Horse Bots and Their Control

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FOR SHEER INVENTIVENESS in accomplishing their objects, it would be hard to beat the insects, and it would seem that the devil himself must have invented the methods used by botflies to reach the viscera of horses. Fortunately, man has brains that can be pitted with reasonable success against instinct.

Horse bots are highly specialized parasites that attack horses, mules, asses, and perhaps zebras. Bots do not molest cattle, sheep, or other farm animals, even though they may be grazing in the same pasture with horses. If the horses are removed from such a pasture, the botflies will die without laying their eggs on the other animals.

Occasionally a young horse bot is found in the skin of a human being, who is evidently an accidental and unfavorable host. Under these conditions the bots act very differently from the way they do in horses; they burrow rapidly about in the skin and have never been known to grow to any considerable size or to reach the stomach or intestines, where they normally attach themselves in horses. In the human skin the minute larvae cause severe itching and local irritation. The burrows may traverse the skin for several inches, leaving a raised, reddened, circuitous streak, suggesting in miniature the work of a meadow mole in a field. How the larvae get into human skin is not known, and the cases are rare.

Four distinct species of bots have been found in the United States, but one of them is extremely rare. The other three are serious pests of horses and mules. They are known as the common horse bot.

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or nit fly (*Gastrophilus intestinalis*); the throat bot, or chin fly (*G. nasalis*); and the nose bot, or nose fly (*G. haemorrhoidalis*).²

**DISTRIBUTION**

Horse bots were undoubtedly brought to this country with horses imported from Europe.

The common horse botfly and the throat botfly occur throughout the United States wherever horses are found, but they are much more numerous in some localities than in others. Throat botflies are extremely abundant in the drier parts of the country and at the higher altitudes—that is, above 3,000 feet. The presence of large numbers of horses in which they may develop favors an abundance of horse bots.

The throat bot appears to have become established in the United States comparatively recently—that is, about 1898. It was first observed in the western part of the Dakotas and in eastern Montana and since that time has spread over much of the region from Illinois to eastern Washington and Oregon, and from southern Canada to central Kansas (fig. 1).

With the free movement of horses and mules from infested areas to various parts of the country, it is surprising that the throat bot has not become more widespread. It is likely that climatic conditions, especially in the eastern and southern States, are not favorable for this species, and this is also probably the reason why the fourth

¹ Further information on the distribution, habits, and methods of controlling bots will be found in publications by Bishop and Dove (1),² by Dove (4), and by Wells and Knipling (11).
² Italic numbers in parentheses refer to Literature Cited, p. 491.
species, the European horse bot (*G. inermis*), has not become established in the United States.

**LOSSES CAUSED BY HORSE BOTS**

Horse owners soon become aware of the presence of horse bots because of the annoyance the flies cause the animals. This is particularly true of the nose botfly, which lays its eggs around the lips of horses. The animal attacked reacts violently; it may toss its head in the air, strike the ground with its front feet, and rub its nose on the ground, the neck yoke, or a barbed-wire fence. If a very nervous animal in harness is attacked, it may run away, and sometimes serious damage results. These flies prevent horses on pasture from grazing. The animals usually stand in groups, preferably on the highest spot available, with the nose of one resting on the back of another, as shown in figure 2. Horses are often seen walking or trotting across a pasture with their heads constantly nodding to avoid the attacks of nose flies.

The throat botfly is also very annoying to animals when laying its eggs, but less so than the nose fly. The animals become excited when attacked and often throw their heads violently upward. The common horse botfly is much less disturbing than the other two, although nervous animals are considerably annoyed by it.

Contrary to the belief of many persons, these flies do not sting or otherwise hurt an animal. They undoubtedly cause a tickling
sensation when they touch the hairs to lay their eggs, and this is probably very disturbing when the nose fly touches the edges of the lips.

The newly hatched nose bots burrow into the lips and travel around in the mucous lining of the horse's mouth; the young common bots burrow in the tongue; the first-stage throat bots infest the gums. This burrowing habit, first recorded by Dinulescu (3) in 1932, causes considerable irritation and perhaps at times interferes with feeding. En route to the stomach, the bots sometimes attach themselves in the pharynx and have been known to cause swelling of the throat sufficient to prevent the passage of food.

In the stomach and intestines, the bots remain attached for several months. At the points of attachment deep pits are formed in the lining membranes (fig. 3), which may serve as places of entry for germs. If the infestation is very heavy, digestion may be seriously interfered with, and clusters of bots attached at the exit end of the stomach may impede the passage of food. These conditions give rise to colic, lowered vitality, and reduced work output. The nose bot has the habit also of reattaching itself in the rectum as it passes out, and there again it causes irritation and itching.

Much of the damage caused by bots in the mouth and digestive tract of horses is not recognized by stock owners, but it is none the less important and causes farmers heavy losses.
LIFE HISTORY AND HABITS

Like other flies, horse bots pass through four distinct stages—the egg, the larva (bot), the pupa, and the adult. The adult botflies are unable to take food; enough is stored up in their bodies in the bot stage to develop the 150 to 300 eggs to be deposited during the short life of the adult fly, whose sole purpose is reproduction. During favorable weather many eggs are laid in a short time.

In 1938 Wells and Knipling (11) presented information on the habits and life histories of these common species.

The eggs of all the species are attached to hairs of the host, but there is considerable difference in the place of attachment and also in the shape and color of the eggs (fig. 4). The common botfly lays its eggs on various parts of the animal, but particularly on the inside of the knees; the throat botfly attaches its eggs toward the base of the hairs beneath the jaws; and the nose botfly deposits its eggs on the short hairs on the lips. The egg of the last species has a stalk on the base that extends well down into the hair follicle.

The egg-laying habits of the three species of botflies prevalent in this country are also different. The common botfly hovers around the legs of the horse with its abdomen curved under, depositing egg after egg. It is a large fly resembling a bee, with the wings conspicuously spotted (fig. 5). The other two species have plain, clear wings, are slightly smaller and darker in color, and fly more rapidly. In depositing eggs they usually approach quickly, hover beneath the head for an instant, and then suddenly dart at the lips or at some spot beneath the jaws, according to the species. Usually only a single egg is laid at each strike.

The eggs of the throat botfly hatch in about 6 days, and the young bots immediately crawl into the horse's mouth. Schroeder (9) has shown that they soon establish themselves in pockets between the molar teeth, where they grow and molt to the second stage. After
3 to 4 weeks in the mouth they pass to the stomach and intestine, where they attach themselves in the pyloric, or exit, end of the stomach and in the duodenum just below the stomach.

The eggs of the nose botfly hatch in 2 to 4 days, and the minute spiny larvae penetrate the skin of the horse's lips and work toward the mucous lining, where they continue to burrow for more than a month before passing to the stomach.

The eggs of the common botfly are ready to hatch 7 days after being laid on the horse's legs, but hatching does not take place until they are rubbed by the warm lips of the horse. The bots may lie quietly in the eggs as long as 3 months awaiting this stimulus. When the horse bites the spot where the eggs are embedded, it warms them, and the bots push off the egg cap and adhere to the animal's moist lips. They soon penetrate the mucous covering of the lips and tongue.

Wehr (10) found that they burrow there for about a month before going to the stomach. During this time they molt, or cast their skins, and increase considerably in size.

All three species of bots remain attached to the lining of the digestive tract for 8 to 11 months, during which time they grow to robust tough-skinned bots about three-quarters of an inch in length. The young bots are distinctly reddish, which may indicate that they feed on blood. When mature, the throat bots are a dirty white and the common bots and nose bots pinkish. The bots of the last species take on a distinctly greenish color just before leaving the animal. When grown, the bots release their hold and pass out with the excrement, except that the nose bots reattach themselves in the rectum for a few days before dropping to the ground. They are often seen attached to the edge of the anus, from which they protrude.

The mature bots differ somewhat in size as well as color, and the species are easily distinguished by differences in their spiny armature (fig. 6).

When the bots reach the ground they seek any protection at hand, or they may burrow just beneath the surface of the soil. In 1 to 4 days the outer skin of the bot contracts and hardens, forming a protecting case in which the change from the sluggish, repulsive maggot to an active, ornate fly takes place. The duration of the pupal, or resting, stage is similar in each species and lasts from 20 to 70 days, depending on the temperature.

In general, botflies are most abundant in late summer and fall,
although in the North Central States they may begin activity about the middle of June. In southwestern Texas, the common botfly has a period of activity in the spring that ends when hot dry summer weather sets in; the flies appear again in the fall. Botfly activity ceases with the advent of freezing weather. In the warmer parts of Texas it may extend well into December.

PROTECTING HORSES AGAINST BOTFLIES

Since botflies do not feed, there is no way of attracting them to traps or poisoned baits. Animals are given little protection by the use of repellents, and nets and fringes also are of little value.

As the throat botfly deposits its eggs beneath the jaws and the nose botfly on the lips, covering those areas when the flies are active largely prevents infestation and also greatly relieves animals from annoyance by the flies. It is difficult to provide such protection for animals on pasture, although protective devices have been used even there. While animals are in harness, the throat botfly can be largely warded off by placing a piece of burlap beneath the jaws with one end attached to the throatlatch and the other to the bit rings.

Various types of protectors against the nose botfly are in use. One of the simplest and best is a piece of belting, or even of an old automobile-tire casing, 4 to 6 inches wide. This is attached at each end by a string or by snaps (fig. 7). The protector should not be drawn tightly against the mouth, and it should be long enough to cover the lips entirely, including the corners.
The incubation period, especially that of the throat bot and the nose fly, is so short that control by destruction of the eggs is impractical because of the frequency with which an ovicide would have to be applied. Moreover, no effective egg-destroying agent has been found for these two species.

The incubation period of the common horse bot is longer, but the eggs are very resistant to destruction. Kerosene oil and creosote dips, often recommended as washes for the destruction of the eggs or nits of this species, are of little value. However, a simple and effective method of destroying the eggs in the fall was discovered by Wells and Knipling (11). It consists of applying water at a temperature of 105° to 110° F. with a sponge or swab. Applying the warm water with vigorous rubbing causes a high percentage of the eggs to hatch, and the larvae quickly die.

**TREATMENT FOR THE REMOVAL OF BOTS**

Of the remedies that have been proposed from time to time for the removal of botfly larvae from the stomach and upper part of the intestines of horses and mules, only carbon bisulfide has withstood the test of rigid, critical, and painstaking experimentation (5, 6, 7, 8). A 6-dram dose, administered by stomach tube or in gelatin capsules, has become the standard treatment for a horse weighing about 1,000 pounds. For horses of other weights the dose is computed on the basis of 1.5 fluid drams (6 cubic centimeters) for each 250 pounds of weight.

This treatment should be administered not earlier than 1 month after the first killing frost, following a fast of 18 hours, and no purgative should be given. Although carbon bisulfide is a toxic substance, it is quite safe for horses provided it is given with due caution by a competent veterinarian. The volatile liquid produces a limited area of inflammation in the stomach of a horse or mule, but this is not known to have serious consequences and disappears in a week or two. When the capsule is administered by inexperienced persons, however, there is danger that it may break in the mouth,
with alarming and possibly dangerous consequences. This treatment destroys practically all of the bots in the digestive tract, and also many of the large roundworms that may be there.

Mass or solid capsules containing carbon bisulfide adsorbed on magnesium carbonate came into vogue a number of years ago as a substitute for the liquid carbon bisulfide. Critical tests by Bozicevich and Underwood (2) on seven horses showed that the solid capsule was not nearly so dependable as the liquid drug. These investigators also observed that the solid capsules became brittle with age and finally cracked and that over a period of several months they diminished in weight, owing to the decomposition of the carbon bisulfide and the escape of hydrogen sulfide. The liquid drug, then, is considered the best preparation to use for the removal of bots from horses and mules. When carbon bisulfide as put up by veterinary supply houses in gelatin capsules is administered, care should be taken to see that the capsules are still flexible. If they are brittle they should not be used.

**TIME OF YEAR FOR TREATMENT**

The time of year when the treatment is given is important. In most parts of the country the greatest success is obtained by treating during December and January. In the extreme South, January is preferable. It is desirable, of course, to remove the bots early in the season in order to put the horses through the winter in the best condition possible, but to prevent reinfection, treatment must not be given until all botfly activity has been stopped by cold weather. Hot water is then applied to all parts of the body where there are eggs of the common botfly. Thirty to forty days is then allowed to elapse to give time for the young bots to pass from the mucous membranes of the mouth to the stomach, where the carbon bisulfide can reach and kill them.

Although many bots can be destroyed by treating the horses at any time of year, if treatment is delayed until spring many of the bots may have matured and passed out, and some of the nose bots may have passed down into the lower intestine, where they are less readily reached by medication.

**COMMUNITY CAMPAIGNS**

One of the most practical developments in medication for the removal of bots from equines is the community or area campaign for eradication by medicinal treatment of horses and mules. In the Middle West, the South, and elsewhere, these campaigns have been carried out with considerable success. As a rule, area or community treatment is supported and arranged for by the county agent or farm adviser. Under ideal conditions, all the horses in a given area are treated at the same time and at one place or in a limited number of places where the animals are assembled. The treatment is administered by veterinarians, practically all of the veterinarians in the community participating in the work. So far as can be ascer-
tained, there has been no dissatisfaction with this method on the part of the veterinarians administering the treatments or of the farmers engaging in such cooperative efforts. In all instances liquid carbon bisulfide in capsules is administered to the horses, which have been kept on a fast for 18 hours. Area or community treatment has great advantages over individual treatment not only because it affords professional services at a minimum price but also because it may pave the way for complete eradication of bots from horses and mules in the area.

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