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APRIL, 1891.

SHEEP SCAB, AND HOW TO CURE IT.

☞ **The Bulletins of this Station are mailed free to all residents of the State who make application for them.**

NOTE. On the 5th day of last October our station office building was destroyed by fire. The laboratory, a large part of the library, and all Reports and Bulletins from 1 to 12 inclusive, were burned. It will be impossible to supply copies of Bulletins issued earlier than No. 13.

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THE COMMON SCAB OF SHEEP.

OTTO LUGGER.

It is no longer a theory but a well established fact that large portions of our State are well adapted to sheep husbandry. A dry region, covered with small-leaved plants and grasses, is essential to success, and no good results can be expected upon low or swampy lands, nor in very dry and dusty regions which are neither good for the animals nor for their wool. Sheep are the only domesticated animals which can fully utilize the vegetation of our wild prairies, as they graze down to the very roots of nearly all plants growing there. With the exception of the seeds of some species of grasses (*Stipa*) that are injurious to them—in extreme cases even causing death, all other plants are eaten with impunity, even should they be poisonous to other stock. By means of sheep husbandry our farmers are enabled to fully utilize much of the uncultivated land in the vicinity of their farms, as well as all the land lying fallow or in stubble. Many of the most noxious weeds introduced in the extensive cultivation of the soil can only be successfully kept in check by the use of sheep. Of course wherever the natural conditions are not in favor of this industry, or where but scant food can be obtained upon the natural meadows, farmers must either be satisfied with fewer sheep, or they must grow food for them. Frequently too many animals are kept by farmers, who can not take proper care of them, and naturally the result is a more or less complete failure. If proper attention is given to it sheep husbandry is one of the most important branches of farming, and one that pays well in more than one sense.

For most of our farmers sheep husbandry is still a new enterprise, and numerous errors in the management of the animals are the consequence. Simply possessing the suitable land for this business does by no means insure success. Among the errors usually made one stands out very prominently, *i. e.*, the farmers are very apt to keep more sheep than they can properly take care of; or, in other words: the sheep are left on the prairies to take care of themselves. The consequences are failure, at least in many cases. No enterprise can be a success unless proper pains are taken to make it such. Herding together large numbers of sheep belonging to a number of farmers has the very dangerous tendency to rapidly spread any disease which by separating the large flocks into smaller ones, would not occur. If, for instance, one farmer is careless, and allows the scab to enter his flock, his animals, grazing together with others well taken care of, will soon spread this disease, and thus force all his neighbors to go to a heavy expense to exterminate it. Concerted action is absolutely necessary to prevent this disease from entering any region, or to stamp it out if once found among the sheep. Most countries have stringent laws, well enforced, to prevent the introduc-

tion of sheep that are not perfectly healthy. We have as yet no such laws and therefore it behooves each farmer so much more to be on his guard. "An ounce of prevention is better than a pound of cure" is an old truth, and exceedingly well appliable to sheep husbandry.

Farmers interested in sheep husbandry ought to procure for themselves the excellent work of Dr. Cooper Curtis, and published by the U. S. Department of Agriculture. It is entitled "The Animal Parasites of Sheep," and contains a vast amount of practical information. But as this work is not in the hands of many farmers, and as the Scab disease is gradually spreading in Minnesota, it was thought best to issue a short bulletin at this time, to contain the information necessary to recognize the disease, and to apply the remedies.

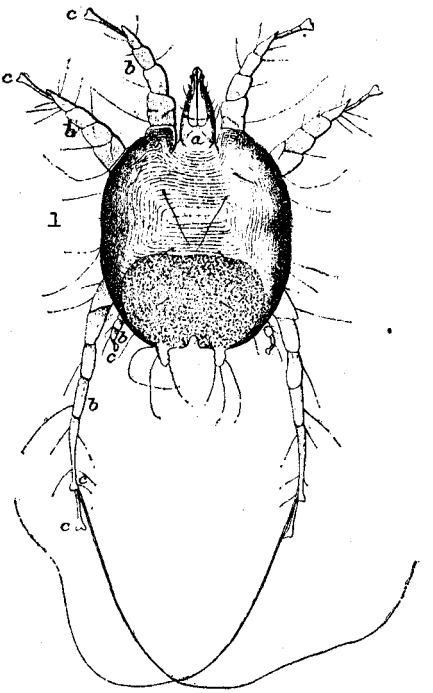

Fig. 1. Adult male of Common Scab-mite, dorsal view. *a*, head; *b*, *b*, legs; *c*, *c*, suckers. (After Curtice).

Scab or Itch Mites.

These mites are the cause of scab in animals, and of the itch in man. One of the worst diseases of sheep is caused by parisites belonging to the above fam ly of mites. The disease is not easy to stamp out if once established in a region, and considerable time and money must be expended for this purpose.

Skin diseases like the scab, or similar ones, are caused by three different groups of mites.

1. *Sarcoptes*, or Burrowing Mites. These mites form burrows or tunnels in the skin of their host, and suck blood. All such mites can produce itch upon the skin of man, a disease, however, easily cured.

2. *Dermatophagus*, or Skin-eating Mites. These mites live upon the surface of the skin of their host, feeding upon the young epidermal cells, thus destroying skin and hair. They do not form itch upon the human skin but simply cause a slight inflammation, and soon die.

3. *Dermatocoptes*, or Sucking Mites. These mites live upon the surface of the skin of their hosts, without forming burrows or tunnels, and obtain their food (blood, lymph, serum, etc.) by penetrating with their sucking mouth into and through the upper skin. Generally they do not produce itch upon man, though some cases are on record in which mites of this kind were successfully transmitted from sheep to man.

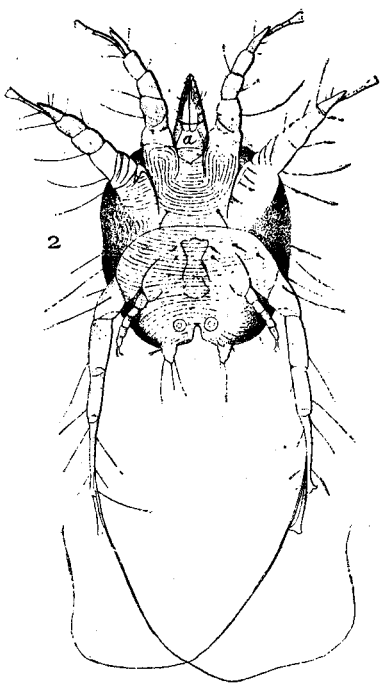

Fig 2. Adult male, ventral view. (After Curtice).

It is frequently asserted that skin diseases, such as the scab, are mainly caused by a poison secreted by the mites and injected by them while inserting their sucking organs. This may be true, but has not been proven. At all events we may say that neither scab nor itch can exist without the presence of mites. Other, and somewhat similar diseases, can, however, be caused by the presence of vegetable parasites infesting the skin.

There are three distinct species of scab mites found upon sheep, all be-

longing to the true *Sarcoptes*. Although quite similar in general appearance they produce very distinct kinds of skin diseases, *i. e.*, the scab of the head, that of the foot, and the common scab. The worst of these diseases, the *Common Scab*, is caused by *Psoroptes communis*, Furst., var. *ovis*, and the losses caused by these mites are very great in some of our western States, and as the pest has found a lodgment in several parts of our own State, great care should now be taken to stamp it out, and prevent other flocks from becoming infested. Our farmers, and chiefly those that are still unfamiliar with the details of sheep husbandry, can not be too careful in regard to this disease. Wherever sheep husbandry has been well established for some time, and where farmers have learned to cure the disease, the losses caused by scab are gradually r. duced by the proper use of remedies, and by the exercise of good judgment in furnishing their animals sanitary surroundings. This scab mite can be more completely and readily exterminated than many of the other parasites.

Description of Mite producing the Common Scab.

The mite is very small, barely visible to the unaided eye; it has an elongated oval body, resembling in shape a turtle. Its skin shows numerous small wrinkles, and is covered with spines, hair, scales and wart-like projections. The mature mite has eight legs, each composed of five joints. The illustrations show the structures of male, female, and young, as well as that of the mouth parts. The male, Fig. 1, upper side, is quite different from the female, Fig. 2, as can be readily seen by comparing the illustrations. The young larval mite, Fig. 4, possesses but six legs. Both males and females make burrows or tunnels in the skin of their host, but those of the former are always very short.

Neither sex lives longer than from three to six weeks, but during this time the female is almost constantly engaged in laying eggs. These are smooth objects, of an elongated oval shape, and are deposited in small patches, each containing from twenty to twenty-four eggs, which hatch in the course of four to seven days. The six-legged larvæ undergo three moults in the tunnels, and reach maturity in about fourteen days, when they leave their old quarters and start tunnels for their own use. Gerlach computed that a single female could produce in three months a progeny of 1,500,000. He gives the result in a tabular form:

First generation after	15	days	produces		10	females	and	5 males.
Second	"	"	30	"	"	100	"	50 "
Third	"	"	45	"	"	1,000	"	500 "
Fourth	"	"	60	"	"	10,000	"	5,000 "
Fifth	"	"	75	"	"	100,000	"	50,000 "
Sixth	"	"	90	"	"	1,000,000	"	500,000 "

This estimate of their rapid multiplication, which is by no means exaggerated, but is a very moderate one, plainly proves that the farmers keeping sheep can not be too careful to prevent the scab from infecting their flocks. Mites, and their eggs as well, if removed from their abodes and placed upon a moist piece of blotting paper, or if kept in a moist atmosphere, can exist from fourteen days to four weeks, but in dry surroundings they will soon

perish. This shows the necessity of preventing healthy sheep from sleeping upon moist soil upon which diseased animals have been resting. All scab mites seem to become more active in warm stables, and thus cause more violent itching. In the case of the human itch-mite it has been observed that the mites leave their tunnels at night, if the patient is in a warm bed, and commence to make new tunnels, hence the increased itching. Fig. 7 shows a section of a tunnel made by an itch mite.

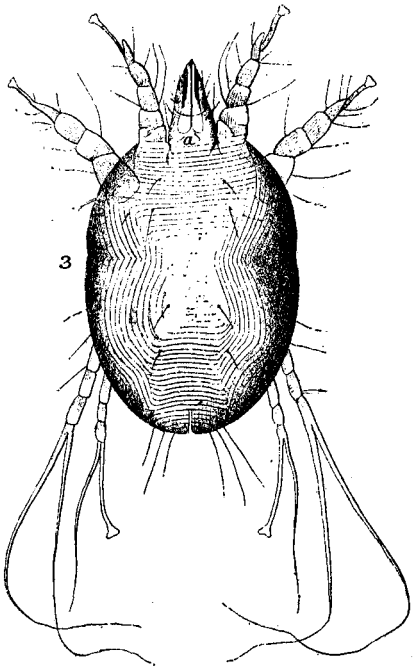

Fig. 3. Adult female, dorsal view. (After Curtice).

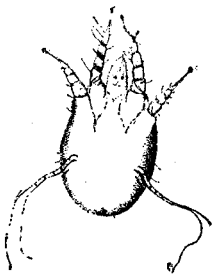

Fig. 4. Young six-footed larva. (After Curtice).

Fig. 5. Egg. (After Curtice).

Description of Common Scab.

The skin disease caused by the common scab mite has a different appearance upon different breeds of sheep. Upon some breeds, characterized by wool nearly free from fat, the disease can spread over the whole body. Starting from small and isolated spots the scab extends slowly but steadily. If of long standing, scab is no longer visible. In Merino sheep the disease is not so readily communicated, and affects mainly spots free from long wool. The first indication of the disease is violent itching, which the infested animals show by rubbing against all sorts of objects and by biting the infested spots. This itching sensation becomes more evident when the animals become heated by exercise. The sensation produced by rubbing against posts, etc., is evidently of a pleasant character, as is shown by a trembling motion of the lips, as well as by the rapid opening and closing of

their jaws. The spots of skin infested—usually upon the back—show small yellowish knots, which soon change to little pus balls filled with lymph. Later this fluid is discharged and dries, forming small yellowish-brown scabs. The wool upon the invaded spots becomes paler and dry, is slightly lifted, but usually remains in position, being glued to the skin by the drying lymph. Very often these first indications are very slight, and escape detection. Separating with the hand the wool of infested animals, the presence of mites will become evident if we find round spots upon the skin, which appear whitish where the epidermis is a little elevated, and where the lymph forms yellowish thin deposits that are easily lifted with the loosened wool. In some cases the animals show pain if scratched, instead of pleasure. The skin of infected animals, if butchered, show upon their under side red points. The disease always starts from small spots, and spreads but very gradually. If neglected, the scabs become thick and of a brown color, as if soaked with oil; eventually the skin, entirely denuded of wool, becomes wrinkled, and between the wrinkles cracks appear. If the further increase of the scab-mites is not checked the animals become poorer and poorer, and frequently die.

By rubbing against posts and other objects many mites and their eggs are removed, and thus frequently find lodgment upon healthy sheep. The mites can be readily found, but not in the early stages of the disease.

Treatment.

"Whatever kills the mite cures the scab" may be said to be the rule that we have to follow to exterminate them. Internal remedies have no value whatever, except in cases where the animal infested is weak, and where rich food is necessary to strengthen the patient.

Creosote, solutions of potash, alkalies mixed with fat, oil of turpentine, benzine, kerosene, tar, tobacco, hellebore, mercury, and arsenic kill the mites more or less rapidly.

Vogel made some experiments, under the microscope, and found that scab mites were killed as follows:

Within one minute by creosote, carbolic soap and benzine.
Within several minutes by tar and caustic potash solutions.
Within one-quarter to one-half hour by tobacco or hellebore.
Within one hour by soft soap.
Within two hours by arsenic.
Within four hours by corrosive sublimate.

In Europe, where all flocks of sheep are given in charge of shepherds who know all the individuals, and who notice, almost immediately if anything is wrong with them, the presence of the scab mite is quickly followed by the proper remedy. The shepherds, although they frequently do not know that a mite is the cause of the trouble, search for the infested spots, remove the wool already loosened, and, scraping away the scab, apply a little extract of tobacco, which they always keep on hand, or apply a gray salve, made of mercury, to which is added a little oil of turpentine. In this way the young colonies made by the mites are soon destroyed.

To kill the scab mites in any given locality, and to prevent infection of healthy sheep, two operations have to be carried out, and ought to be enforced, if necessary, by law; *i. e.*,

1. *Direct destruction of the mites*, and
2. *Disinfection of stables, etc.*

Both are most effectively carried out immediately after shearing, as at that time the scabs are exposed to view. The sheep, after being dipped, should be kept away for some time from their old stables to prevent new infection.

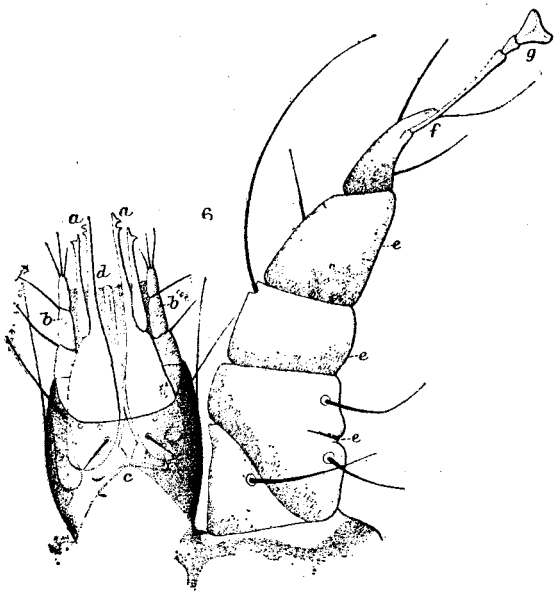

Fig. 6. Head and anterior limb enlarged, ventral view. *a*, mandibles; *b*, antennæ; *c*, maxillae; *d*, membrane joining the antennæ; *e*, *e*, *e*, joints of the limb; *f*, the claw; *g*, sucker. (After Curtice.)

To kill the mites in a thorough manner, it is best to apply the remedy over the whole surface of the animal, and not alone to the region showing scab. For this purpose two baths, or dips, are required, one to loosen the scab, so as to permit the scab remedy to reach the mite, and the other to perform the actual work of killing the parasites.

For the first bath, or dip, it is best to make a solution of two parts of potash, one part of lime, and fifty parts of water, or, in other words, dissolve in 100 quarts of water 10lb of potash and 5lb of lime.

For the second bath, a good dip is composed of 80 gallons of water and 40lb of tobacco. In both baths the water should be warmed to a temperature of 100° to 110° Fah. This second bath should be applied twenty-four

hours after the first one. With proper appliances, each sheep, after shearing, requires about two gallons of either fluid, and in winter, or when the wool is long, about four gallons.

It requires four men to do the work thoroughly, one to hold the front legs, one the hind legs, and one the head. The animal is kept in the bath from three to four minutes. A fourth man separates with his hands the wool, and thoroughly rubs the infested skin, using a sharp brush to remove the scab. The legs of the sheep are kept in the bath, the head must be well washed and should be immersed several times; in doing so one man should keep the eyes of the animal closed with his hands. After the bath the sheep is put in an adjoining empty box to collect the drippings, which are added from time to time to the bath. Of course the animals should be kept in a sheltered place, free from the disease, after each bath, and should be protected from the winds until dry.

This bath kills only the mites, but not their eggs, and consequently —as the egg stage lasts from three to seven days—another bath must be given seven to eight days after the first one to kill the young mites just hatched. It is usually not necessary to give still another bath after this. The animals still suffer a little from the itching of their skin, but this will gradually disappear as the sores become healed. If, however, after a sufficient time the itching does not stop, then it is necessary to repeat the bath.

Where large flocks have to be dipped tubs merely large enough to completely immerse one sheep are not sufficient, and dipping pens or tanks have to be made, through which the animals to be treated may be driven. Large boilers to prepare the dip and to heat the water are also necessary.

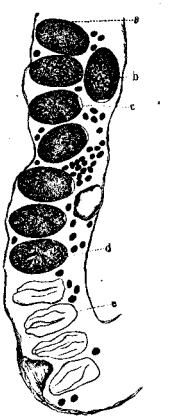

Fig. 7. Tunnel made by Itch-mite in the human skin. *a*, fresh egg; *b*, *c*, *d*, eggs, showing development of embryo; *e*, empty egg shells. The black dots are the excrements of the old mite. (After Heller.)

Disinfection of Stables, etc.

The first step necessary is to remove the dung from stables to fields not accessible to sheep, where it should be plowed under. The earth compos-

ing the floor of the stables should be dug up to a depth of several inches and should be removed and replaced by fresh material. All the wood work in stables must be washed with hot soap-suds, and white-washed to a height of five feet. Posts in or near pastures should be treated in a similar manner. After leaving the well-ventilated stables in this condition for two weeks sheep can again be housed in them.

Composition of Dips.

There are a very large number of dips recommended, and most of them are satisfactory if thoroughly well applied. A few of the leading ones are here given.

Australian Dip. 100lb of flower of sulphur, 150lb of quick lime, and 100 gallons of water. Mix and stir, while boiling, for ten minutes, until the mixture assumes a bright red color, then add 3 gallons of water. Use the dip, heated to 100°–110° Fah. twice, at an interval of two weeks.

Texas Dip. 30lb of tobacco, 7lb of sulphur, 3lb of concentrated lye, dissolved in 100 gallons of water.

Nevada Dip. Sulphur, 10lb; lime 20lb; water, 60 gallons.

California Dip. Sulphur, 4lb; lime, 1lb; water, enough to make 4 gallons.

Kansas Dip. Sulphur, 22lb; lime, 7lb; water, 100 gallons.

Curtice's Dip. Probably tobacco and sulphur form the best combination known for the treatment of scab. To every hundred gallons of water there should be used 35lb of good strong tobacco (if stems or other inferior parts are used there should be more), and 10lb of flowers of sulphur. This preparation used at a temperature of 120° Fah., will kill all mites, ticks and lice, and leave the wool in a clean condition. Has to be applied a second time in 10 to 14 days.

Walz's Dip. 6lb of freshly burned slaked lime, 6lb potash, 10 quarts of water; boil an hour, stirring occasionally. Add pine-oil 8lb, and tar 2 quarts. Make an infusion of 20lb tobacco in 130 quarts of water; add the lye already made and stir. This quantity suffices for 100 sheep. Apply by immersing the sheep, separating the wool, and breaking the scabs. Repeat in 8 or 10 days.

Law's Dip. Take 16 lb tobacco, 3 pints of oil of tar, 20 lb soda ash, 4 lb soft soap, 58 gallons of water. This quantity suffices for 50 sheep. The tobacco should be steeped, afterwards the other ingredients should be added at 70° Fah.

Zundel's Dip. 13½ lb tobacco, infuse in 66 gallons of water; dissolve in it 8 lb soda, add 4 lb freshly burned or slaked lime. Dilute 8 lb soft soap with hot tobacco broth, add it to the rest, then add 4 lb crude carbolic acid. Mix. This quantity is sufficient for 100 sheep.

Roloff's Dip. For 100 sheep. Take 20 lb of tobacco, steep it with 66 gallons of water for half an hour; heat it to 95° Fah. and add 2½ lb each of pure carbolic acid and potash.

Mix an infusion of 15 lb tobacco with 2½ lb carbolic acid and 13½ lb wood tar, pour it into 66 gallons of water at 125° Fah., in which 3 lb soda have been dissolved. Use it at a temperature of 80° or 90°, and repeat in six or seven days.

Clement's Dip. Arsenious acid 1 part, sulphate of zinc, 5 parts, water, 100 parts. The water is put over the fire, the chemicals added, and it is allowed to boil for 8 or 10 minutes. The sheep is entirely submerged in the liquid with the exception of the head, when cool enough for use. The laborers should grease their arms with linseed oil, as well as the udder of ewes, to prevent the action of the astringent on the skin and on the secretion of milk.

Mathew's Dip. 1 part arsenious acid, 10 parts alum, 100 parts water.

Scheurle and Kehm's Dip. 1 pt. arsenic, 12 parts alum, 200 parts of water.

Kerosene emulsion as a sheep dip.

Prof. Gillette has made a number of experiments with an 8 per cent kerosene emulsion, and says that a dip of this strength could be safely used. Such an emulsion is much cheaper than any of the commercial dips, and it is a matter of great importance to try this remedy very fully.

Patent dips are objectionable because their formulas are not given, and consequently may be valueless or not strong enough, and they are usually more costly than they are actually worth.