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The Insects and Mites Injurious to Poultry in Nebraska and Their Control

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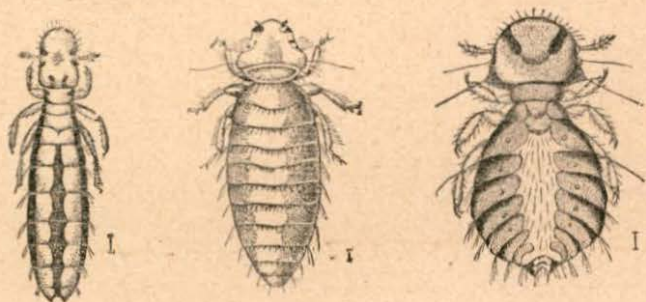


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M. H. SWENK AND F. E. MUSSEHL



Types of chicken lice: The wing louse (*Lipeurus caponis*) at left, x18; the shaft louse (*Menopon gallinae*) in center, x25; and the brown chicken louse (*Goniodes dissimilis*) at right, x12. (From Osborn, 1896, after Denny, 1842.)

AGRICULTURAL EXPERIMENT STATION
THE UNIVERSITY OF NEBRASKA
LINCOLN

W. W. BURR, DIRECTOR

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The Insects and Mites Injurious to Poultry in Nebraska and Their Control

M. H. SWENK AND F. E. MUSSEHL

There are a number of different kinds of insect and mites (arthropods) that are more or less injurious to poultry in Nebraska. Some of these pests are very generally and commonly injurious; others are only locally or seasonally so. Most of the seriously injurious ones are external parasites of the birds, living or feeding on the surface of their bodies, such as the lice, bedbugs, blood-sucking gnats, mites, chiggers, etc. The rose-chaffer and the corn billbugs are exceptions in that the former poisons the poultry that eat them while the latter attack chicks with their bills when the birds attempt to eat them. This circular is designed to give practical information concerning these pests and their control.

POULTRY LICE (MALLOPHAGA)

Among the external parasites of poultry, except for the chicken mite, the several kinds of biting lice are by far the most injurious to the birds, as well as the most troublesome to the poultryman. Their control becomes a consideration of primary importance in profitable poultry production.

Poultry lice are all of the biting sort. They are not fitted for sucking blood, and their food consists of portions of the feathers or skin scales. More than 40 different kinds of biting lice are known to occur on our various domestic fowls, but not all of these are common or injurious enough to have any serious economic importance. In the United States several different kinds of lice are found commonly on chickens, at least 4 different kinds are found on turkeys, 3 or more different kinds occur on pigeons, and several different kinds occur on ducks and geese. Only the more important of these numerous species will be taken up in this circular.

As a rule, chickens and turkeys are more heavily infested with lice, and more injured by them, than are the other kinds of fowls. Fully grown chickens and turkeys may sometimes be heavily infested with lice without showing any obvious ill effects, but usually marked lousiness is accompanied by a distinct decrease in egg yield, while frequently the fowls lose weight and may die by succumbing to one of the common diseases of chickens or even as a direct result of the attack of the lice. Young chicks and poults suffer greatly because of louse attack. Lousy young birds become droopy, lower their wings, ruffle their feathers, and after a few days may die. The lice pass to the young birds shortly after they emerge from the shell, if the eggs are hatched by natural incubation, or at the first contacts with older birds if they are hatched in incubators. Injury to young chickens by lice is especially severe in the case of young birds hatched during the late spring and summer and

brooded by hens. All of these lice remain on their hosts constantly, never leaving them as do the chicken mites. Lice cannot live and reproduce when separated from the body of the fowl.

Probably our commonest poultry louse is the body louse (*Menopon stramineum* Nitzsch),¹ which is found on chickens, turkeys, guinea fowls, peafowls, and rarely on pigeons. It is called the body louse because it has the habit of remaining on the skin of the fowl rather than working among the feathers. It prefers to live on those portions of the skin that are not densely feathered, and when the feathers are parted so as to expose the bare skin of these parts, the lice can be seen running rapidly upon the skin, to hide among the feathers. On chickens these lice sometimes occur on the head and neck, but are more numerous on the breast, back, under the wings, on the thighs, and in the case of old birds they are especially numerous on the region just below the vent. This louse is from 1/25 to 1/16 of an inch long, straw yellow in color, and copiously provided with hairs. Whenever it becomes abundant on the host it produces an irritated, reddened condition of the skin, which may develop scabs and blood clots where the infestation is very heavy. The body louse is to be regarded as the most injurious species on grown chickens, and is also often serious on chicks. These lice deposit their eggs in clusters around the bases of the feathers, usually on the lowest feather barbs along the shaft. They like, especially on old birds, to lay their eggs on the small feathers below the vent, where sometimes there accumulate large masses of eggs, a quarter to a half inch long. On young birds the eggs are laid more commonly on the down or small feathers, or on hairs about the head, neck, and back. The eggs hatch in about 7 days and the young lice have become adult in from 7 to 13 days after hatching. This is a quite rapid rate of increase, and makes it possible for fowls to become heavily infested with the lice very quickly.

The louse known as the shaft louse (*Menopon gallinae* Linnaeus)² resembles the body louse in structure, but it is smaller, paler yellow in color, and more thinly haired. It has habits quite different from those of the body louse, since it does not live so much on the skin of the host but more along the shafts of the feathers. When the feathers of the chickens or turkeys are parted, especially along the breast or thighs, the shaft lice can be seen running toward the body along the shafts of the feathers, sometimes several of them, one behind another along a feather shaft. This louse is as common on chickens as is the body louse, if not more so, but it is of much less economic importance because of its habit of living on the feather shafts most of the time and feeding almost exclusively on the barbs of the feathers and the scales along the shaft. Young chickens, because of the insufficient development of feathers, do not harbor this louse. It occurs on guinea fowls, and even on ducks if they are closely associated with chickens. It lays its eggs

¹ *Menopon biserialatum* Piaget.

² *Menopon pallidum* Nitzsch and *M. trigonocephalum* Olfers.

singly at the base of the feathers, hidden between the main shaft and aftershaft of the feather. The eggs hatch more slowly and the young lice grow more slowly than is the case with the body louse, and the louse itself lives longer as an individual than does the body louse, especially when separated from the host.

On young chickens, by far the most injurious louse is the chicken head louse (*Lipeurus heterographus* Nitzsch). This louse is of slender form, about 1/10 of an inch long, and of a dark grayish color. It is usually to be found, on both young and old chickens, close to the skin of the head, or sometimes of the neck, with its head touching the skin and its body extending up into the down or among the small feathers. Especially does it like to locate around the ears of chicks, or beneath the beak, or on the top and back of the head. After the young chicks get well feathered, the head lice become less abundant and injurious, but do not disappear. Some remain on the old chickens and pass readily from the hen to the chicks. The head louse lays its eggs singly on the down or small feathers about the head. These eggs hatch in 4 or 5 days, and after 17 to 20 days of growth the young become adult. The poultrymen must give especial care to the control of this species.

The chicken wing louse (*Lipeurus caponis* Linnaeus)³ resembles the chicken head louse very closely, but is even more slender in form and darker in color. Like the shaft louse it occurs among the feathers, and not on the skin, of the chicken, and is called the chicken wing louse because it is the only species of louse that is found commonly on the large wing feathers of the chickens. It is also sometimes found on the tail feathers and the long feathers of the neck and back. These lice are found most easily on the wing feathers of white chickens. They are sluggish and do not run when disturbed, but lie quietly along the shafts of the wing feathers. They lay their eggs between the barbules of the wing feathers, and undergo all of their development there.

At least 3 other kinds of lice are found more or less commonly on chickens in this country. These are the large chicken louse (*Goniocotes gigas* Taschenberg),⁴ the chicken fluff louse (*Goniocotes hologaster* Nitzsch), and the brown chicken louse (*Goniodes dissimilis* Nitzsch). The large chicken louse is a gray species about 1/8 of an inch long that is found only among the feathers of different parts of the body of the chicken. It is active, but usually not very numerous. The chicken fluff louse is more numerous, and, as the name indicates, is found on the fluff of the feathers, and is most abundant where the feathers are fluffiest. It is not a very active species, and is very small in size, only about 1/25 of an inch long, and of a whitish color. The brown chicken louse is nearly as large as the large chicken louse, but its color is brown. It is found on the feathers of the body. These species are of but little economic importance.

³ *Lipeurus variabilis* Nitzsch.

⁴ *Goniocotes abdominalis* Piaget.

In addition to the body louse and the shaft louse, which are primarily chicken lice, turkeys are infested with two kinds of biting lice of which they are the native host. These are the large turkey louse (*Goniodes stylifer* Nitzsch) and the slender turkey louse (*Lipeurus gallipavonis* Geoffroy).⁵ Of the two, the large turkey louse is the more abundant, and it occurs on the feathers of various parts of the body, especially of the neck and breast. The slender turkey louse resembles the chicken head louse, but is larger and paler in color. These lice are most injurious to young turkeys.

The guinea fowl is infested with the common body louse of chickens, and in addition may also harbor others of the common species affecting chickens. Pigeons are sometimes quite seriously affected by lice. The commonest and most troublesome of these is the slender pigeon louse (*Esthiopterum columbae* Linnaeus),⁶ which sometimes occurs in great numbers and attacks both the old pigeons and the partially feathered squabs. There are two other species of lice attacking pigeons, known as the broad pigeon lice (*Goniocotes bidentatus* Scopoli⁷ and *G. damicornis* Nitzsch), the former of which is found quite frequently in annoying numbers on these birds. Ducks and geese are attacked by several kinds of lice, and when they are present in great numbers they sometimes cause some injury. However, lousiness of these water birds is usually not nearly so serious a matter as in the case of the land fowls. A very common louse of these water birds is the little red louse (*Philopterus dentatus* Scopoli).⁸ The slender duck louse (*Esthiopterum crassicornis* Scopoli)⁹ is found on both domestic and wild ducks, as are also two or more related species. These slender duck lice are found on the wing feathers, especially about the bases of the large feathers. Young ducks that have been hatched by hens are sometimes much annoyed by the chicken head louse, which attacks them in the same way that it does young chickens.

CONTROL MEASURES AGAINST LICE MERCURIAL OR BLUE OINTMENT

Certain stomach poisons are very effective in combating these parasites. At the University Poultry Farm the use of a blue ointment¹⁰ that is 33 1/3 per cent mercury has proved very effective on mature birds. A lump of blue ointment about the size of a pea should be rubbed on the skin just below the vent. It is believed that the lice go to the vent

⁵ *Lipeurus polytrapezius* Nitzsch.

⁶ *Lipeurus baculus* Nitzsch.

⁷ *Goniocotes compar* Nitzsch.

⁸ *Docophorus icterodes* Nitzsch.

⁹ *Lipeurus squavidus* Nitzsch and *L. constrictus* Kellogg.

¹⁰ The U. S. Dispensatory, 20th edition, gives the following formula for preparing blue (or mercurial) ointment: "Mercury, 500 grams or 17 ounces avoirdupois; Oleate of mercury, 20 grams; Prepared suet, 230 grams; Benzoinated lard, 250 grams, to make 1000 grams. Triturate the oleate of mercury in a warm mortar with the mercury added gradually, and when the globules are completely divided and distributed, set it aside for about 15 minutes. Melt the lard and suet, allow the mixture to partially cool, add about 25 grams of it to the mercurial mixture, and continue the trituration until globules of mercury are no longer visible under a lense magnifying ten diameters. Then add the remainder of the lard and suet and mix thoroughly."

quite regularly for moisture. As they make their pilgrimage they obtain some of the mercury in the blue ointment, which acts as a positive poison.

Blue ointment has a number of advantages not possessed by other louse control agents. First, it is easy to apply and things which are easy are usually done more regularly than are the jobs which are more difficult. Experience at the University Poultry Farm has been that two treatments per year, one in the fall and the other in the spring, will very effectively control body lice. Two men with a simple catching coop can catch and grease 100 hens in 45 minutes. If the greasing is done at night when the hens are on the roost it can be done in even less time.

About 1 pound of blue ointment will treat 300 hens, so that the cost of material should average about one-third of a cent per bird. The ointment clings persistently to the feathers and skin, so that it is available for poisoning the young lice which may hatch from eggs present at the time the birds were greased. It should be remembered that blue ointment is very poisonous in its nature, and consequently should be handled with caution.

SODIUM FLUORIDE

Another poison which has been found to be very effective for the control of lice is sodium fluoride. This chemical is the sodium salt of fluorine, just as common table salt is the sodium salt of chlorine. It is found on the market in two forms, one known as chemically pure sodium fluoride and the other as commercial sodium fluoride. The chemically pure article consists of small lumpy crystals, while the commercial article is a fine dry powder that is 90 to 98 per cent sodium fluoride. It is this latter grade that should be used, since the chemical can be used to much greater advantage in the dust form, and furthermore is cheaper in that form. Sodium fluoride can now be obtained at most drug stores, and usually sells at from about 40 to 60 cents a pound. The material does not deteriorate quickly. It should be kept in tight cans or bottles in a dry place, and in this condition it will retain its qualities indefinitely. A pound of sodium fluoride will treat from 100 to 300 chickens, according to their size and the method of application used.

Sodium fluoride may be used in either of two ways, as a dust or in solution as a dip. When used as a dust the action is slower and more material is required, and the results are not always so dependably thoro as when used as a dip. Dipping is also more rapid and easier for the operator in the majority of cases. This method is of course only practical during the spring and summer months or when temperatures average above 75 degrees Fahrenheit.

"DIPPING METHOD" OF USING SODIUM FLUORIDE

When sodium fluoride is used by the dipping method a solution is made by dissolving one ounce of commercial sodium fluoride (or two-thirds of an ounce of the chemically pure article) in each gallon of water. The chemical is readily dissolved by stirring in tepid water. If two persons are to assist at the dipping, it is advisable to use a large wash-tub or similar container. The tub should be filled to within 6 or 8 inches of the top with the solution, and as the amount is lowered thru dipping the birds, water with the proper proportion of sodium fluoride dissolved should be added from time to time. In dipping the fowls it is best to hold the wings over the back with the left hand, and quickly submerge the fowl in the solution, leaving the head out while the feathers are thoroly ruffled with the other hand so as to allow the solution to penetrate to the skin on different parts of the bird. The head is then ducked once or twice. The bird is lifted out of the bath and allowed to drain a few seconds before being released. Keeping the fowl under water for about 20 to 30 seconds and the head only an instant is sufficient.

The dipping should be done early on a bright still day, so that the fowls will be thoroly dried before going to roost. When used as a dip, sodium fluoride acts much more quickly than when used as a dust, the lice all being dead within a few hours of the application, but the final effect is the same whether the material is used as a dip or a dust, in that the lice are all killed. The dipping method is a little more economical of materials than is the dusting method, which will be described later. The rapidity of the treatment and convenience of the operation for the operator are fully as good in the dipping as in the pinch method.

"PINCH METHOD" OF USING SODIUM FLUORIDE

When applied as a powder, probably the best method of using sodium fluoride is by what is known as the pinch method. This method is economical in both the time of the operator and the material used. The bird to be treated is placed on a table in a flat open pan and is held by the legs or wings with one hand, while with the other hand a small pinch of the chemical, as much as can be held between the thumb and first finger, is placed among the feathers next to the skin about as follows: one pinch on the head, one on the neck, one on the back, one on the breast, one on the fluff feathers below the vent, and one on the underside of each wing when spread. Each pinch can be distributed somewhat by pushing the thumb and fingers among the feathers as the material is released. The sodium fluoride is kept in an open can within convenient reach of the operator. From time to time the powder that collects in the flat open pan is returned to the container and thus is saved.

In applying sodium fluoride in a dust form, if the powder reaches the body of the operator and is allowed to remain there for several hours, as may be the case when a large number of birds are being treated,

local irritation and burning may be set up on the tender portions of the skin. This is especially true when the fowls are held between the knees when being dusted or where the hands are tender. Trouble of this sort can be avoided by dusting the birds on a table or box, and, if necessary, by wearing rubber gloves while doing the work. The idea of applying the dust to the birds with a dusting machine or revolving barrel is worthless, and may even kill many fowls because of the irritation to the respiratory system. The action of sodium fluoride when applied in dust form is comparatively slow and it will be 3 or 4 days before all of the lice will have disappeared.

The dipping and the pinch methods are of equal value from the standpoint of final efficiency. With the dipping method the amount of material needed to treat 100 hens is about one-third of a pound, and from 200 to 300 birds can be treated by two men in an hour. When the pinch method is used, about one pounds of the chemical is needed for 100 hens, and the time requirement is also slightly greater.

TREATMENT OF CHICKS

The increasing use of incubators and brooders for chick rearing means that little difficulty is experienced with lice until the birds are nearly mature, if ordinary precautions are taken. If natural hatching is used, the hen should be treated with sodium fluoride or blue ointment at the time she is set so that the parasites will be eliminated before the chicks appear. There is no injury to the eggs, provided the setting hen is properly treated. If by chance chicks have become infested with body lice they can be treated after they are 10 days old with sodium fluoride which has been diluted with about 3 additional parts of flour.

The poultryman starting in business with clean premises should see to it that his fowls are free of lice, and should keep them so. Once freed from lice there is no reason why the fowls should not be kept clean if all of the chickens, old and young, are treated immediately before they are put into the poultry houses. The best time to undertake a general clean-up of the flock is in the late summer or early fall. If the clean-up is neglected at that time, it will be very necessary to treat the birds before brooding time in the spring.

TREATMENT OF PIGEONS

Lousy pigeons can be treated by either the dusting or the dipping method. If the dust method is used, about 5 pinches should be applied to each pigeon. For complete eradication, however, the pigeon should be dipped. Owing to their close feathering, where pigeons are being dipped it is necessary to add an ounce of soap, or slightly less, to each gallon of dip in order to increase its penetration. A thoro dipping of the pigeons, including the squabs, the feathers being ruffled while the birds are under the water, will get rid of all the lice.

BEDBUGS

In addition to being a house-infesting parasite of man, the common bedbug is also frequently a pest in poultry houses. Infestations of

poultry houses by bedbugs are apparently a common thing in Nebraska. We have had complaints of such infestations from Cedar, Burt, and Pawnee counties west to Boyd and Kearney counties, and no doubt they occur under favorable circumstances over the entire state, since the bedbug occurs thruout Nebraska. The poultry house seems to afford ideal quarters for the bugs, which frequently attack the chickens and suck their blood. If the bugs are present in sufficient numbers in the poultry house, so that their attacks are many and often repeated, it will result in a loss of flesh by the birds and a reduction in their egg production. Setting hens attacked by these pests may be forced to abandon their nests, in which case the surface of the eggs will likely have small black spots, formed by the excrement of the bugs. Cases are on record of fatalities to chickens having been induced by exposure to excessive attacks of bedbugs.

As is well known, bedbugs are nocturnal in their activity and feeding. At night they come out from their daytime hiding places in the poultry house—from the cracks and crevices of the floor, walls and ceiling, from back of the roost ends and in the nests, and from other sheltered places. At such times they crawl freely about in search of food, and may even spread to other buildings. They are easily carried from place to place on the clothing of people. During the spring and summer months the females deposit their large, yellowish white eggs in protected places in the poultry house. Each female may deposit anywhere from 75 to 200, or even more, eggs. The eggs hatch in 5 to 12 days, usually in about a week, and ordinarily the young bugs develop to maturity in from 6 to 10 weeks, tho sometimes if food is scarce they may require nearly a year for their full development. Bedbugs can easily live for a month or more without food or moisture.

Altho as a rule bedbugs are most troublesome in old poultry houses, that is not necessarily true. One of our correspondents reports that a chicken house that was built during the winter from new lumber, and kept free from mites during the succeeding summer, was swarming with bedbugs by fall. She thinks that the infestation came from bugs that were present on the lumber from which the house was built.

There are other species of bedbugs, in addition to the common bedbug (*Cimex lectularius* Linnaeus), that are known to attack poultry. These include not only the Mexican chicken bug (*Haematosiphon inodorus* Duges), which occurs in the southwestern United States south to central Mexico, but also the swallow bedbug (*Oeciacus vicarius* Horvath), which normally occurs in the nests of the barn swallow. We have not found this latter species in poultry houses in Nebraska, tho it occurs in the state. Other species of bedbugs that occur in Nebraska, but that have not been found attacking chickens, are the chimney-swift bedbug (*Cimexopsis nictalis* List), which we have found occurring in occupied houses in this state,¹¹ the rock-swift bedbug (*Synxenoderus comosus*

¹¹ See List, Proceedings of the Biological Society of Washington, xxxviii, pp. 107-108.

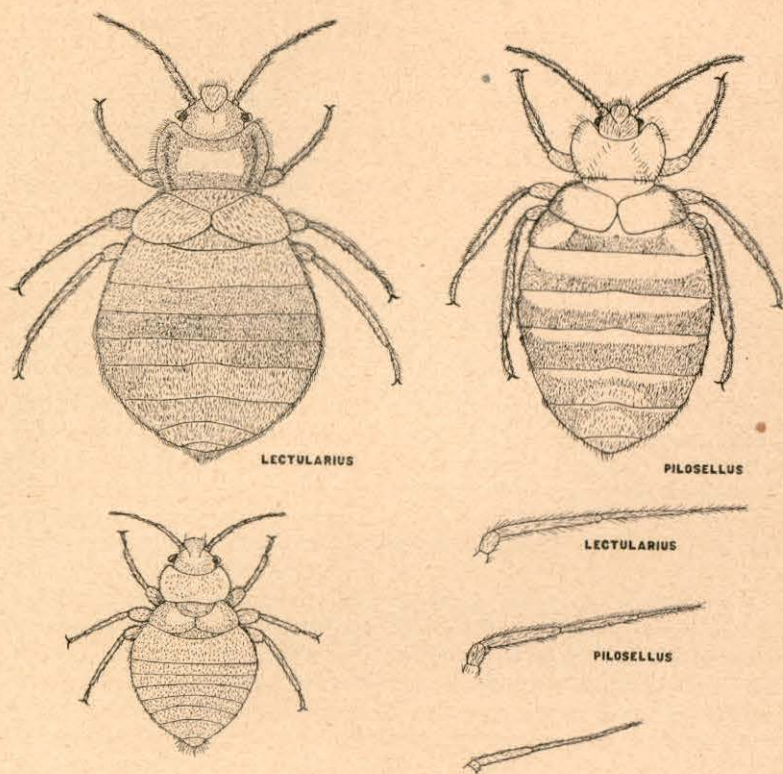


FIG. 1.—Types of Nebraska bedbugs: The common bedbug (*Cimex lectularius*), upper left, x8; the American bat-bug (*Cimex pilosellus*), upper right, x7.5; the chimney-swift bedbug (*Cimexopsis nictalis*), lower left, x9; and their antennae, lower right, about x20. (Original.)

List), and the American bat-bug (*Cimex pilosellus* Horvath), which normally occur, respectively, in the nests of the chimney swift and white-throated rock swift and on various species of bats. We have taken the latter species here in Nebraska on the silver-haired bat.

The two principal methods of eradicating bedbugs in the poultry house are by fumigation and spraying. But before either of these methods is used, all loose boards and unnecessary boxes, and all straw or other litter present in the poultry house should be removed and burned. This will help greatly in permitting the gas or spray to reach the bugs and their eggs in the concealed places in which they occur.

Bedbugs can hide themselves so easily and securely in the very narrow cracks and crevices of the poultry house that they are relatively safe against any but the more penetrating gases and sprays. Among the fumigants, probably hydrocyanic acid gas is the most effective, but we do not recommend it for general use because of the danger involved in applying this deadly gas. Ordinarily, hydrocyanic

acid gas fumigation is properly a matter for the experienced or professional fumigator. The next best fumigant is sulphur. While some of our correspondents have reported poor results from the use of sulphur fumes, the method is ordinarily effective if the fumes are strong enough and are closely confined in the chicken house for a sufficient length of time. After removing the poultry and making the house as tight as possible, sulphur should be burned at the rate of 1 pound to each 250 cubic feet of air space in the poultry house. The sulphur may be burned in a shallow iron pan, pot, or skillet, which is best placed on bricks in a tub, in which water is added up to the level of the tops of the bricks. This is to prevent the burning sulphur running out and setting fire to the chicken house. The sulphur may be ignited by pouring a little wood alcohol over it and lighting it with a match. After the sulphur is burning well, the chicken house doors should be tightly closed and the fumes kept in for 24 hours. The doors and windows should then be opened and the poultry house thoroly ventilated before the birds return to it. Sulphur fumigation has the advantage of being safe to the operator, and reasonably effective in killing the bugs and their eggs if the job is well done. Metal objects in the chicken house can be protected from corrosion if they are coated with vaseline before the fumigation.

Sprays of any sort must come thoroly into contact with the bedbugs or their eggs to kill them. They will not kill the bugs hiding too deeply in cracks. When the poultry house is sprayed with coal tar creosote oil or carbolineum, to get rid of mites, as is explained farther on, the bedbugs that are reached by these sprays are killed. However, where a spray is applied especially for bedbugs, a lighter spray that is more penetrating and will not discolor the inside of the chicken house is preferable. A mixture of 2 parts of kerosene and 1 of gasoline, thoroly applied with a spray pump, usually proves to be a very satisfactory remedy, tho of course in its use the fire hazard must be fully taken into account. Usually more than one application is necessary. Some of our correspondents report that after spraying the chicken house with kerosene or gasoline they afterward found a good many bugs crawling out from the cracks. These were the bugs that were not reached by the one application. If additional applications are made the poultry house will be rid of the pests. Another effective spray is kerosene emulsion. This is made by dissolving 1 pound of soap in 1 gallon of boiling water, taking from the fire, and while still warm adding 2 gallons of kerosene and then emulsifying the kerosene in the soapsuds by agitation. A good way to do this is to run the mixture back upon itself thru a spray pump by directing the spray back into the tank. In 5 or 10 minutes of such agitation the emulsion becomes a creamy mass. Then add 17 gallons of water to make about 20 gallons of spray, and thoroly spray the whole inside of the poultry house with it, being careful to get it into all of the hiding places of the bugs. Other light-

colored spray applications that are of value against bedbugs are crude oil, linseed oil, and a mixture of equal parts of cottonseed oil and turpentine. All of these will kill all of the bugs with which they come in contact and some of their eggs, but it will probably require more than one application of any of them to do the job thoroly.

BLOOD-SUCKING GNATS

Poultrymen living near streams are sometimes troubled, during May and June, by swarms of tiny, dark-blue, blood-sucking flies or gnats, varying from 1/16 to 1/8 of an inch in length, that attack the chickens, sucking blood from them and producing wounds from which blood continues to ooze. They attack especially the combs and wattles, and under the wings. Young chickens are sometimes killed, and old chickens may be driven away from where they occur. The following two extracts from correspondents illustrate this sort of injury:

"I am sending you enclosed some insects which a farmer has just brought in, saying that they were very numerous at his place, which is close to the Blue River, and were destroying young chickens. He also states that mature fowls will not stay out in the open where these are." (York County, May 10.) "I am sending enclosed a few specimens of a small fly that has been creating considerable excitement along the Elkhorn River. This fly is causing some loss of small chickens. I examined some of these chickens today and found red blotchy marks over various portions of the body where they had been bitten. While I stood near the house there seemed to be great swarms of these flies going by. This particular place is less than 100 yards from the Elkhorn River. Is this their breeding place, and can anything be done in the way of control?" (Madison County, May 25.)

These and similar complaints proved to relate to the common turkey gnat (*Simulium meridionale* Riley) and a closely related species known to entomologists as *Simulium johannseni* Hart. Both of these species develop abundantly in water, like mosquitoes, in the rivers and small streams and their branches. The flies, which are abroad during April and May, deposit their eggs near the water, either on objects in the water or at the water margin. The larvae that hatch from these eggs attach themselves to submerged vegetation, usually dead leaves, or other objects in the water, and feed upon the tiny life that they can find floating by. When fully grown, in latter March and early April, they form cocoons near the bottom of the stream, later giving forth the flies. There is but one generation in a year. Another species, *Simulium vittatum* Zetterstedt, which we have found commonly in both eastern and western Nebraska, has 2 generations a year, one in the spring and the other in late summer and fall, but these have not been identified with attacks on poultry. *Simulium venustum* Say also occurs in this state.

It is difficult and expensive to try to control these tiny, blood-sucking gnats. Sometimes oiling the breeding places with a film of kerosene does considerable good, but the method is not so dependably effective against these gnats as it is against mosquitoes. Keeping the streams in which the insects are breeding as free as possible from old logs or other debris is also a help, as it lessens the opportunities for egg-laying and larval development. Often moving the birds farther away from the water gives relief. Fortunately, these pests are troublesome for only a short time in the spring, usually in May, and in only a few localities in the state.

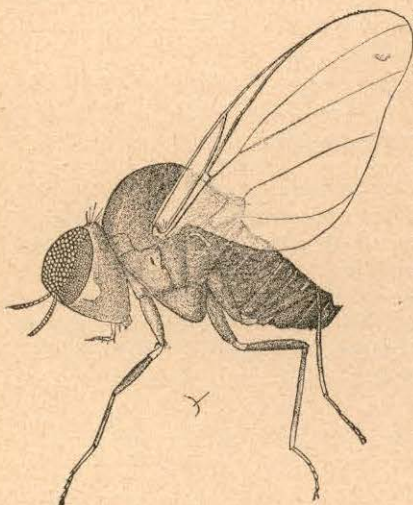


FIG. 2.—The common turkey gnat (*Simulium meridionale*), male, about x20. (From Riley, 1886.)

THE ROSE-CHAFER

Every year in late May or early June, at about the time of the blossoming of the rose, swarms of long-legged, grayish-brown beetles, about one-third of an inch long, appear in our west-central counties, especially in the sandhill region, coming in from the sandy lands to the cultivated valleys where they do their utmost to devour everything green. These beetles, properly called the rose-chaffer but known usually as "June-beetles" or "rose-bugs," continue their depredations for from 4 to 5 weeks, disappearing all at once with the last wild rose blossoms, and are then seen no more until the next year. In some years they are worse than in other years. They were especially obnoxious during the years 1906 to 1909, 1921, and 1924 to 1928. While the rose-chaffer occurs over the whole of Nebraska, the lack of extensive sandy areas in the more eastern and southern counties restricts it in the item of suitable breeding ground, and it is consequently not very abundant in those parts of the state. But in an area included by Cherry, Keyapaha, Holt, Antelope, Greeley, Valley, Custer, Lincoln, Keith, Arthur, and Grant Counties, involving 21 of our sandhill counties, where it has a continuous breeding ground approximately $\frac{1}{5}$ of the area of the state, it is one of the worst insect pests to be contended with. It is also frequently troublesome in parts of Kearney, Hall, and Adams Counties, and in some seasons east even to Stanton County.

The rose-chaffer (*Macrodactylus subspinosus* Fabricius) is a native insect, afflicting to a greater or less degree the entire northern United States east of the Rocky mountains. It is but single brooded annually, and is most common in light, sandy soils, the vast sandhill region of our state forming an ideal breeding-ground for this insect. When the

beetles appear they begin feeding and pairing at once. Each female lays 2 or 3 dozen eggs before she dies. They are deposited singly at a depth of a quarter-inch to 4 inches below the surface of the ground, and, after a period of 2 or 3 weeks, hatch into larvae which feed upon the grass roots within reach. By fall they have become full-grown grubs, and, before the advent of winter, work down into the earth for several inches, beyond reach of the frost, constructing a small cell in the earth within which they pass the cold season. With the warmth of spring they work upward again, and in late April and early May pupate at a depth of an inch or so. In three weeks or a month the adult beetles are developed. They then emerge from the ground and spend about 3 weeks devouring all the vegetation they can and laying eggs for the next generation. By preference the rose-chaffer attacks roses, grapes, and fruit trees, stripping them of their blossoms, leaves, and young fruits, but the insect also attacks cane fruits, strawberries, currants, and nearly all kinds of garden truck, field crops, and cultivated flowers. In fact the insect is a practically omnivorous feeder, and the soft parts of most available plants are eaten.

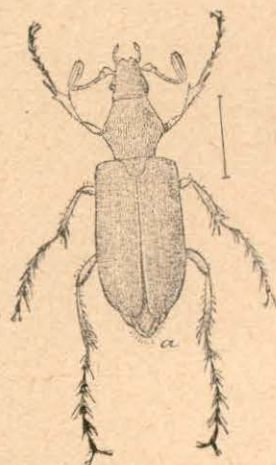


FIG. 3.—The rose-chaffer: adult beetle, about $\times 5$. (Rearranged after Riley, 1890.)

The importance of the rose-chaffer in this circular, however, is due to the fact that these beetles are eaten by poultry, and that they have in their bodies a poison that affects the nervous system of the birds and often causes a heavy death loss. Altho chickens less than 10 weeks old are most susceptible, older chickens will sometimes succumb to this poison. As the chicks grow older it takes an increasingly larger number of the beetles to kill them. Old hens are not killed. When allowed to feed upon rose-chafers in quantity, after 4 or 5 hours chickens will droop their wings, close their eyes, become increasingly drowsy, lose their ability to stand up, and finally die within 5 to 24 hours after having eaten the insects, sometimes in convulsions, or else, if they survive 24 hours, they will gradually lose the symptoms mentioned and in several

days become normal again. Poult, ducklings, and goslings are also frequently killed by eating rose-chafers. The losses seem to be increasing the last few years. The following letter from a Custer County correspondent is typical of complaints of poultry losses because of rose-chafers in recent years:

"I am sending you some specimens of a bug commonly called the 'rose-bug.' They come at this time of the year [June 27] fully grown and millions of them. We have tried numerous sprays but nothing

seems to affect them. The bugs kill hundreds of chicks, turkeys, geese, and ducks in this locality during each year that they make their run. I am leader of the 4-H poultry club of this community and hope to help in saving some of the chicks from these pests. Two of the club boys had a flock of 80 turkeys, weighing one pound each and have lost over half of them. They tried penning them in movable pens, but as these bugs fly and crawl they still drop to the turkeys. I have watched baby chicks die from these bugs and it takes only a few hours for a lively healthy chick to go. It acts just like a poison."

The fact that the stay of the rose-chaffer is limited to a few weeks, the beetles rarely appearing before May 20 and rarely surviving in numbers beyond the first week in July, is about the only consoling feature in its life history. In years and localities where the rose-chafers are present in great abundance it is not possible to protect poultry completely. The loss can be greatly reduced in such years, however, by mowing a piece of ground about May 20, or otherwise securing ground free from plants attractive to rose-chafers, and penning the birds so that they will run only on such ground, and be kept away from the plants that are very attractive to the pests, until early in July. If the birds can be got thru this danger period, they can then be allowed to forage freely without further risk. At the same time, the plants that attract the rose-chafers should be sprayed with arsenate of lead at the rate of 3 pounds of the powder to 50 gallons of water (except on peach, where half this strength should be used), with a gallon of black strap or other cheap molasses added. Tho not entirely satisfactory, this is the best spray that is known for these beetles.

CORN BILLBUGS

There are a number of species of medium-sized to large, dull-colored snout beetles, usually known as corn billbugs but also sometimes called "elephant bugs" or "curlew bugs," that are frequently injurious in the cornfield by thrusting the proboscis or bill into the lower part of the stem of the young plants and eating out a cavity within, so that when the leaves of the closely rolled corn "bud" later expand they show numerous transverse rows of holes. Sometimes this injury is so severe as to result in the killing or serious stunting of the young corn plants. These billbugs chiefly frequent low or swampy lands, where their larvae or grubs develop in the bulbous roots of sedges and grasses. They are most active and injurious to corn in late May and June.

Chickens and turkeys, especially chicks and poults, readily undertake to eat billbugs, but in so doing they sometimes encounter difficulties; for when the billbug is picked up it frequently will save itself by locking its legs about the beak of the bird and clinging there so tightly that the bird cannot get rid of it, and sometimes cannot even open its mouth. The situation may develop into a prolonged struggle in which the insect may be the victor. When a chick partially swallows one of the billbugs, the latter sometimes may attach itself by its bill to the tongue or throat of the bird in such a way as to lodge there and choke it.

Our correspondence develops evidence that these billbugs are seriously open to suspicion as occasionally killing young chickens. A Harlan County correspondent, writing under date of June 26 and sending a specimen, says: "A neighbor has brought me this bug. He says that he saw it fasten its bill into a young chicken just above the bill and below the eye, and that the chick could not scratch it off. Another chick came up and grabbed the bug while it was fastened to the first chicken, when both chicks pulled and pulled until the one with the bug fastened to it fell over dead. We found another bug of the same kind. My neighbor is losing young chickens and wants to know if these bugs kill chicks." Another correspondent, from Nemaha County, writes on June 15 as follows: "My little chicks die regardless of the remedies I give them for blindness. Just recently I discovered a bug clinging to the mouth or side of the bill near the eye, with the bill of the bug fastened securely into the chicken near the eye. I am sending you this bug and would like to know what it is and if it is the cause of the chickens becoming blind." Still another case, reported by a veterinarian at Clay Center, Clay County, on June 21, is the following: "I am sending you, under separate cover, a bug for identification. The history is that a number of chicks 3 or 4 weeks old were found dead, one each morning, with a small blood spot on the inferior part of the neck, posterior to the beak. This bug was finally caught in the act, and was detached with the use of considerable force with a pair of pliers."

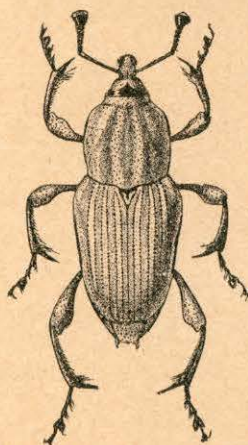


FIG. 4. — The clay-colored corn billbug (*Calendra aequalis*). about x2. (From Webster, 1889.)

We have in Nebraska at least 21 distinct species of these corn billbugs (*Calendra*),¹² and possibly several of the larger ones of these may be concerned in attacks upon chicks when the latter attempt to eat them. The species actually concerned in the three reports above quoted were the clay-colored corn billbug (*Calendra aequalis* Gyllenhal) and the robust corn billbug (*Calendra robusta* Horn). The first mentioned of these two species has been previously reported (Forbes, 1902) as making similar attacks on young chickens in Illinois, while the species known as the Southern corn billbug or "curlew bug" (*Calendra callosa* Olivier) has been recorded as attacking chickens in North Carolina (Metcalf, 1917). The accompanying illustration is that of the clay-colored corn billbug, the species that is apparently most prone and most able to do serious injury to chicks.

From the standpoint of avoiding injury to corn, the cultural remedies for corn billbugs are crop rotation, fall plowing, clean cultivation, planting of crops immune to billbug injury, and better drainage of low, wet fields. As to the protection of poultry, if such is necessary, probably

¹² These are *Calendra aequalis*, *callosa*, *cariosa*, *cicatistriata*, *costipennis*, *cultellata*, *destructor*, *distichlidis*, *germari*, *melanocephala*, *minima*, *multilineata*, *parvula*, *pertinax*, *robusta*, *robustior*, *sayi*, *scoparia*, *venata*, *vomerina*, and *zeae*. (Det. A. F. Satterthwait.)

this could best be accomplished by temporarily keeping chicks and poults in the yard during June to prevent their running in cornfields or other lands that are badly infested with billbugs.

CHICKEN MITES

Chicken mites are even more troublesome and injurious to poultry than are lice, unless they are kept under control. Chicken raisers are usually familiar with these tiny red or gray creatures that infest the chicken houses. Most chicken houses in this country are, or have been, more or less infested with these pests. This parasite attacks chiefly chickens, hence the name, but it also attacks turkeys. It punctures the skin and sucks the blood of the fowl thru its sharp, conical beak. The pests are most troublesome during the summer, especially during July and August.

The adult chicken mite (*Dermanyssus gallinae* Redi) is a tiny creature, measuring about 1/25 of an inch in length and easily visible to the unaided eye. Before engorging with blood they are all of a grayish color, but at the first opportunity the female mites suck themselves full of blood, and are then of a reddish color and of distinctly plumper form. Within about 12 hours after engorgement, or within about 26 hours after becoming adult, the female mites begin depositing eggs. The average rate of egg deposition is about 4 eggs a day. The mite egg is a small object, measuring about 1/75 inch long by 1/100 inch wide, and is oval, smooth, and an iridescent pearly white in color. The adult female mite deposits eggs after each engorgement.

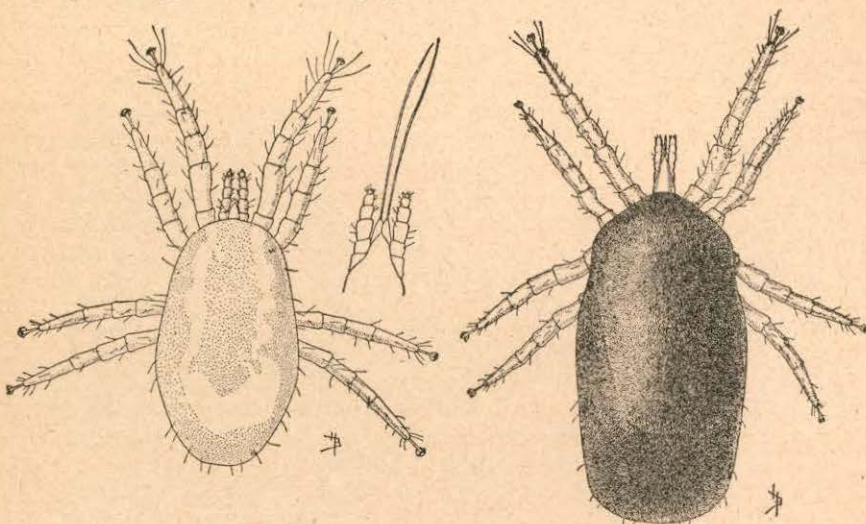


FIG. 5.—Female chicken mite (*Dermanyssus gallinae*), before (left) and after (right) engorging, x50; mouth parts, greatly magnified, at center. (From Bishopp and Wood, 1917.)

The egg hatches in about 48 hours, at our summer temperatures. The mite larva is about the size of the egg from which it hatched, white, and has only 6 legs. It is slow in its movements, and does not feed at all. About 24 hours after hatching, at summer temperatures, the larva molts and changes into the first-stage nymph. This nymph has the 8 legs usual with mites, is brownish white in color, and, after a few hours of resting, becomes quite active. It then seeks out a chicken at night, and draws itself full of blood by means of its long, piercing mouth parts. When thus fully engorged it becomes bright red in color. After a period of about 36 hours, at summer temperatures, the first-stage nymph, which then measures about 1/50 inch long by 1/100 inch wide, molts and changes into the second-stage nymph. Following a few hours of resting, the mites in this stage again seek the host, and engorgement takes place a second time. After this feeding the mite measures about 1/26 inch long by 1/11 inch wide. Usually in about 48 hours the second-stage nymphs change directly into the adult mite, but sometimes there is a third nymphal stage and molt before the adult stage is reached, in which case development takes longer. The entire life cycle can thus be passed in a minimum of about 8 days at summer temperatures (egg 2 days + larva 1 day + first-stage nymph 1½ days + second-stage nymph 2 days + adult to egg-laying 1½ days), but usually it requires slightly longer, 9 to 11 days. Nevertheless, chicken mites can reproduce at a very rapid rate. The possible progeny of a fertilized female in 5 weeks is estimated at 1,631 and in 8 weeks at 2,609. Breeding goes on all thru the warmer parts of the year.

The length of time that a chicken mite lives depends upon several factors—food, moisture, and temperature. Adult mites that feed and lay eggs regularly live longer than those that do not feed; those that live where there is some moisture live longer than those living under very dry conditions; and during the summer months the term of life is shorter than during the winter. At summer and early fall temperatures, feeding mites, under dry conditions, will live about 8 to 12 weeks, while at the same temperatures, when moisture is present, they will live about 13 or 14 weeks. At late summer, fall, and early winter temperatures they will live about 15 weeks, under dry conditions. At fall and winter temperatures they will live about 16 weeks. The second-stage nymphs are even more tenacious of life than the adults under similar conditions. At fall and winter temperatures second-stage nymphs will live up to about 20 weeks. One may conclude that chicken mites could be starved out of a poultry house in about 4 months during the summer, or in about 5 months during the winter.

During the winter the mites become largely inactive. In artificially heated chicken houses they may, of course, feed during the winter, and even in houses not artificially heated they may revive sufficiently during warm spells in the winter to feed on chickens close by. But it is in an inactive, non-feeding condition that the mites for the greater part survive the winter period. Only the weaker individuals, however, succumb

to low temperatures, and these are quickly made up for when the survivors begin reproducing the next spring.

Chicken mites usually feed at night. When they have engorged themselves they usually leave the hosts. When not feeding they retire to the cracks and crevices of the interior of the poultry house, especially on or near the roost poles. While they feed somewhat on the decaying filth that accumulates in their daytime retreats, their chief food is the blood of poultry. A few will feed in the daytime, when hungry, but the real attack on the chicken begins about an hour after dark, and they continue to feed in rapidly decreasing numbers until after daylight. It takes less than 2 hours for a mite to engorge; sometimes this is done in 20 or 30 minutes. These mites do not remain on the chickens permanently. But a few will remain among the feathers of the chicken during the day, when it is running about, and there are enough of these to carry infestation to a new house. It may be several days before the very last mite has left a chicken.

Aside from dispersion by means of infested chickens, these mites may be carried in several other ways. They may be spread by the use of coops, crates, or boxes in which infested chickens have been kept; by being carried on people's clothing; by being carried by English sparrows or pigeons; by dogs, cats, cattle, horses, or other animals; and, finally, by actual crawling to clean houses in contact with or close by infested houses. But the chief source of dispersion is thru the infested fowls themselves.

Damp, dark poultry houses are very favorable to the increase of poultry mites, and conversely, well-ventilated and sunny houses tend to check their increase. If they become abundant they become a very serious poultry pest. Poultry frequently seem to be suffering from some disease when the real difficulty is that they are seriously infested with mites, often so that they are unable to sleep at night. Mites also keep setting hens from their nests and have a marked effect in reducing egg production. A high mortality exists among young chicks in a badly mite-infested flock. If a poultry house has become abundantly infested with these mites it must first be cleaned. In fact, frequent cleanings and disinfections are very desirable if this pest is to be kept down to unimportant numbers, and once a month is not too often for this process, especially during the summer. All filth and debris should be carefully scraped up and removed, for the mites often occur during the day in the hen manure in large numbers.

CONTROL MEASURES AGAINST MITES

MINERAL OILS

In controlling an infestation with the chicken mite the first thing is to prepare to get at them in their daytime hiding places. If the infestation is a light one the mites will be confined to the roosts and nests and the adjacent walls. But if the infestation is a heavy one the mites will be all over the inside of the chicken house, including the

whole of the walls and roof. The roosts should be taken down and all boxes and boards that are not solidly nailed should be removed. The advantages of simple, removable poultry house fixtures will be readily accepted by those who have been thru a mite-control campaign. All straw, manure, etc., should be removed a considerable distance from the premises or, preferably, burned. The inside of the chicken house should then be given a thoro application with a good mite-destroying agent.

There are many agents that can be used for this purpose with very satisfactory results, but the best are various mineral oils. One is pure, *heavy, coal-tar creosote oil*, applied either undiluted or diluted with kerosene so that not less than 20 per cent of the mixture is heavy oil, or with water so that not less than 90 per cent is creosote oil. The light creosote oils are less efficient, probably because of too rapid evaporation. Crude carbolic acid is also good. Another satisfactory agent is *carbolineum*, which consists of a coal-tar product known as anthracene oil with zinc chloride added. This is efficient when diluted with kerosene so that from 10 to 50 per cent of the mixture is carbolineum. The dilution is recommended because carbolineum is rather expensive and too heavy to spray well undiluted. Pure *crude petroleum* or *kerosene oil* are also efficient, but not so much so as the coal-tar creosote oil or carbolineum. Kerosene emulsion containing 20 per cent of kerosene oil is also efficient. Emulsions of heavy mineral oil containing 20 to 25 per cent of oil are likewise efficient. Coal-tar creosote dips of 5 per cent strength or greater are efficient, but are inferior to straight coal-tar oils or mixtures of coal-tar oils and mineral oil emulsions. Non-oily agents are, for the most part, inefficient when used against the chicken mite. In spraying use a coarse spray, such as is thrown by a Bordeaux type of nozzle, with a bucket pump or knapsack sprayer, or, for more extensive operations, a barrel pump. A hand atomizer will do for spraying coops, nests, brooders, etc. It is well to make a second application about a month after the first one. Treatment should not be given, if avoidable, during the hatching season, but before it if possible.

OTHER REMEDIES

Some poultrymen like to employ a whitewash to destroy the mites. This method is effective only if a killing agent is added to the whitewash. The addition of creosote oil, or of crude carbolic acid, to the extent of comprising 10 per cent or more of the wash, makes the whitewash quite efficient. It is not easy to penetrate deep cracks in a poultry house with a brush and therefore whitewash applications should be made as a spray rather than with a brush. The use of blue (mercurial) ointment or sodium fluoride dust on chickens, so effective in the control of lice, is ineffective against mites.

Fumigants have been used to destroy, or attempt to destroy, chicken mites. Some of these are helpful but many are not. Altogether the fumigation method of controlling the chicken mite is not a very satisfactory one. Treating the ends of the roosts to prevent the mites from

getting to the roosting fowls to suck blood is not a very efficient method. There are on the market proprietary articles in the form of medicated roosts which may have some value. A wooden roost grooved beneath so as to fit tightly to a tin trough running the whole length of the roost, and filled with a mixture of coal-tar and mineral oil, successfully repels the mites from the roost as long as the trough contains enough oil to keep the roost permeated with it, but has no effect on the mites in other parts of the poultry house. Since a thoro treatment of the roosts and dropping boards once a year with the heavy mineral oils is so effective, one is not justified in making a great investment in patented mite-repelling roosts.

Some alleged mite-killing or mite-repelling devices now on the market come in the form of prepared nest material or nest eggs, supposed to be used under setting hens to protect them from mite attacks during the period of incubation. Several of these have been tested by the U. S. Department of Agriculture, as well as a number of preparations on the market that are advocated as remedies against the chicken mite, these being either liquids to hang up in a bottle, provided with a wick, from the roof of the poultry house, or powders to hang up in the poultry house, and especially over nest boxes.¹³ The first sort (the liquids to hang from the roof and allow supposedly mite-killing or mite-repelling vapors to escape) contain usually carbon bisulphide, mixed with a mineral oil in which a smaller amount of naphthalene has been dissolved. Such a mixture used in a poultry house for 2 weeks was without value. The second sort (the powders hung in cloth bags) usually contain ground pyrethrum flowers, commonly more or less adulterated. Pure pyrethrum tested out in this way was also without value.

There is a more or less prevalent belief among poultrymen that if certain substances, and especially sulfur, are given to the birds in their drinking water or food, they will be protected from the attacks of mites, lice, and other external parasites, the underlying idea being that the substance will be taken up by the blood and excreted on the surface of the body, where it will drive the parasites away or kill them if they remain. This method of controlling these pests would, if effective, certainly be a very easy and simple solution of the problem; so, under the influence of the wide-spread advertising by the manufacturers of proprietary preparations alleged to bring about these results, many poultrymen have used these preparations to the neglect of such methods as have been discussed above.

The U. S. Department of Agriculture has also tested a considerable number of these proprietary preparations recommended for use in the drinking water and food of poultry for the control of external parasites, purchasing the preparations on the open market and very carefully following the manufacturer's directions.¹⁴ The preparations used

¹³ Davidson, W. M. Results of Experiments with Miscellaneous Substances Against the Chicken Mite. Department Bulletin 1228, U. S. D. A. (January 23, 1924).

¹⁴ Parman, D. C., Abbott, W. S., Culver, J. J., and Davidson, W. M. Ineffectiveness of Internal Medication of Poultry for the Control of External Parasites. Technical Bulletin 60, U. S. D. A. (February, 1928).

included liquid lime-sulfur to be administered in the drinking water or wet mash food, tablets containing lime and sulfur compounds (calcium sulphide, calcium thiosulphate, and calcium sulphate) to be dissolved in the drinking water or used in a mash, and powders to be mixed with the feed. Liquid lime-sulfur preparations added at different dilutions and continued for periods of time varying from 5 to 53 days failed to produce any noticeable effect against mites or lice. Tablets containing lime and sulfur compounds administered in the drinking water for periods of time varying from 7 to 19 days were likewise of no value against the parasites. Nor were any of the three proprietary powders tested productive of any effect on the parasites. In all cases the parasites on the treated birds fed, behaved, and reproduced normally. The evidence is conclusive that the external parasites of chickens are not to be controlled by such internal treatments, which are essentially without value as parasite remedies and may, moreover, have an injurious effect upon the birds.

CHIGGERS

Chiggers are the larvae of certain species of mites of the harvest mite family (*Trombidiidae*), especially those belonging to the genus *Trombicula*. In the South they are commonly called "red bugs." These harvest mites are soft-bodied, bright red mites, about the size of a pin-head, which may commonly be observed in the fields and woodlands during the fall and early spring. They winter in the soil or in protected situations, and in the spring the female deposits her eggs on or in the ground. These eggs are rounded, brownish objects of very small size. Sometimes hundreds are laid in a cluster. When the eggs hatch they produce tiny, 6-legged mite larvae, so small in size as to be invisible without a lens, of a rounded or ovoid outline and of a pale

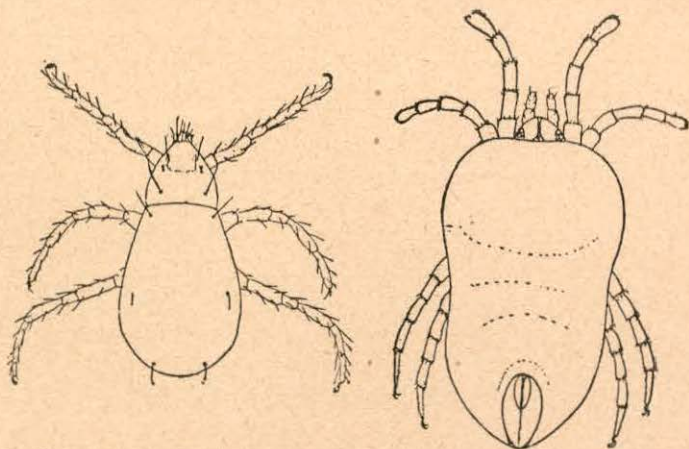


FIG. 6.—Harvest mite (*Trombidium* sp.), larva (left) and adult (right), highly magnified. (From Chittenden, 1915, after Banks, 1904).

reddish color. These are the chiggers or "red bugs" that attack man and domestic animals, including poultry. They are so different from the adult mites that one would not easily guess the relationship. There are several species of chiggers known from North America, but the common chigger of the eastern United States is *Trombicula irritans* (Riley).¹⁵

Chiggers do not as a rule frequent bare ground, mowed lawns or parks, or cultivated fields, but they abound in brushy thickets, dense shrubbery, weed patches with some growth of canes or shrubs, long grass, or other localities that are damp and shady, especially along the margins of streams. The host relationships of our species of chiggers are not fully understood. It is now believed, however, that amphibians and reptiles are their commoner vertebrate hosts, birds and mammals being less attacked. Among domestic animals, chickens are very subject to attack. The tiny chiggers attach themselves to the skin in groups beneath the wings and on the breast and neck. Intense irritation is set up and abscesses are formed at the points where the clusters of chiggers are feeding. These abscesses may become very large, and suppuration may take place beneath the skin, causing the skin to swell around the cluster of mites. Young chickens are most severely injured. They become droopy, emaciated, refuse to eat, and may die. Even old chickens that are heavily attacked frequently seem to contract a diarrhea, grow continually weaker, and die. Chiggers are especially injurious to poultry in the southern United States.

Chiggers occur almost exclusively at or near the surface of the ground. Contrary to the general idea, our common chiggers, at least, do not occur on the foliage of the vegetation growing in the localities frequented by them, as "seed ticks" do, to await a host, but they approach the host from the ground. They are active little creatures, and tho large enough to be seen with a hand lens, they run with such great rapidity that it is hard to detect them. Contrary to the usual opinion, chiggers usually do not actually burrow in the skin of the host. They merely insert their mouth parts deeply into the outer skin or at the mouth of a hair follicle and then become quiescent, as they engorge with lymph from the true skin. They are too large actually to enter a normal hair follicle or skin pore. The hooked jaws are thrust into the skin, along with the clawed palpi. The claws are then forced backward, securely locking the larva to the skin. They attack by preference places on the body where the skin is thin and the flesh tender. Where the skin is unusually thick the chigger larvae attach with difficulty or not at all. After locating on the body of a host they run over the skin for many minutes, sometimes several hours, before finally attaching for engorgement. After several days of attachment in this way they become fully engorged, detach themselves voluntarily, but with considerable difficulty, and drop off.

¹⁵ *Leptus irritans* Riley (1873) = *Tetranychus ilasahuat* Murray (1877) = *Trombicula cinnabaris* Ewing (1920).

Chiggers are especially pests of the summer months. From about harvest time in early July, or immediately thereafter, and on to late in September, not only people but domestic animals of all sorts are likely to become affected with the attacks of these parasites. The trouble is most prevalent during late July and August. By October the chiggers have largely or wholly disappeared for the season. Normally there is but one generation in a year.

No very practical way has been devised to protect the susceptible domestic animals from chiggers except to keep them from ranging in those localities where the chiggers are known to be, or are likely to be, very numerous, and to keep them dusted with flowers of sulfur. Where fenced range is infested, chiggers can be destroyed by applying flowers of sulfur to the infested parts of the field at the rate of 50 pounds to the acre with a dust gun or dust blower. Chickens hatched early in the spring are likely to escape chiggers more or less completely. When they do become infested, local applications of sulfur and lard or kerosene and lard (1 to 10) will kill the clusters of chiggers, and if extensive suppuration has already developed the scab should be softened with soap or vaseline and removed and the area washed with a 4 per cent carbolic acid solution.

ITCH-MITES

THE SCALY-LEG ITCH-MITE

The itch-mite genus *Cnemidocoptes* contains several species that occur on birds. They are all microscopic in size, and of a short, broad, rounded, and flattened form, with short, suckerless legs and only a few small hairs on the back. They produce eggs that hatch in the body of the parent mite, and thus give birth to live 6-legged nymphs. Some of them produce a crust of loosened tissue and dead skin and others work at the bases of the feathers. Both types are found on domestic chickens, in the form of the scaly-leg itch-mite (*C. mutans* Robin and Lanquetin) and the depilumitching itch-mite (*C. laevis* Railliet).¹⁶ These begin their attack on the feet or comb, from which they gradually spread up the legs or down the neck, and on the rump or neck region, respectively.

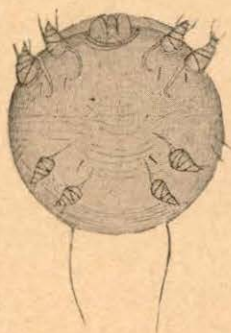


FIG. 7.—The scaly-leg itch-mite (*Cnemidocoptes mutans*), ventral view of female, about $\times 100$. (After Huttyra-Marek, 1922).

The scaly-leg itch-mite is the commonest and most important species of itch-mite infesting poultry, and it produces the disease known as "scaly-leg." It infests many poultry flocks in Nebraska. These tiny mites excavate places under the scales of the foot and leg, and burrow into the skin tissues. They set up an irritation which leads to the multiplication of cells and the exudation of serum, forming a

¹⁶ *Cnemidocoptes gallinae* Railliet.

rough, crusty deposit. Fowls affected with this disease usually first show grayish scabby spots of varying size on the feet and legs, then the foot and leg scales begin to loosen and become encrusted until the whole of the foot and tarsus assumes an unsightly, scabby, chalky-white appearance. This condition lessens the attractiveness of the infested bird from the market standpoint. Under these crusts and scales the mites occur in numerous burrows. At about the same time the combs sometimes become infested, and the disease shows up there in the form of discolored whitish dots and lines covered with minute, loose scales, and a brownish rather than reddish color to the affected parts of the skin of the comb. Later the base of the comb thickens and darkens, the feathers of the head about the beak lose their glossy appearance, turn whitish and stand erect, and finally drop out, while the skin about the base of these affected feathers becomes raised and thickened because of the mite burrows in it. However, this mite begins its work and prefers

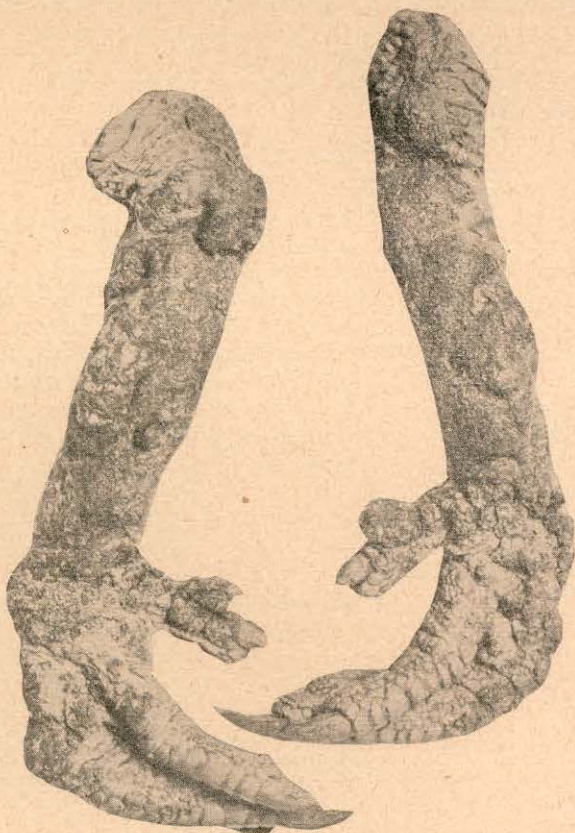


FIG. 8.—Scaly-leg (From Van Es and Martin, 1923).

to continue it on the unfeathered parts of the fowl. Affected birds at first maintain a good appetite and liveliness, but exhibit restlessness and evidences of a severe itching on the affected parts. As the scabs develop the birds may become lame, at times so lame they can hardly walk.

Along the course of the burrows formed by these mites may be found young mites, and in their blind ends adult male and female mites. These latter do not contain eggs, but instead the female *Cnemidocoptes mutans* produces its young alive as it progresses with its burrow. These mites are fairly active when immature, and pass on from bird to bird by contact. As the trouble is therefore very contagious, one infested fowl will soon infest all the other birds in the same flock. Probably the mites reach the comb thru contact with the feet when these are used to scratch the head or when the fowl picks at its itching feet. Filthy houses and roosting quarters favor the distribution of these mites.

Individual treatment of the birds affected with scaly-leg is essential. The application of some penetrating oil to the scaly portions of the legs is effective. In treating scaly-leg it is advantageous first to soak the legs in warm, soapy water for some minutes, until the crusts are loosened, when they should be scraped off carefully. Then make up a 5 per cent solution of one of the coal-tar creosote dips and soak the legs in this for a time, at the same time washing the comb and head with the same solution. Repeat the treatment once or twice at intervals of a few days. If only the legs are affected, treatment with raw linseed oil at intervals of 3 to 5 days will usually bring about a cure in 3 weeks. Or, a mixture of 1 part of kerosene with 2 parts of linseed oil, or an ointment made of either 1 part of oil of caraway and 5 parts of white vaseline, or of creosote and lard, or of sulfur and lard, may be substituted, if desired. The infested fowls should be absolutely isolated until cured, and the poultry house and yard should be thoroly disinfected with a strong, hot, carbolic acid wash and then whitewashed. Within a few weeks the foot scabs disappear, new feathers will grow out on the head, and the comb will resume its normal form and color.

THE DEPLUMING ITCH-MITE

This mite is very similar to the preceding species, but even smaller, and the condition that it produces is like scaly-leg in being very contagious. It works at the bases of the feathers and burrows into the quills, which become filled with a powdery, whitish material among which the mites may be found, as many as 10 or 12 to the feather. This weakens the shaft of the attacked feathers so that they very commonly break and drop off. Also, the activity of the mites sets up an irritation, causing the fowl to pluck out its feathers, and, after forming the habit, to pull out the feathers of other fowls. The disease usually begins at the rump and gradually spreads. "Bare backs" in many poultry flocks are often due to the activities of this parasite.

The head and neck, especially, become heavily infested and bare of feathers, and the malady is worst in the spring and summer.

In cases of depluming scabies, isolate the affected fowls. Dust thoroly with sodium fluoride powder or dip the fowls in a solution of $\frac{2}{3}$ ounce of chemically pure sodium fluoride, 2 ounces of sulfur, and $\frac{1}{2}$ ounce of laundry soap in 1 gallon of water. Treat the affected parts with an application of the ointment made of oil of caraway, 1 part, and white vaseline, 5 parts, or with sulfur and lard ointment or creosote and lard ointment. Repeat as often as necessary to effect a cure.

THE FLESH MITE

The flesh mite or cystic fowl mite (*Laminoisioptes cysticola* Vizioli) is a very tiny species that works both on the surface of the skin of the fowl and in the subcutaneous tissues, rarely burrowing deeply into the body. The presence of the mite in its burrow causes a soft, granular or calcareous, yellowish, oval cyst, about the size of a pinhead. Dead mites may be found in these cysts. Frequently when preparing poultry for the table, small, white lumps of tissue are found immediately under the skin, especially in the region of the neck, breast, sides, and thighs, and become the subject of inquiry by the poultryman or housewife. These are the cysts of this mite. The mite is very common on Nebraska poultry and probably the majority of the adult chickens in the state are more or less infested. Since the health of the chickens is apparently not injured by the presence of these mites, no remedy is necessary.

THE PULMONARY MITE

The pulmonary mite or air-sac mite (*Cytodites nudus* Vizioli)¹⁷ inhabits the air sacs and other body cavities, as well as the pneumatic bones, of chickens, turkeys, pheasants, and probably other gallinaceous fowls. It is widely distributed in Nebraska, and probably is not uncommon in our flocks of poultry. These mites probably get into the body by entering the nostrils and from there in thru the respiratory passages. They can live only a short time outside the body of the host. They are very active and can penetrate most of the tissues of the body. They produce their young alive. When present in relatively small numbers only, these mites do not have any obvious ill effect on the health of the infested birds, for fowls that appear

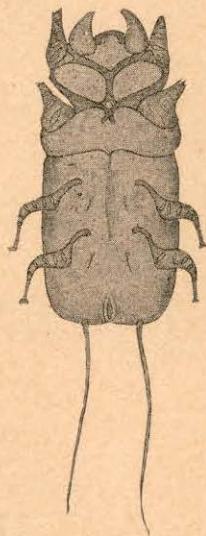


FIG. 9.—The flesh mite or cystic fowl mite (*Laminoisioptes cysticola*), ventral view of gravid female, x200. (After Fiebiger, 1923, after Mègnin).

¹⁷ *Cytodites nudus* Vizioli.

to be perfectly healthy may have them. But if they occur in great abundance in the air passages they may produce an irritation and congestion, as well as a mechanical obstruction, or if they penetrate in great numbers to the internal membranes they may produce peritonitis and enteritis. No remedy for seriously affected birds is known. Cleanliness and general good sanitation in and about the poultry house are the only protective measures that can be suggested.

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