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Mite Affecting Domesticated Mammals

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Mites Affecting Domesticated Mammals

ENTOMOLOGY
DEPARTMENT

AGRICULTURAL EXPERIMENT STATION
South Dakota State College of Agriculture and Mechanic Arts
Brookings, South Dakota

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Mites Affecting Domesticated Mammals¹

JOSEPH H. CAMIN² and WM. M. ROGOFF³

Introduction

The control of mites that are parasitic on mammals frequently involves complications not experienced in the control of free living mites. Many mange-like lesions that are not caused by mites occur in domesticated mammals. In such cases the failure of miticides to effect cures is to be expected. The fact that field diagnosis is often based on the appearance of lesions or even on modifications of host behavior, such as excessive rubbing of cattle or swine, introduces the complication that controls may be applied where no mites actually exist. The failure to recover mites, however, does not necessarily indicate their absence, as they are frequently very difficult to find. While the appearance of the lesions is of great value in diagnosing diseases caused by mites, the value of positive identification of the mites themselves prior to the application of control measures cannot be overemphasized. This bulletin is intended to provide the means for such positive identification, as well as to describe the mites, the lesions produced, and some of the available methods of control.

In cases where parasitic mites burrow in the skin or are otherwise protected (such as by scabs or dirt) the problem of getting the miticide in contact with the mite assumes considerable importance. High pressure equipment does not appear to be necessary for effective mite control. Thoroughness of application of the proper miticide, however, is of prime significance. Not only must applications be thorough, but care must be exercised to insure that all animals in a herd are rounded up and treated at the same time, or reinfestation may quickly recur.

The advent of chlorinated hydrocarbon insecticides, such as chlordane and especially *gamma* benzene hexachloride, has changed mange control on the farm from a problem of alleviation to one of eradication. Benzene hexachloride (BHC), probably at this time the material most widely used against parasitic mites, contains a number of closely related chemicals only one of which, the *gamma* isomer, is of any practical importance as a miticide. In any BHC preparation, therefore, the percentage of *gamma* isomer is the figure to consider. Products formulated from essentially pure *gamma* BHC are usually

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referred to as lindane. Lindane has certain advantages such as relative lack of odor and lower chronic mammalian toxicity than crude BHC, though these advantages may sometimes be offset by the higher cost of lindane. In relation to the effect on mites, however, it does not appear to matter whether one uses lindane or the corresponding percentage of *gamma* benzene hexachloride in crude BHC.

Description of Lesions and Methods of Control

The mites listed below are numbered in the same order as given in the key at the end of this bulletin.

I. *Demodex* sp., follicle mites. Size 0.3 mm. Demodectic or follicular mange; red mange of dogs. Affects cattle, sheep, goats, horses, swine, rabbits, dogs, cats and man. Demodectic mange is of minor economic importance in cattle, sheep, goats, and swine in the United States, but is a very serious disease of dogs. Mites live in hair follicles and oil glands. Transmission is usually by direct contact. This mange does not itch severely and frequently not at all.

Appearance and location on affected animals:

Cattle—*D. bovis* Stiles. The lesions appear as nodules, most often in the skin of the neck, shoulders, breast, and dewlap and sometimes other parts of the body. The nodules, which result from secondary bacterial invasion, vary in size from that of a pinhead to that of a hazelnut or larger and are filled with a thick, cheesy mass. In the early stages, there is no marked change in the hair coat and the nodules are not seen until the hair is parted, but they can be located by feeling. In advanced cases several nodules may unite to form small abscesses. These sometimes rupture and discharge their contents over the surrounding hair and skin to form crusts or scabs.

Sheep and Goats—*D. canis ovis* Railliet and *D. caprae* Railliet. The disease is rare on sheep in the United States, but is found more frequently on milk goats. The lesions are similar to those found on cattle. In sheep they appear most often around the eyelids, while in goats the usual location is on the neck and sides.

Horses—*D. equi* Railliet. The disease is very rare in horses and has not been reported in the United States.

Swine—*D. phylloides* Csokor. The lesions are similar to those found on cattle. They are usually located around the eyes and snout at first and then they spread slowly over the underside of the neck, breast, and abdomen, and between the hind legs.

Rabbits—*D. cuniculi* Pfeiffer. The disease is very rare and has not been reported in the United States.

Dogs—*D. canis* Leydig. Demodectic mange or red mange is

common in dogs of all ages and breeds, but is most frequently seen in young dogs of the short-haired breeds. The first evidence of red mange is the appearance of hairless areas around the eyes, on the elbows, hocks, and toes and other parts of the body. These spots are usually reddened at first, becoming copper color as the hair continues to fall out, and finally lead-gray or bluish in the more advanced stages. The secondary invasion of bacteria leads to the formation of small pustules in the hairless areas. As this stage progresses, the skin becomes thickened and wrinkled and the pimples frequently ooze pus and blood.

Cats—*D. cati* Megnin. The lesions are similar to those in dogs, but the disease is not as common and the lesions are usually on the head.

Control measures:

Control measures available for demodectic mange are generally difficult to apply and frequently erratic in their results (11). In general, the recommendations given for *Sarcoptes* (XI) will provide relief for the parasitized animal but will not eradicate *Demodex*. A 1 percent solution of rotenone in oil, applied repeatedly, or a 20 percent benzyl benzoate preparation, in ointment base, has been widely used on dogs. Red mange of dogs may also be controlled with powdered phenothiazine dusted into the coats at weekly intervals and applied to the feet by forcing them into a can of powder (4). Good control, but possibly not complete eradication of demodectic mange of dogs, may be obtained by dipping in either 0.25 percent gamma BHC or 0.25 percent chlordane (5). Small puppies should not be dipped. Cats should be treated with miticides of low mammalian toxicity, because of their methods of cleaning themselves.

II. *Pneumonyssus caninum* Chandler & Ruhe, dog nasal mite. Size 0.7 mm. Affects dogs. Apparently causes some irritation of the nasal membranes and the membranes of the frontal sinuses. Not much is known concerning the life history or the effects of this mite. No practicable control measures are available.

The cattle ear mite, *Railletia auris* (Leidy), is not included in the key because it occurs very rarely and is of no economic importance so far as is known. The mite occurs deep in the ears of the cattle. It has been reported several times from the United States, but there is no indication of pathological effects on the host. The mite is similar to *Pneumonyssus caninum*, but is somewhat more heavily sclerotized and possesses long peritremes.

III. *Bdellonyssus bacoti* (Hirst), tropical rat mite. Size 0.8 mm. Rat mite dermatitis. Normally parasitic on rats, but will infest domestic animals and man temporarily, sometimes causing a severe dermatitis.

Control of tropical rat mites in a laboratory animal colony may be obtained with a 10 percent DDT dust, though some mortality has

been experienced among mice held on treated bedding (6). Lindane would probably be a more suitable miticide to use in this connection.

IV. *Trombicula (Eutrombicula) alfreddugesi* (Oudemans) and other species, chiggers. Size 0.5 mm. Larvae will infest domestic animals and man. Larger mammals are usually attacked on the head and neck, where the mites produce an itching dermatitis with scaly skin and loss of hair.

Chiggers may be controlled in limited areas, where the expense is warranted, by spraying infested grounds at the rate of about 20 to 25 gallons per acre with an emulsion of chlordane or toxaphene at 2 pounds of actual toxicant per acre, or lindane at one-fourth pound of actual toxicant per acre (10). Under unusual circumstances, individual domesticated mammals may possibly be protected by repellent skin treatments developed for human beings (9).

V. *Cheyletus eruditus* (Schrank) and other species, predaceous mites. Size 0.7 mm. Sometimes found on animals that are infested with another species of mite. *Cheyletus* is not parasitic itself, but preys upon parasitic mites, therefore, no control would be desirable.

VI. *Cheyletiella parasitivorax* (Megnin). Size 0.4 mm. Usually found on rabbits, occasionally on cats, and rarely on man. It has been suspected of causing mange, but the best evidence is that it preys upon parasitic mites, thus no control measures would be desirable.

VII. *Psoroptes equi* (Hering), scab mites. Size 0.6 mm. Psoroptic mange or scab. Different varieties affect cattle, sheep, goats, horses and rabbits. The mite lives on the surface of the skin on any part of the body that is thickly covered with hair. The mites feed upon serum or lymph and continually migrate to the periphery of the lesions as the lesions become larger. This form of mange usually itches severely. Transmission is usually either by direct contact or by contact with objects which infested animals have rubbed against.

Appearance and location on affected animals:

Cattle—The first symptom of the disease is an intense itching of the skin on the withers, on top of the neck just in front of the withers, or around the root of the tail. From these points the mites spread over the back and sides and may eventually involve most of the body. As the mites multiply, they make large numbers of small wounds in the skin. These are followed by intense itching, formation of papules, inflammation, and the oozing of serum. The serum that comes to the surface mixes with dirt and hardens into yellowish or grayish scabs which are frequently

stained with blood. As the disease continues, large areas become denuded of hair and covered with thick crusts or scabs. The skin becomes thickened and wrinkled, itching is intense and the animal is constantly irritated.

Sheep and Goats—The lesions and the course of the disease are very similar to that described for cattle and may appear anywhere on the body. The disease is very important in that it is responsible for loss of wool, emaciation, and often death in sheep. Itching is severe and infested animals are often observed scratching and biting themselves.

Horses—The lesions and the course of the disease are similar to that described for cattle. The first lesions are usually on the head under the foretop, on the top of the neck around the mane, or on the rump.

Rabbits—The mites and lesions are usually confined to the ears, but the inflammation may spread to the covering of the brain and sometimes to the face, the neck, and even the legs. There is intense itching and a brownish, ill-smelling discharge, which becomes caked on the insides of the ears. Secondary bacterial invasion may cause the formation of ulcers. If the mites migrate to the middle or inner ear, they may cause serious nervous disturbances with shaking of the head as a common symptom.

Control measures:

Presence of these mites on sheep or cattle makes the flock or herd subject to quarantine and in South Dakota such infestation must be reported to the State Livestock Sanitary Board at Pierre. Interstate movement of sheep, under the control of the Bureau of Animal Industry, U.S.D.A., is permitted only after the infested animals are dipped according to standard procedure in lime-sulfur or nicotine sulfate (1, 2, 11). Psoroptic mange of sheep may be easily controlled by a single dipping in 0.06 percent *gamma* BHC (3), but official sanction by the B.A.I. is being withheld pending a reliable vatside test for BHC.

VIII. *Chorioptes* sp., scab mites. Size 0.4 mm. Chorioptic or symbiotic mange or scab. Affects cattle, sheep, goats, horses and rabbits. The habits of the mite and the lesions produced are very similar to those described for *Psoroptes* (VII), except that the infestation usually remains more localized and very rarely involves the entire body of the host.

Appearance and location on affected animals:

Cattle—*C. bovis* (Gerlach). The lesions, which are similar to those produced by *Psoroptes*, are usually found on the tail or limbs and show little tendency to spread. The disease is commonly known as "tail mange" in cattle.

Sheep and Goats—*C. ovis* Railliet and *C. caprae* Gervais. The disease may be distinguished from psoroptic mange by the localization of the lesions around the feet and on the limbs. The disease is commonly called "foot scab." The lesions usually appear on the lower parts of the legs and around the feet, but in severe cases they sometimes spread to the insides of the thighs and to the udder.

Horses—*C. equi* (Gerlach). The disease, commonly known as "foot mange," is similar to psoroptic mange, but the lesions are usually confined to the lower part of the limbs around the foot and fetlock. Occasionally the mites spread over the legs above the hocks and may even reach the thighs and abdomen, but usually the disease remains localized around the feet.

Rabbits—*C. cuniculi* (Zurn). The disease is almost indistinguishable from psoroptic ear mange, but is usually less serious.

Control measures:

Statutory regulations and treatment procedures for chorioptic mange or scab on sheep or cattle are essentially the same as for psoroptic infestations, described under *Psoroptes* (VII). A single spraying of *gamma* BHC at 0.043 percent results in great improvement, but does not always provide complete eradication of these mites (7). Two such applications at 10- to 14-day intervals are probably desirable for dairy cattle, though refractory cases are likely to be encountered. It appears that some dosage such as 0.075 percent *gamma* BHC will prove desirable for use on beef cattle, with the lower, somewhat less effective dosage being kept for dairy cattle because of possible residue complications in milk.

IX. *Otodectes cynotis* (Hering), ear mange mite. Size 0.4 mm. Ear mange. Affects dogs and cats. The mites do not burrow into the skin, but are found deep in the ear canal near the eardrum, where they feed upon tissue fluids. Intense irritation results and the canal becomes filled with inflammatory products and modified ear wax as well as mites. The host animal scratches and rubs its ears and shakes its head or holds its head to one side. In advanced cases the animal may run in circles or show other evidences of nervous disturbance. Secondary bacterial infection sometimes results in inflammation of the middle ear and even of the brain.

A variety of remedies are in common use such as swabbings of 1 percent phenol in glycerine or 0.5 percent rotenone in petrolatum. Lindane is now coming into prominence, generally as swabbings of 0.25 percent solution in vegetable oil. Note the precaution on cats given under control recommendations for *Demodex* (I).

X. *Notoedres* sp., mange mites. Size 0.3 mm. Notoedric mange. Affects cats [*N. cati* (Hering)] and rabbits [*N. cuniculi* (Gerlach)]. The mites burrow into the skin of the face and ears and sometimes spread to the legs and around the sex organs. The burrowing of the mites causes a constant intense itching, and the scratching and rubbing done by the animals will often produce open sores that frequently become infected with bacteria. There is loss of hair in the affected areas and the burrows ooze serum which hardens into grayish or yellowish crusts or scabs.

Complete control of notoedric mange on laboratory rats was obtained with two treatments, at 6-day intervals, of 0.1 percent gamma BHC in liquid paraffin (8). Increasing the concentration to 0.25 percent would probably give control after only a single treatment. Note the precaution on cats given under control recommendations for *Demodex* (1).

XI. *Sarcoptes scabiei* (Degeer), mange mites. Size 0.5 mm. Sarcoptic mange, itch, or scab or scabies. Different varieties affect cattle, sheep, goats, horses, swine, rabbits, dogs and man. The mites burrow into the skin of the host in areas where the skin is tender and the hair is thin. From these areas they may continue to spread until most of the body of the host is affected. The burrowing and feeding of the mites cause intense itching, inflammation, and swelling in the affected areas. Nodules and vesicles usually appear over and around the burrows and these burst and ooze serum. The serum hardens to form grayish or yellowish scabs and the hair often falls out in the affected areas. The intense itching causes the animals to scratch and rub, leaving open sores which frequently are invaded by bacteria. In advanced cases the skin becomes thickened and wrinkled. Transmission is usually by direct contact, either with mangy animals or with objects that affected animals have rubbed against.

Appearance and location on affected animals:

Cattle—The lesions first appear on the inner surfaces of the thighs, the underside of the neck or brisket, or around the root of the tail. From these points the disease may spread to all parts of the body. The lesions appear as described above.

Sheep and Goats—The disease is commonly called "head scab" or "black muzzle" in sheep and is rare in the United States. The mites are usually confined to the head and face and the lesions are typical.

Horses—The earliest visible lesions usually appear on the neck, the shoulders, or around the head, but they may start on the breast, flanks, sides or other parts of the trunk. If the mites are not

checked, typical lesions will eventually be found on all parts of the body.

Swine—The lesions first appear on the head, around the eyes, nose, or ears in baby pigs. In growing pigs and older animals, the lesions are frequently first observed on the ears, tail, and the posterior surfaces of the hind legs, where they may remain confined in light infestations. From these points the mites spread over the neck, shoulders, and back, and along the sides to involve the entire surface of the body. The lesions are typical.

Rabbits—The lesions first occur on the nose, the lips, the chin, forehead, ears, and legs and then spread to involve the whole body. The disease is similar to notoedric mange, but is frequently more serious.

Dogs—The lesions first appear as small red points which soon develop into papules or vesicles. These may start anywhere on the body, but are most easily seen where the skin is thin and unpigmented, as on the abdomen. Later lesions are typical and often involve the whole body.

Control measures:

Statutory regulations and treatment procedures for sarcoptic mange on sheep or cattle are essentially the same as for psoroptic and chorioptic infestations, described under *Psoroptes* (VII) and *Chorioptes* (VIII).

Sarcoptic mange of swine is easily eradicated by a single spraying of lindane or *gamma* BHC when used at a concentration of 0.15 percent to 0.25 percent. This corresponds to 3 to 5 pounds of 25 percent lindane wettable powder, or 12 to 20 pounds of 6 percent *gamma* benzene hexachloride wettable powder per 100 gallons of water.

Many other species of mites, such as the cheese mites (Acariidae), beetle mites (Oribatei), and spider mites (Tetranychidae), occasionally may be found on domesticated mammals. These mites are usually transients that have accidentally wandered onto the animals from their normal habitats of grain, soil or growing plants. Such mites are not usually parasitic on the mammals for even a short time and are, therefore, of little consequence. For reasons of practicality and economy, the authors of this bulletin have not attempted to include all of the mites that may be encountered on domesticated mammals, but only those that occur commonly or are of economic importance.

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Identification

Methods of collecting mites for examination vary with their habits. Blood-sucking mites, such as the tropical rat mite, and other species that move about freely among the hairs of the host may often be seen with the naked eye. These are most easily collected with an aspirator. However, a small camel's hair brush or even a pin may be used. The brush or pin should be moistened with paraffin oil so that the mites will adhere, but water will do if the oil is not available.

For collecting mange mites a scalpel or knife blade may be sterilized by running it through a flame and then cooling it by dipping in water. Mites are collected more easily if the edge of the scraper is first dipped in paraffin oil, but this is not imperative because the lesions are usually moist. A fold of skin, showing lesions, is held between the thumb and forefinger and the crest of the fold is scraped until lymph begins to ooze. Care must be taken to avoid drawing blood. Several scrapings may be necessary before a positive diagnosis can be made.

Temporary mounts for immediate examination can be prepared by placing the mites or the scrapings containing mites into a drop of oil or water on a microscope slide and covering the preparation with a cover glass. The low power objective should be used at first with rather low illumination.

In order to observe the finer detail in the structure of the mites, it is often necessary to prepare permanent mounts. The mites are killed in hot water or, in the case of heavily engorged blood-sucking mites, in steaming lactic acid. They can then be lifted with a camel's hair brush, a pin, or a pipette and placed into a drop of mounting medium on a microscope slide. In order to avoid trapping air bubbles, the specimen should be submerged in the mounting medium and the cover glass then put in place. The slide may be used immediately if proper care is taken, but it is safer and better to allow the preparation to dry and the specimen to clear before examining it.

Polyvinyl alcohol (PVA or Elvanol) is an excellent mounting medium for mites. It has the advantages of being quick drying and easy to formulate and specimens may be mounted alive or transferred directly into it from water, alcohol, lactic acid, formalin, and many other materials. PVA may be prepared by dissolving PVA powder in distilled water in the ratio of 1 to 10. The mixture is placed in the top of a double boiler and stirred frequently until it goes into solution and is then allowed to cook until it has the consistency of thin molasses. The medium is then poured into a small bottle and allowed to stand for about 24 hours until the air bubbles disappear. If the medium becomes too thick, it may be thinned by adding water.

Hoyer's medium is superior to PVA in dry climates because of the smaller percentage of water and the consequent reduction in the amount of shrinkage of the medium and shriveling of the mounted specimens on drying. The technique for mounting mites in Hoyer's medium is the same as that described for PVA. The formula for Hoyer's medium is as follows:

Distilled water.....	50 cc.
Gum arabic (clear crystals)	50 gms.
Chloral hydrate	200 gms.
Glycerine	20 gms.

Acknowledgment

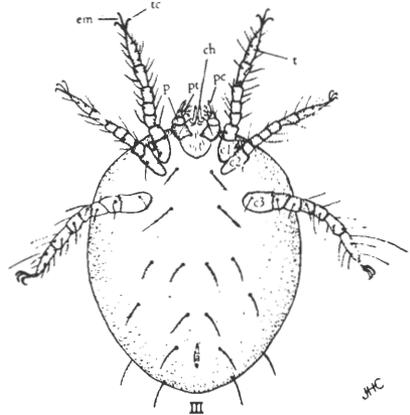
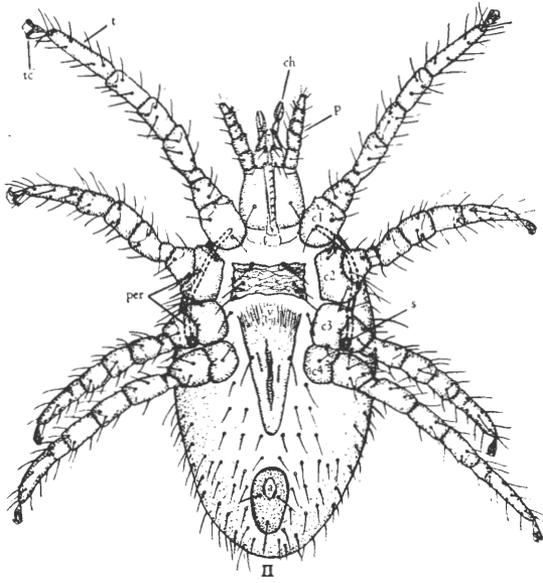
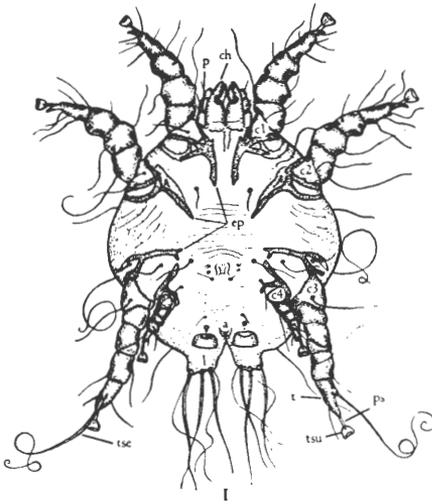
In the following key, all illustrations were drawn from actual specimens of the mites. The authors wish to acknowledge the cooperation of Dr. Benjamin Schwartz, Zoological Division of the Bureau of Animal Industry, and Dr. F. R. Koutz, College of Veterinary Medicine, The Ohio State University, in supplying slides of some of the mites that are included in the key.

Guide to Terminology

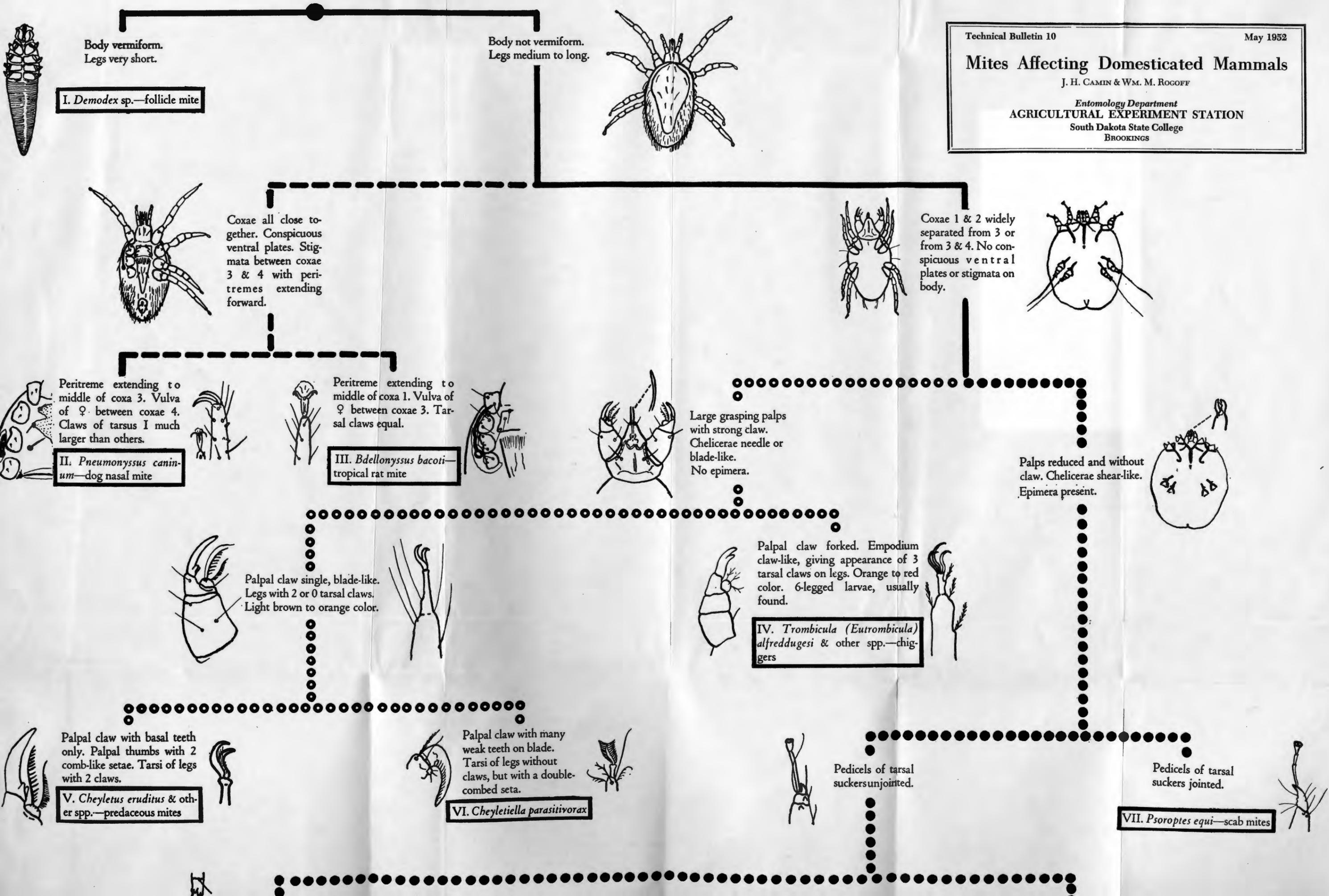
I—Ventral view of male Chorioptic Mange Mite

II—Ventral view of female Tropical Rat Mite

III—Ventral view of larval Chigger



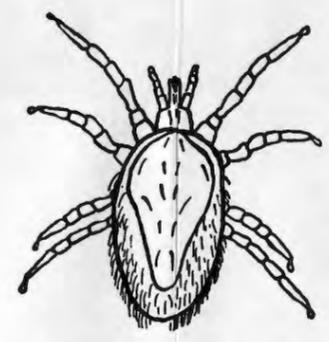
- a—Anus
- c1, 2, 3, & 4—Coxa 1, 2, 3, & 4
- ch—Chelicera
- em—Empodium
- ep—Epimera
- l—Lobes on tip of body
- p—Palp
- pc—Palpal claw
- per—Peritreme
- ps—Pedicel of tarsal sucker
- pt—Palpal thumb
- s—Stigma
- t—Tarsus
- tc—Tarsal claw
- tse—Tarsal seta
- tsu—Tarsal sucker
- v—Vulva of ♀
- ♀—Female
- ♂—Male



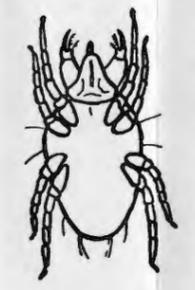
Body vermiform.
Legs very short.

I. *Demodex* sp.—follicle mite

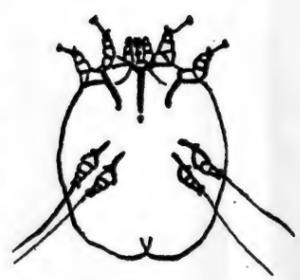
Body not vermiform.
Legs medium to long.



Coxae all close together. Conspicuous ventral plates. Stigmata between coxae 3 & 4 with peritremes extending forward.



Coxae 1 & 2 widely separated from 3 or from 3 & 4. No conspicuous ventral plates or stigmata on body.



Peritreme extending to middle of coxa 3. Vulva of ♀ between coxae 4. Claws of tarsus I much larger than others.

II. *Pneumonyssus caninum*—dog nasal mite



Peritreme extending to middle of coxa 1. Vulva of ♀ between coxae 3. Tarsal claws equal.

III. *Bdellonyssus bacoti*—tropical rat mite



Large grasping palps with strong claw. Chelicerae needle or blade-like. No epimera.



Palps reduced and without claw. Chelicerae shear-like. Epimera present.



Palpal claw single, blade-like. Legs with 2 or 0 tarsal claws. Light brown to orange color.



Palpal claw forked. Empodium claw-like, giving appearance of 3 tarsal claws on legs. Orange to red color. 6-legged larvae, usually found.

IV. *Trombicula (Eutrombicula) alfreddugesi* & other spp.—chiggers



Palpal claw with basal teeth only. Palpal thumbs with 2 comb-like setae. Tarsi of legs with 2 claws.

V. *Cheyletus eruditus* & other spp.—predaceous mites



Palpal claw with many weak teeth on blade. Tarsi of legs without claws, but with a double-combed seta.

VI. *Cheyletiella parasitivorax*



Pedicels of tarsal suckers unjointed.

Pedicels of tarsal suckers jointed.

VII. *Psoroptes equi*—scab mites





Palpal claw with basal teeth only. Palpal thumbs with 2 comb-like setae. Tarsi of legs with 2 claws.

V. *Cheyletus eruditus* & other spp.—predaceous mites



Palpal claw with many weak teeth on blade. Tarsi of legs without claws, but with a double-combed seta.

VI. *Cheyletiella parasitivorax*

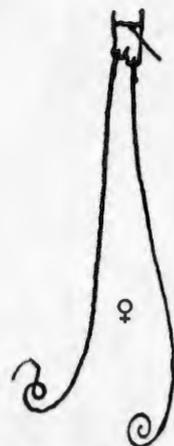


Pedicels of tarsal suckers unjointed.



Pedicels of tarsal suckers jointed.

VII. *Psoroptes equi*—scab mites



♀—Leg 3 ending in 2 long setae
♂—Tarsal suckers on all legs. Lobes on tip of body.

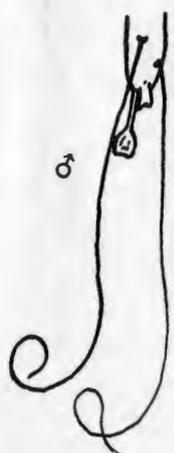


♀—Legs 3 & 4 each ending in a single long seta.
♂—Tarsal suckers on legs 1, 2 & 4 only. Leg 3 as in ♀. Lobes absent.



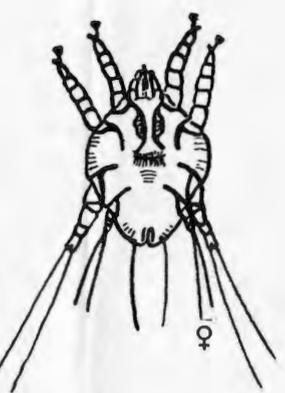
♀—Tarsal suckers on legs 1, 2 & 4.
♂—Leg 3 with one long seta.

VIII. *Chorioptes* sp.—scab mites



♀—Tarsal suckers on legs 1 & 2 only.
♂—Leg 3 with two long setae.

IX. *Otodectes cynotis*—ear mange mite

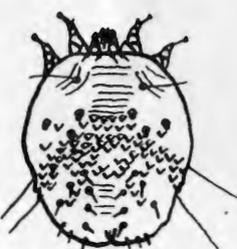


Anus dorsal. Dorsum without triangular scales.

X. *Notoedres* sp.—mange mites

Anus terminal. Dorsum with triangular scales.

XI. *Sarcoptes scabiei*—mange mites



JHE