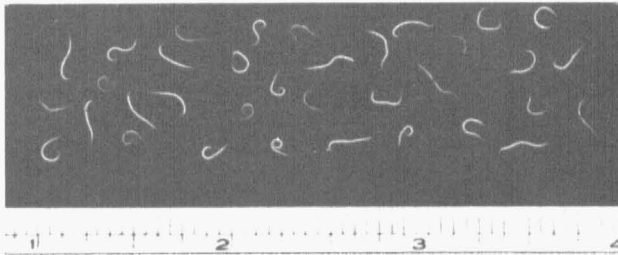


Fig. 6.—Although the worms shown above appear to be pointed at each end they are in general the same shape as the round worms shown in Figure 4. The scale at the bottom of the photograph is in inches.

Symptoms.—These worms are usually present in farm poultry flocks, and except in very rare cases, they are not present in sufficient numbers to cause symptoms. *These* are the parasites usually associated with blackhead.

Description.—These parasites when examined with the unaided eye are in general quite similar to the large roundworms, except that they are quite small, from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in length. (Figure 6.)

Habitat.—The cecal worm is found loose in the ceca (blind pouches), and most of them are at the extreme tips of these organs.

Control.—Sanitation and prevention; medicinal measures are quite costly and laborious, and except in rare cases are not justified.

Treatment.—Administration of drugs for the removal of these worms is usually unjustified. The fact that they are commonly found in the farm poultry flocks certainly does not justify the promiscuous purchase of various "worm remedies." However if it is necessary to treat the birds for the removal of cecal worms one of the following measures may be used.

1. *Flock Treatment.*—2% tobacco dust in the mash as is recommended under treatment for roundworms.

2. *Individual Treatment.*—The U. S. Department of Agriculture's recommendation of cotton seed oil and oil of chenopodium may be used. For a $1\frac{1}{2}$ pound bird mix:

Oil of Chenopodium	$\frac{1}{10}$ cc.
Cotton Seed Oil	5 cc.

In using this treatment it is necessary to secure a bulb syringe fitted with a long hard rubber nozzle, as the drug must be injected by way of the vent near the junction of the ceca with the main intestine. It is usually best to have one person hold the bird while another gives the treatment; the bird should be held with its head down for a few minutes after treatment has been given.

The Capillaria

This long, thin worm is oftentimes overlooked in poultry. It is commonly called "the thread worm" because of its extreme length and small diameter.

Symptoms.—Recently birds have been sent in to the laboratory showing symptoms of parasitism, such as paleness about the head and wattles, discolored plumage, extreme lightness in weight, and other symptoms of unthriftiness. Upon examination these birds were found to have large numbers of these parasites in the upper digestive tract, primarily the crop. After treating parasitized flocks the birds apparently return to a nearly normal condition. However it would have been impossible to destroy all of the worms since they burrow deep into the tissues.

Description.—This parasite is white or gray in color and is thread-like in appearance. Some of them are very short while others are several inches long.

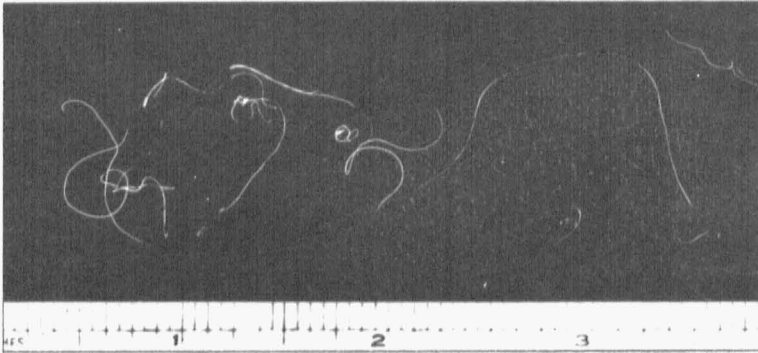


Fig. 7.—The small diameter of this parasite makes it very hard to photograph, and, as noted above, the worms appear as threads against a dark background. The shapes are characteristic in that when the worms are removed from the crop they assume various twisted forms.

Habitat.—This threadlike parasite burrows in and out of the lining of the crop, glandular stomach, and first part of the intestine. It appears as having been stitched into the structures with a sewing needle. By holding the tightly stretched crop before a strong light, these parasites may be seen under the lining of the affected crop. The parasite may then be easily raised with an ordinary pin. It will oftentimes break when being removed.

Control.—Sanitation and prevention.

Treatment.—Adult chickens, 1 c.c. of tetrachlorethylene or 1 c.c. of carbon tetrachloride, given by way of the mouth.

The Gapeworm

This round worm is oftentimes called the "Y" worm.

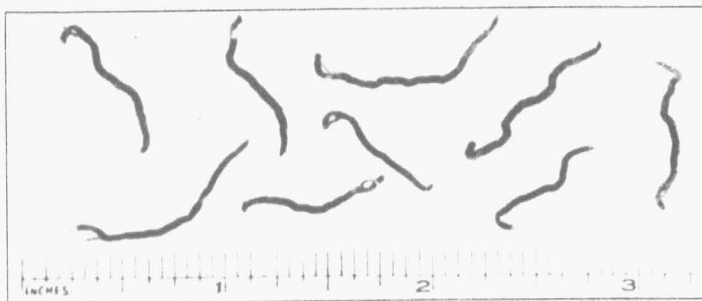


Fig. 8.—The parasite in the lower left of the photograph shows the typical "Y" shape. The female is much larger and darker than the male, and they are always found so joined. The white streaks on the bodies of the females are parts of their reproductive system.

Symptoms.—Gapeworms are apparently becoming more numerous in poultry in this state and they are also being found in some of the game birds. The young of chickens, turkeys, or game birds are most seriously affected. Difficult respiration is one of the first symptoms noticed. This is followed by gasping and extreme difficulty in breathing; that is, the parasites have grown or have so attached themselves in the trachea that they prohibit the free flow of air through the trachea. These parasites may be seen in the live birds by looking directly into the trachea.

Description.—The male and female both attach themselves to the lining of the trachea or windpipe, by what appear to be small suckers. In color the worms are various shades of pink, red, or dark brown depending upon their age and the amount of material or red cells taken into their digestive tract.

Habitat.—The worms are found firmly attached to the inner lining of the trachea (windpipe or weasand).

Control.—Turkeys are the common or natural carriers of this parasite, therefore they should not be allowed to range with chickens.

Modern incubation and brooding methods, combined with sanitary feeding methods have, to a great extent, eliminated this parasite. Feeding the chicks in troughs instead of on the ground, and hatching and brooding the chicks without hens has in a great measure prevented them from picking up the gape worm eggs, embryos, or infected earthworms.

Treatment.—Many devices have been used to remove these parasites from the trachea. The art of removing the worms with a twisted horse hair has been replaced by medical treatments. Barium Antimony Tartrate, as recommended by the U. S. Department of Agriculture, may be used. Another treatment is that of giving each affected bird three drops of a mixture of garlic oil and cottonseed oil. The stock mixture is garlic oil, 33 parts; cottonseed oil, 67 parts.

The Gizzard Worm

Often this parasite is overlooked when examining poultry. Although the specimen in Figure 9 is from an advanced case, all abnormal nodules on the gizzard should be carefully examined.

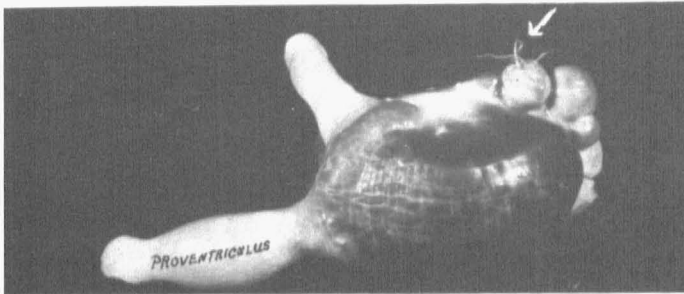


Fig. 9.—An advanced case of gizzard worm infestation. The proventriculus or glandular stomach is at the left. The large dark mass is the gizzard or grinding stomach, and the light structure extending upward and toward the left is part of the duodenum. On the right upper part of the gizzard are three distinct well formed nodules. The upper nodule has been opened to expose some of the hidden parasites (indicated by the arrow).

Symptoms.—Usually none. Heavily infested birds may show signs of unthriftiness.

Description.—This roundworm of poultry is white, or pinkish, or rather deep red in color. They are usually extracted from their burrow when they are one-half to three-fourths of an inch in length.

Habitat.—Peculiarly this parasite inhabits the muscular, or grinding stomach of the bird. It is usually found near the entrance or exit of the gizzard, yet may be found between the posterior parts of the two muscular masses (see Figure 9). The worm usually establishes itself in the part of the gizzard which is not covered by the dense, horny-like lining. Here it burrows and forms the peculiar nodules evident when examining the outside of the organ. If these nodules are opened the worms are readily visible.

Life Cycle.—Eggs are passed from the worms into the gizzard contents, which pass on down the digestive tract and consequently pass with the droppings. Grasshoppers while feeding pick up the eggs and in their bodies the eggs hatch and the larvae migrate to the muscles. Birds feeding on grasshoppers carrying the parasites become infected in about three weeks.

Prevention and Treatment.—The habitat of the parasite renders it more or less unresponsive to treatment. Sanitation, and ranges free of grasshoppers are most conducive to breaking the life cycle.

The Tapeworms

These flat, segmented worms are commonly found in poultry. They are securely attached to the inner surface of the intestine. There are many kinds of tapeworms, but they will be considered as a group.

Symptoms.—Growing birds usually show the most pronounced symptoms. They become extremely thin, pale, and emaciated. Heavy mortality may occur, particularly under adverse weather conditions. Egg production may be decreased in adult birds and soon the birds will go “out of production.” Segments or parts of the worms may be found on or in the droppings.

Description.—These parasites are usually white or yellowish-white in color and are from a small fraction of an inch to many inches in length. On the small end of the worm is found its prehensile apparatus (suckers and hooks). These devices enable it to securely fasten itself to the inner part of the intestine. The worms are

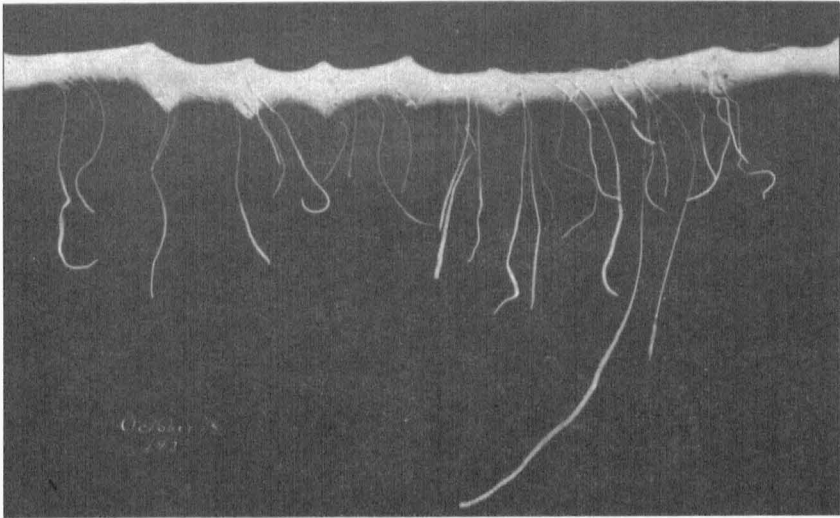


Fig. 10.—A photograph of an intestine that has been opened (the ribbon-like structure near the top of the picture) and which is heavily infested with tapeworms.

flattened from side to side and are definitely segmented. As the worms grow and mature these segments become more and more pronounced. Each segment contains the male and female apparatus necessary for the production of an enormous number of eggs. As the segments mature, eggs and ripe segments pass from the bird with the droppings; these segments may be seen as small motile white bodies on the droppings.

Habitat.—Since there are a great number of different kinds of tapeworms that affect chickens, each kind has its own peculiar loca-

tion in the intestines. The worms may be found from the junction of the gizzard with the intestine to the junction of the ceca with the main intestine. Ordinarily most of the small thread-like tapeworms are found in the duodenal loop, while the larger worms are found further back toward the ceca. Chickens and turkeys may carry enormous numbers of these parasites and sometimes the intestine may appear plugged, due to the great number of them present.

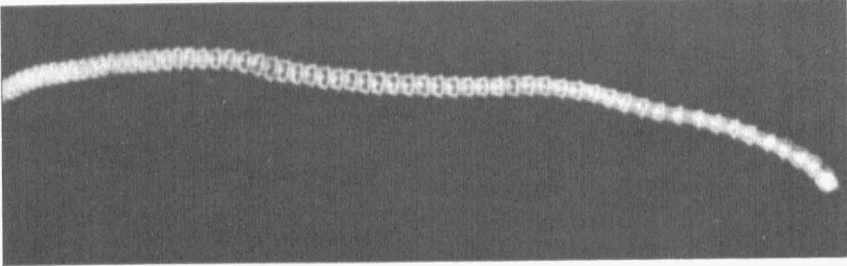


Fig. 11.—This photograph is an enlargement of one of the long tapeworms in Figure 10. Notice the segmented structure in the part of the worm most distant from the intestine (center and to the right).

Control: Sanitation and Prevention.—Cleanliness about the poultry house and yard is necessary, as the fly is the most common carrier. Extreme caution should be exercised when removing litter from a poultry house to scatter or place the litter such a distance from the poultry house that flies will not travel from the litter back to the birds in the house. If hardware cloth runs or sun porches are built outside the house, the droppings should be frequently limed or more frequently removed; in either case it tends to eliminate the fly population.

Treatment.—Over a period of years Kamala has proven to be effective against tapeworms of poultry. It is best given in gelatin capsules. A No. 000 capsule holds (without tamping) a sufficient dose for an adult bird. For young birds the dose must be smaller, such as an 0 or 00 capsule. The birds may be taken off feed at noon and the treatment given in the evening.

The poultry house may be cleaned the following morning and the droppings and litter placed at such a distance from the house that infected flies will not return to the poultry house. One treatment in the fall is usually sufficient.

When a laying flock is treated with Kamala it usually stops or greatly retards production over a period of 4 to 6 weeks. Therefore, it is advisable to treat only non-laying birds and pullets or cockerels.

NOTE: Kamala varies in "strength." It is advisable to pen 4 or 5 of the weakest birds and give them the recommended dose. If the birds do not show any ill effects the entire flock may then be treated.

EXTERNAL PARASITES**The Lice**

Lice are usually found on birds when the owner or caretaker gives the flock a minimum amount of attention and handling.

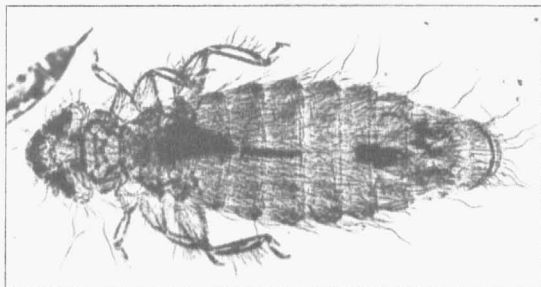


Fig. 12.—The common body louse magnified 27 times.

Symptoms.—Infested birds are constantly picking in their feathers, and as more lice appear the birds' plumage becomes soiled. It is not unusual to find masses of eggs cementing several feathers together at their base, particularly near the vent, on the thighs, or near the oil gland. (See Figure 13.)

Description.—These active, six-legged parasites are usually yellowish-brown or greyish in color. Some of them are quite small, while others are quite easily seen with the unaided eye. In shape they are flattened and are longer than they are broad. (See Figure 12). Lice appear to be constantly moving as by habit or in the quest of food. They are extremely irritating, as their legs usually terminate in some form of hook.



Fig. 13.—Feathers "matted" together with clusters of eggs.

Habitat.—The most heavily infested areas are those around the vent and those of the feather tracts on the thighs. Some small lice are found about the head in adults, in the same area as is found the

large head louse of chicks. Occasionally lice are found which seem to spend most of their life cycle on the feathers.

Control of Poultry Lice.—There are several effective means of controlling lice on poultry.

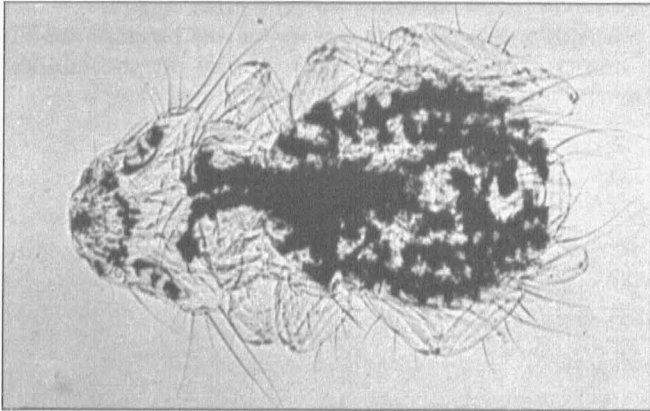


Fig. 14.—This louse (magnified 50 times) is commonly found about the neck and head of poultry. It is very small and greyish white in color. However, this is not the true head louse found on chicks.

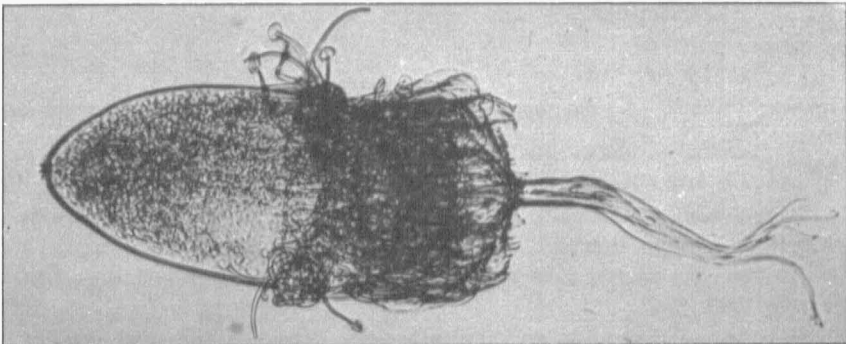


Fig. 15.—A single egg (magnified 160 times) from the cluster shown in Figure 13. From the activity of the hatching louse within the egg, its smooth end (part of egg toward left) is pushed away and the louse emerges.

In warm weather the birds may be dipped, using 1 ounce of sodium fluoride to 1 gallon of water. At other times the dry sodium fluoride powder may be used by placing small amounts around the vent, deep into the feather tracts under the wings, thighs, chests, and back, also along the neck.

Nicotine Sulphate may be painted on the roost poles just before the birds go up on the roosts for the night.

When using either treatment it is advisable that the birds be treated *again in ten days* to destroy the young lice that hatch from the eggs.

The Mites

Several kinds of mites infest poultry and as their habitat and habits are so different each will be discussed separately. These parasites are all very small. The adults have eight legs.

The Red Poultry Mite

This parasite is commonly found in poultry houses (see Figure 2). Modern construction has been very helpful in the control of the red mite.

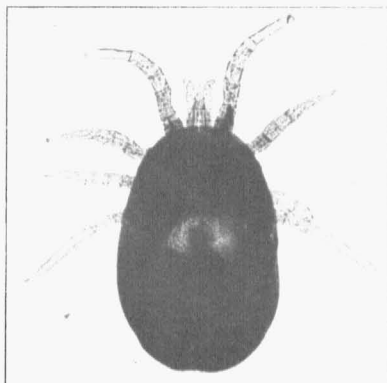


Fig. 16.—Adult Red Mite.—Magnified 38 times.

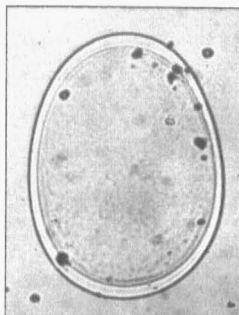


Fig. 17.—Egg of Red Mite.—Magnified 84 times.

Symptoms.—Unless the mites are present in enormous numbers symptoms are not noticed.

Description.—This mite feeds on the birds at night. Before feeding it is greyish in color, but after gorging itself with blood it is quite red. It appears as a tiny moving red or grey speck. (See Figure 16.)

Habitat.—During the day the mites are found in the nest, cracks in boards, particularly cracks in the *roost poles*, or where the roost poles are joined to a support. In their protected places the mites lay very small white rounded eggs. (See Figure 17.) At night the mites leave their shelter to feed upon the birds.

Control.—Kerosene and used crank case oil, equal parts, may be sprayed or “painted” on the suspected areas. A pressure spray pump is much the best as the oil is forced deep into the cracks and crevices. Straw or nest material should be removed and burned. If infestation is extreme it may be best to remove and burn the roost poles and wooden nests. Two treatments at ten-day intervals are recommended for the destruction of these parasites.

The Northern Fowl Mite

The number of parasites illustrated in Figure 18 suggests a rapid life cycle. They spread swiftly throughout the entire flock and are easily carried by the attendant. The Northern fowl mite may be readily introduced into the flock by infested breeding stock. Unfortunately in many instances the parasites are not noticed until they have infested practically all birds in the flock.

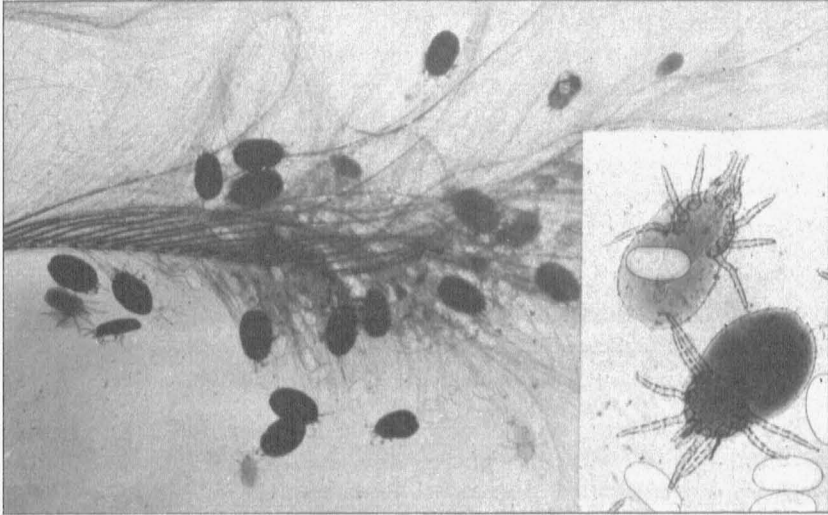


Fig. 18.—Part of a feather showing an immense population of mites. Insert shows adults magnified 160 times. The lighter ovals are their eggs.

Symptoms.—Uneasiness or restlessness, soiled feathers, rather rapid decrease in weight.

Description.—This extremely annoying parasite may cause considerable damage in a very short time. They are greyish to very dark brown or blackish in color. This parasite is extremely active and will readily attack persons handling infested birds.

Habitat.—These mites spend their complete life cycle on the birds. As noted in the illustration above, the eggs are deposited promiscuously throughout the feathers. The eggs hatch in a short time and soon become adult mites.

Control.—Extremely fine sulphur or wettable sulphur is very effective. The sulphur is applied as a powder, putting generous amounts deep down in the feathers around the vent, under the wings, on the thighs, chest, back, neck, and other feathered parts of the body. It is *important* to repeat the treatment in *ten* days. The sulphur is not immediately effective upon contact with the parasites.

The Scaly Leg Mite

Although the parasitized birds are unsightly their general health does not seem to be impaired. This mite is rather deep in the tissues, and the poultryman sees only the results of the parasite.

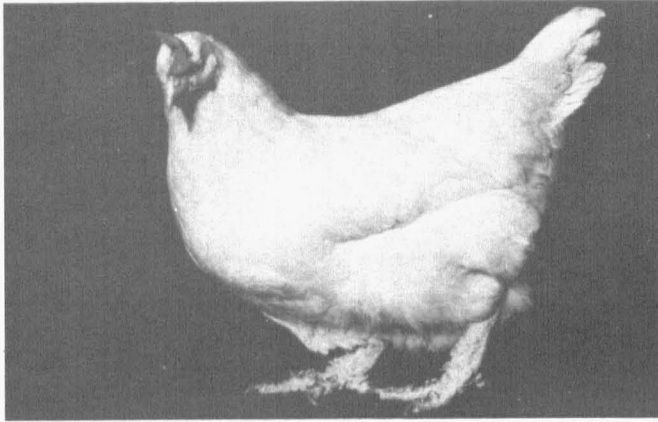


Fig. 19.—The feet and shanks of this bird are rough and misshapen. Some of the scales appear to stand "on end" from the accumulation of cells and detritus under them; other areas are noticed where scales have been lost.

Symptoms.—There are not any generalized symptoms attributed to this parasite. Oftentimes after the shanks and toes have been depleted of scales, thick greyish white masses cover the area. Their removal leaves a raw bleeding surface.

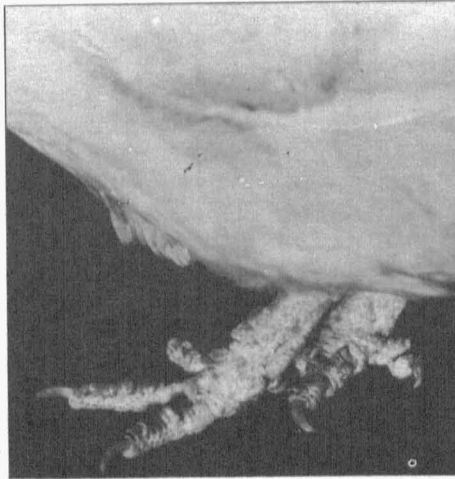


Fig. 20.—Enlargement of the feet and shanks of the bird shown in Figure 19.

Description and Habitat.—The scaly leg mite completes its life cycle in its burrows under the scale covered feet and shanks. It is

very small, quite round, and has very short legs. The eggs may be found in the burrows.



Fig. 21.—Scaly leg mite magnified 80 times.



Fig. 22.—Egg of scaly leg mite magnified 80 times.

Treatment.—The diseased feet and shanks may be immersed in a mixture of kerosene, $\frac{1}{3}$ and $\frac{2}{3}$ oil (crank case, olive, mineral). Since the kerosene, oil mixture is very irritating to feathered parts of the body, care should be taken to confine the mixture to the scaly shanks and feet. A small stiff bristled brush can be used to gently scrub the affected parts.

The Air Sac Mite

This parasite is very small and is peculiarly confined to the air sacs.

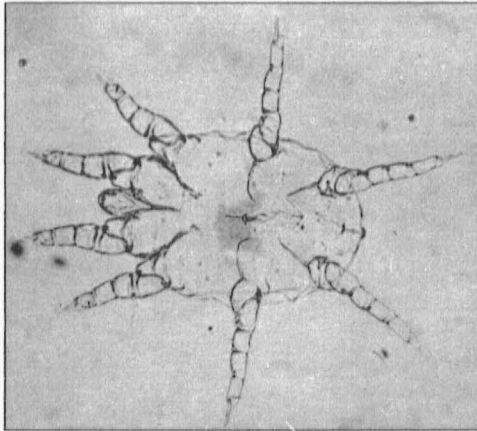


Fig. 23.—(Magnified 40 times.) Singly or in groups these mites appear as small, moving yellow objects on the translucent walls of the air sacs.

Symptoms.—Old birds, particularly bantams, may show characteristic symptoms. The bird seems to be off balance and has a tendency to fall forward.

Treatment.—Complete segregation of old birds from young birds, and general poultry hygiene is necessary. There is no medicinal treatment.

NOTE: All poultry mites are very persistent and more than one treatment of the birds or house is necessary for the eradication of these parasites. At least three treatments at ten day intervals are required.

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The Grass Chigger, Red Bug, or Harvest Mite

Ordinarily the grass chigger is thought to attack only humans. However birds that are not fully feathered are often subjected to the ravages of this parasite.

Symptoms.—Poults are most commonly infested, probably because of their ranging habits. Occasionally growing chickens are infested. During the later hot summer months poults, rarely chickens, are brought to the laboratory for a diagnosis of a peculiar skin condition. The ulcers formed by the chiggers are usually near the keel bone or sternum. They are crater-like in structure and may be quite red in color at their borders. In size they range from a small nodule to craters one-half inch or more in diameter.

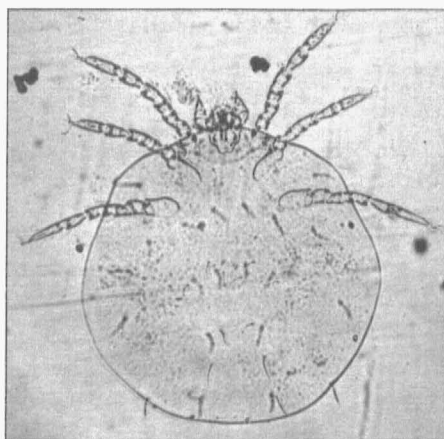


Fig. 24.—Grass Chigger (magnified 40 times).

Description.—This small, very active and extremely annoying parasite is found not only in the woods, but also in closely clipped lawns. It most commonly attacks humans, giving rise to an intense itching at its point of entry into the skin. Chiggers may be seen on the skin as minute, moving red objects.

Treatment.—A heavy paste made by mixing extremely fine sulphur into carbolated vaseline is very effective. The paste is thoroughly rubbed into the irritated areas. Only a few applications are necessary.

The Bedbug

This insect attacks not only humans but is occasionally found inhabiting poultry houses.

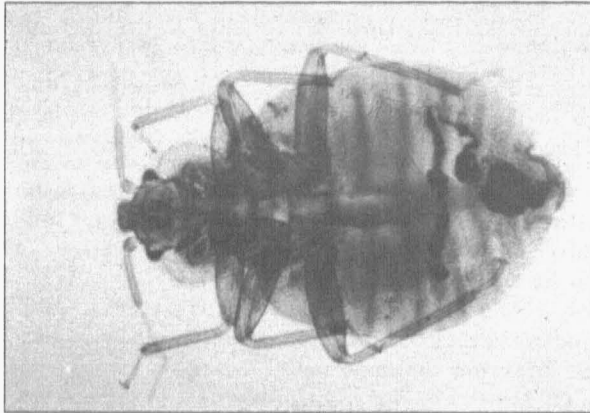


Fig. 25.—The adult bedbug (magnified about 14 times). It is about $\frac{1}{4}$ inch in length. It is extremely flat, which allows it to enter and hide in very narrow cracks and crevices. This photograph was made from a cleared specimen.

Symptoms.—Unless these insects are present in large numbers few symptoms are noticed. However infestation may be such that the birds will become thin, which in part may be caused by loss of blood and restlessness.

Description.—The color, depending upon the age of the parasite and the time of feeding, may vary from gray or light tan to a deep brown, reddish brown, or brownish black. It has piercing mouth parts which enable it to draw blood from its victim. The bedbug ordinarily feeds upon the birds at night and is not found upon the birds in the day. When mashed a pungent stench is noticed which is peculiar to this parasite.

Habitat.—Occasionally bedbugs become firmly established in a laying house. At night they attack the birds and during the day they are found hidden in cracks or in other secluded places in the poultry house. The areas in the immediate vicinity of feeding or hiding may be soiled with the blackish excreta of the bugs. Although the setting hen has been largely replaced by the modern mechanical incubator, it is not unusual to find eggs being hatched by the old method. Setting hens are particularly prone to the ravages of bedbugs. Instinctively the hens' main object is to hatch the eggs; therefore, they are quite reluctant to leave the nest although they are constantly irritated by the blood sucking parasites.

Control.—The eradication of this parasite is very time consuming. Fortunately the bedbug does not stay on the birds during the day-time. Therefore birds can be moved to an uninfested house, and the infested house can be cleaned by several methods. A power spray may be used to drive kerosene into their hiding places such as cracks, holes, etc. It is very necessary to spray the house completely as the bugs may be hiding some distance from where the poultry roosts. Repeated spraying at 7 to 10 day intervals should be continued until there are no parasites remaining. All nests, nesting materials, roost poles, etc., that are of little value should be burned and the house cleaned as thoroughly as possible before spraying with the kerosene to eradicate the parasites.

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