INFECTION OF MAN BY DIPTEROUS LARVÆ.

WITH REPORT OF FOUR CASES.*

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The presence of various fly-larvæ as parasites or as pseudo-parasites of man has attracted little attention, although it has been noted since very early times and is of constant, although relatively infrequent, occurrence.

Homer mentions a maggot affecting man. Plutarch tells of Mithridates being condemned by Artaxerxes Longimanus to be devoured by fly-larvæ. He was left bound, with his face smeared with honey, and fed daily. When he died on the seventeenth day it was found that the fly-larvæ had so consumed his flesh that his entrails were exposed and covered with the larvæ. Herod Agrippa also was "eaten of worms and died." Later we find Galen prescribing a remedy for ulcers inhabited by "worms."

During the sixteenth and seventeenth centuries especially do we find a great many records of fly-larvæ as well as more remarkable creatures that were found in the feces, vomitus and urine of patients. Many of these were doubtless more or less fanciful and, as is occasionally the case to-day, the reports of hysterical patients.

Authentic cases are numerous, however, not only of infection by fly-larvæ, but by other insect larvæ as well. Hope⁵ records a cause of a boy that vomited large numbers of the English cabbage butterfly, and Hope, Chichester,⁴ Pickels,¹⁷ Sandberg²¹ and Blanchard² report cases of infection with beetle larvæ. Other cases are given by Kirby and Spence,⁸ and Hope gives a table of reported cases. Such cases are, however, rare and accidental, but in the case of certain few dipterous larvæ we are concerned with species whose normal mode of life is parasitic or with species that readily adapt themselves to parasitic existence.

Infection by fly-larvæ was designated by Hope as myiasis and has been divided by other authors (Joseph) into myiasis externa or dermatosa and myiasis interna or intestinalis.

I shall take the infections by these larvæ up in their natural order. The nomenclature in each case is that of the original reporter.

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FAMILY SYRPHIDÆ.

This is one of the largest groups of flies and comprises those more commonly found about plants and flowers. But few cases are recorded of infection by larvæ of this family and these all by larvæ of the genus *Eristalis*, which are found in decaying vegetables and fruits and in decaying organic matter of all kinds or in water saturated with organic remains.

The following species are reported to have been passed from the bowels, but no definite history of the manner of infection or of the duration of their parasitic existence is given:

Eristalis diminiatus.
Eristalis tenax.
Eristalis arbustorum.
Eristalis pendulus.

FAMILIES SEPSIDÆ AND DROSOPHILIDÆ.

The larvæ of these two families are found in the leaves and stems of plants or decaying vegetables and animal matter. Some of the larvæ are aquatic.

The larvæ of *Piophilæ casei* are well known as the "skippers" of cheese and bacon. The eggs of this fly have been swallowed with cheese or bacon and have lived and developed in the human stomach and intestines until nearly ready to pass into the pupal stage (Meschede¹² and Moniez¹³). Infections by these larvæ were observed during the eighteenth century by von Rolander and Linné.

The larvæ of *Drosophila melonogastra* occur in fermenting fruits, preserves, vegetables, sour cream, etc., and are mentioned by Joseph⁶ as occasionally found in the stomach and intestines.

The symptoms in both of these cases are those of acute gastric irritation and are discussed under the symptoms of myiasis intestinalis produced by *Anthomiidæ*.

FAMILY ANTHOMIIDÆ.

This comprises a family of flies "similar in appearance to the common house-fly, the main vein posterior to the middle of the wing turned upward. Eyes of the males large and contiguous, bristles of antennæ either feathery or bare" (Sharpe²²). These flies are small or of moderate size and usually non-metallic in color. They are common about vegetable gardens and orchards and about heaps of decaying vegetable matter, compost and the like. One fly of the group is so common a frequenter of privy vaults as to have gained in Europe the name of the "privy-fly" and to have led to the supposition that the intestinal infection

was from eggs deposited on the anus (Finlayson²⁸). These flies are frequently found about the house also and have been referred to as the "lesser house-fly."

The larvæ are characteristic in appearance; of an elongated conical shape, pointed anteriorly and more rounded posteriorly, showing their segments plainly, and bearing on each segment a pair of branched lateral branchiæ which are very prominent and replace the spiracles found in other groups of dipterous larvæ, enabling the animals to exist indefinitely in liquid and semi-liquid media.

The larvæ of the species which cause intestinal myiasis are found in vegetables, such as turnips, lettuce, beets, radishes, etc., in orchard fruits, and often occasion considerable loss to the gardner. Others live only in decaying vegetables and fruits and experiments on decayed fruit (Walsh⁴⁷) have produced several varieties of fly larvæ from eggs previously deposited on the ripe fruit. Other flies of the group are parasitic on other insects as the locust, and another form was found in a tumor on the wing of a woodpecker. Kuchenmeister⁷ and Wernicke state that anthomyiid larvæ occur in the intestines of dogs and Iliff³⁴ reports an instance of the larvæ being found in the feces of a boa-constrictor.

The following species have been found parasitic in man:

Hydrota metcoricis.
Homolomyia cunicularis.
Homolomyia scalaris.
Anthomyia cunicularis.
Anthomyia furcata.
Anthomyia brassica.
Anthomyia saltatrix.
Anthomyia radicii.
Anthomyia ceparium.
Anthomyia fluvialis.
Anthomyia incisurata.

The larvæ of this family can live as true parasites of man for the full term of their larval existence, there seems to be little doubt. As will be brought out later, they do not, as a rule, have the digestive juices or the peristalsis of a normal intestinal tract to contend with. Their lateral branchiæ allow them to live in a fluid media and to draw their supply of oxygen from a considerable area; their inactive existence renders their need of oxygen very small. Hofman³³ points to the power of the larvæ to live in acid media (vinegar) as indicative of their ability to resist the acidity of the stomach. In the gastrointestinal tract they have presented to them also food which differs but little from the normal. From the length of time which the symptoms last in the different cases before the

larvæ are expelled and from the lapse of time between the history of ingestion of the probable source of infection and the appearance of the larvæ in the stools, it is to be assumed that the full period of larval life is passed in the intestine. It is, of course, evident that only the eggs or the freshly hatched larvæ could escape detection in the food or survive the masticatory process. In the case cited by Lampa⁹ the larvæ went into the pupil stage almost immediately after they were expelled in the feces.

For the history of the following case I am indebted to Dr. Blankenmeyer, bacteriologist for the Illinois State Board of Health, at Springfield:

The patient was a man aged 30; weight, 145 pounds; rural mail carrier. For the last twelve years there had been constant gastrointestinal symptoms, abdominal pain, constipation and headache. On Saturday, May 19, 1906, the patient began eating raw pumpkin seeds and continued the same without other food until Tuesday morning; then a full dose of laxative mineral water was given. At noon of that day he passed from one thousand to one thousand five hundred larvæ, which proved to be a species of *Anthomyia*. The patient was put on calomel, santonin and aspidium but without further result. The abdomen decreased five inches in circumference and the patient professed to have slept better than for months previously.

In addition to the preceding instance I have collected reports of twenty cases. In nine of the twenty-one cases available there had been previous gastric disturbances or a lowered general resistance. Hofman³¹ and Lublinski⁴⁶ diagnosed a previous gastric catarrh, Lublinski⁴⁶ gastrop-tosis, Huber³² phthisis, and in other cases (as in that reported now) the history indicates gastric or enteric derangement. It is regrettable that accurate gastric analyses have not been made so that it might have been learned whether or not the eggs and larvæ were subjected to the action of a normal gastric juice.

The onset is generally sudden and the symptoms those of an acute catarrhal gastritis and enteritis, but it may be more gradual, the symptoms merging with those of an antecedent gastric or enteric disorder.

General malaise and weakness are prominent; the face is pale and there is a complete loss of appetite. Nausea and vomiting occur at the onset and during the course; in some cases the larvæ are found in the vomitus. In many cases the gastric and abdominal pain is mentioned as severe; the pains are described by Lublinski as "*fürchterliche Leibschmerzen*." There is a feeling of distention and distress and in the classical case of Jenyus³⁶ a "tremulous motion" was complained of; in the case of Lockwood⁴³ there was "a choking sensation, as of worms crawling up the throat." All the remaining symptoms of acute catarrhal

gastritis are present, such as a coated tongue, acid eructations, mucus in the vomitus, excessive thirst and colicky pains. In the two cases recorded by Leidy⁴² the symptoms are described as those of cholera morbus.

The nervous symptoms are especially prominent and severe; dizziness and violent headache occur, and in the case of Judd, the patient, a lad of fourteen, had violent spasms which disappeared with the passage of the larvæ. Krause⁴⁰ and Germar's³⁰ cases were characterized by severe epileptiform attacks. In both cases the attacks ceased with the passage of the larvæ. The patients were adults.

The larvæ have been found also in other parts of the body. Fairmaire²⁷ reports an ear infection in which anthomiid larvæ were found, and James³⁵ quotes an instance of nymphomania described by Wernicke, of Buenos Aires, with severe excoriations of the vagina and discharge, irrigation bringing to light anthomiid larvæ, which, so it was thought, "had developed in the rectal pouch and migrated through the parietes."

The diagnosis can be made only by finding the larvæ in the stools or vomitus. The prognosis is certain. The larvæ are passed out naturally within a time varying from one to fourteen days if no treatment is given, and with their passage the symptoms cease. Schlesinger¹¹³ reports a fatal case of infection by fly-larvæ, in which the nature of the larvæ was not determined, but the result of the autopsy by Weichselbaum would seem to indicate that it was not an anthomiid infection.

The treatment in the published cases has varied. Lampa⁹ is of the opinion that it is impossible to reach the larvæ by any means and that they will pass out in their own time, which is just before they enter into the pupal stage. Blanchard¹ also found all vermifuges and anthelmintics without effect; Meschede alone obtained good results from *santonin*. On the other hand, simple purgatives and laxatives have given good results. Finlayson²⁸ succeeded with a large dose of mineral water after *aloin* had failed; in other cases also a laxative water has freed the intestine of the parasites. It is likely from the structure of the larvæ that such would be the case, as they are possessed of no means of obtaining a firm hold on the mucosa and would be readily washed out by copious doses of laxative water or saline cathartics.

FAMILY OESTRIDÆ.

"Rather large or very large flies, with extremely short antennæ, having a segmented arista; the front of the head prominent; the posterior portion of the wings rough and with few veins; mouth usually atrophied, the trophæ being represented by tubercles" (Sharpe).

This is a small group of flies, of less than eighty species, the larvæ of all of which are true parasites in mammals; in birds and reptiles (terrapin) also, cases are reported (Leidy). The adult flies are well known as bot-flies, breeze-flies, warbles, heel-flies or gad-flies, and present a very characteristic appearance. They are large, the common species hairy, with short antennæ and small eyes. The mouth parts are atrophied and the fly subserves only a generative function.

The larvæ are parasitic in various animals, as in cattle, horses, sheep, deer, rabbits, squirrels, etc., and are found in various parts of the body; beneath the skin in cattle (*Hypoderma*), in the stomach in the horse (*Gastrophilus*), in the nasal sinuses of sheep (*Oestrus ovis*), beneath the skin and the scrotum of the squirrel (*Cuterebra cuniculi*), etc.

Gastrophilus equi.—The eggs of this species are deposited on the hair of the fore parts of the horse. The moisture and friction of the horse licking these parts opens the operculum at the free end of the egg, and the living larvæ are transferred to the horse's tongue. Osborne⁶² has shown that this occurs most readily from the fourteenth to twenty-eighth day. The larvæ grow rapidly in the mucous secretions of the mouth and pharynx and are gradually passed on to the stomach, where they become fastened to the wall by the two chitinous oral hooks and grow rapidly. They are most abundant about the pyloric end. The larvæ remain attached to the wall of the stomach from late summer or fall until the succeeding spring, when they are passed out by the intestine and burrow into the ground, emerging as the adult fly in five weeks. The adult larvæ is three-fourths to one inch in length and elongated oval in shape. The head is slender and surmounted by two chitinous spines, below which is a double row of short, minute spines. Along the anterior margin of the first seven segments is a double row of short chitinous spines. Along the anterior margin of the eighth segment is a single row.

Raillet shows that these larvæ can exist in other animals, as in the dog. I have been able to find but two definite instances reported in man, although certain doubtful cases from their chronic nature and their severity would seem to belong to this class.

French⁶¹ gives the case of a boy ten years old, who had been the subject of epileptic seizures for four years. When a free catharsis was produced larvæ were found in the stools which were said by Howard and Coquillet to belong to a species of *Gastrophilus*. But one more spasm occurred after the administration of an anthelmintic.

Schock's⁶⁸ case occurred in a woman with a chronic gastric catarrh.

Larva Migrans (Crocker).—There has been described by Hamburger⁶⁵ in this country, by Lee⁷³ in England, and by several Russian observers, Samson-Himmelstjerna,⁸⁴ Sokolow and others, an eruption which is supposed to be due to a species of *Gastrophilus*, possibly *hemorrhoidalis* or *pecorum*. The etiology is not certain, however, and Newman (Galloway⁶²) supposes it to be due to some acarine mite, possibly *Tetranychus telarus*. It starts an itching pimple or small fissure and proceeds as an irregular, unbranched line, red, slightly raised, 2 mm. wide, and just beneath the skin. The parasite is found about 0.5 cm. beyond the reddened extremity of the line, and can be seen with a lens by rendering the skin just beyond the line anemic by pressure with a glass slide, when it appears as a black speck 0.5 to 1 mm. long. It moves about the body in a very irregular manner, advancing from 1 to 15 cm. per day, and is accompanied by severe itching and discomfort. The part previously traversed heals rapidly, leaving for a while a pigmented line.

It especially affects children and young peasants working in the fields. Only the uncovered parts of the body are attacked. So far it has been observed principally in Russia.

Genus Hypoderma.—The larvæ of species of this genus are normally parasitic beneath the skin of cattle, and of buffalo, deer, camels, etc. In this country two species have been described—*Hypoderma lineata* and *Hypoderma bovis*. Of these, *Hypoderma lineata* is found universally in North America and it seems probable that the cases of infection by *Hypoderma bovis*, which is the common old-world species, should be referred to *Hypoderma lineata*.

Hypoderma lineata is found in all portions of the United States, but especially in the south and middle west. The adult fly is found in the open fields, rarely in wooded places or in the stables, and it rarely follows the cattle into the water. The eggs are deposited generally in the late summer or early fall, on the heels and hind parts of the cattle, fastened four or six together on a hair, one fly often depositing a very large number on each animal. It was long supposed that the larvæ hatched from these eggs burrowed at once beneath the skin, thus finding their way to the back and shoulders. It was also thought by some that the fly in the act of deposition placed the eggs beneath the skin, a painful process which would explain the great terror which the cattle are said to have of these flies. Cooper Curtice^{56, 57} has shown, however, that here, as in the case of *Gastrophilus equi*, the larvæ are licked off by the animal, thus finding their way into the pharynx and esophagus. The larva as found in the esophagus when first hatched is about 0.08 mm. long by 0.02

mm. wide and of a slender, elongated oval in shape. It is densely covered with spines, those on the terminal segment being much larger and curved backward. Two oral hooks are present on the first segment.

In the second stage, which represents that most commonly found in the pharynx and esophagus and which is the form first found beneath the skin, the larva is from 11 to 14 mm. long and has lost all except a few short spines about the anal spiracles and the mouth parts. In this stage it lives in the secretions of the pharynx and esophagus for several months, generally migrating through the cellular tissues to just beneath the skin about December.

The parasite found beneath the skin at first is identical in form with that found in the esophagus. The larva migrates around in an irregular manner, living on the wound secretions, and grows rapidly, so that it causes a palpable tumor.

In the third stage the larva is about 16 mm. long, is broader and tapers anteroposteriorly. The spines are again prominent, but they are differently arranged and are not as prominent as in the adult larva. The tubercles have not yet developed.

In the fourth stage it is about 22 mm. long and is a thick, fleshy grub, grayish white in color, sometimes showing a brown color in the later stages. The spines are larger, less numerous and thick tubercles are developed on the segments. In this stage the larva burrows through the skin and falls to the ground, ready to enter into the puparium.

These larvæ have been known as parasites of man for centuries. At one time an *Oestrus hominis* was described, but all such cases have been shown to fall within the well-known species parasitic in animals, in this country *Hypoderma lineata* and in Europe *Hypoderma diana*.

The following case was sent to Dr. Zeit by Dr. J. G. Holmes, of Fierro, New Mexico. I am indebted to Dr. Holmes for the history.

The patient was a boy, aged 13; goat-herder; no history of any previous gastric disturbance. In the fall of 1903, the patient began to complain of indigestion, regurgitation of food, belching and gastric pain of irregular occurrence. The bowels were regular and the patient was apparently in other respects, well.

In November he noticed a swelling on the chest. It moved over the upper part of the body, head and arms, never staying in one place more than three or four days. Where the swelling had been a yellow stain was left which disappeared after several days. At one time the patient noticed two distinct swellings, one on the head and one on the shoulder. Occasionally he would apparently be free from the swellings and tender spots for two or three days.

The patient was examined by Dr. Holmes on several occasions. On the first examination in December the tender spots on the right side of the chest over third and fourth ribs, was slightly swollen, red, and about three or four inches in diameter, with no fluctuations, tender to touch, and often causing great pain. At another time the swelling was over the left ear, on the scalp.

On Dec. 30, 1905, the patient noticed a swelling on the right arm, painful

and red. During the day the swelling moved from the shoulder to the wrist of the same arm. On waking the next morning the swelling was on the anterior surface of the right shoulder over the head of the humerus, about two inches in diameter, red, and tender to the touch. A small circular hole about one-twentieth of an inch in diameter was noticeable at the center of the swelling. On the evening of December 31, while squeezing the swelling, the larva in question was expelled. It was about one-half an inch long. About one dram of thin, yellow serum followed. Recovery occurred after about two or three days. Subsequent health was good.

The larva in question was a larva of *Hypoderma lineata* in the second stage, or the first stage in which it is found beneath the skin.

There are several records of such cases in the literature, but none with a more complete history.

The persons most commonly affected are men whose occupation takes them about cattle or into the fields which cattle frequent. It is probable that some degree of personal uncleanness plays a part and that the fly in depositing its eggs on man, if it does so, is guided by the odor of the cattle on the person in question. It seems more probable, however, from the fact that only one or very few larvæ are ever found in a single patient, that the living larvæ are transferred to the mouth.

The large proportion of children infected is especially noticeable. In seven American cases in which the larvæ were doubtless those of *Hypoderma lineata*, six were in children between the ages of six and twelve. The European cases, however, afford a larger proportion of adults.

The case above reported is the only one I have been able to find in which a definite history of gastric disturbance is given. From the life history of the worm we would expect a history of gastric pain.

The tumor usually appears during December or January and is first seen on the breast or on the neck. It is circumscribed, red, tender and moves about in an irregular manner, leaving a yellow pigmented trail, which gradually disappears. On palpation, movement may sometimes be detected within the tumor. Allen⁵⁰ closely observed the movements of the larva, marking with silver nitrate the spot where the larva was last seen. On one occasion it had moved only one inch, while at another time it traveled from the wrist to the elbow in twenty-four hours.

The presence of the larva occasions considerable burning and itching. Pain is present and is especially severe at night, keeping the patient awake.

If allowed to progress the tumor frequently becomes quiescent and a small opening is formed at its apex. The larva needs more oxygen for its now more rapid growth and the posterior end of the body, the posterior segment of which bears the principal breathing apparatus, is close below the opening.

The tumors may be found on almost any part of the body, but are usually on the upper trunk, neck, shoulder and arms. Hamilton gives a fatal case in which the larvæ were at the root of the tongue.

The treatment in each case is immediate excision of the larvæ.

Cephenomyia.—Several species of this genus are found parasitic in the nasal sinuses of sheep, in which they occasion very severe symptoms. Wesley Thompson reported a case in a man in San Bernardino, California. The patient, who had previously suffered from nasal catarrh, showed an accelerated pulse and fever, the nose was swollen and the nares nearly closed with dried blood and mucus. Forty larvæ were removed.

Dermatobia cyaniventris (Marquart, 1840), *Dermatobia noxialis* (Brauer, 1860), *Cuterebra noxialis* (Goudot, 1845).—I shall give these as one species, although Blanchard⁵¹ distinguishes two separate species, *Dermatobia cyaniventris* and *Dermatobia noxialis*. Their classification and life-history are still indefinite and the cases in the literature are given as for a single species.

The larva is known and described under various local names, as the *ver macaque* (monkey-worm), *torcel*, and in Mexico *moyociul*. It is found in South and Central America and cases have been reported in the southern portion of the United States. It has so frequently affected man as to become known as the *Oestrus hominis*, under which title it has been frequently described in literature.

It attacks also horses, cattle, sheep, cats and dogs. It is probable that the eggs are deposited on the hair as in other species, although some observers describe a painful sting, on the site of which the tumor subsequently develops.

The tumor is found on all parts of the body, but especially on the buttocks. It is furuncular in appearance, motionless, and, according to most observers, very painful, although natives, who are frequently affected, are said to feel very little discomfort.

FAMILY SARCOPHAGIDÆ.

This family of flies is distinguished by "little more than that the bristle of the antennæ is feathery at the base, but hair-like and very fine at the tip" (Sharpe²²).

The larvæ are found in decaying vegetable and animal matter, often in fresh meats and other foods. Several species are parasitic in other insects and others are parasitic occasionally in other animals and in man. The flies are exceedingly prolific and the eggs hatch very rapidly, or as in the genus *Sarcophaga*, the fly is viviparous or else the eggs hatch almost instantly.

Cases have been observed of intestinal myiasis in which species of *Sarcophagidæ* have been found (*S. hæmatodes*, *S. carnaria*, *S. hæmorrhoidalis*, *S. affinis*).

In man, however, the flies are most commonly found developing in suppurating wounds and ulcers and in chronic ear and nose affections, where there has previously been considerable discharge. In Egypt the larvæ have been found in ulcers beneath the eyelid.

Kohn³⁹ gives a case in which thousands of sarcophagid larvæ were found in the peritoneal cavity, whence they had found their way from an ulcer molle. Kirby and Spence⁸ mention a beggar who was accustomed to placing his surplus contributions, especially meat, between his shirt and skin. Feeling ill, he lay down to sleep in the shade. What was probably a species of *Sarcophagidæ* consumed the meat and then attacked the man. When found he was too weak to help himself and the flesh was partly consumed from his breast so that he died in a hospital one hour after being moved there. Cloquet gives a similar case.

Larvæ of this family have also been found in furunculous swellings beneath the skin, in the vaginas of girls and women, especially where there had been a discharge. They are even reported to have penetrated the cranial cavity from infection of the sinuses or by the orbital fissure (Peiper¹⁵).

In Russia infections by these larvæ have been very frequent (Portschinsky¹⁰⁵).

The following species have been found: *Sarcophaga carnaria*, *S. Magnifica*, *S. wohlfahrti*, *Sarcophila meigeni*, *S. latiferous*, *S. ruralis*, *S. ruficornis*.

FAMILY MUSCIDÆ.

The *Muscidæ* comprise our common house-flies, and are distinguished by the bristle of the antennæ being feathered. The larvæ are found in all manner of decomposing matter and are everywhere well known.

Several larvæ of *Musca domestica* were sent to Dr. Zeit, having been found in the stools of a patient and mistaken for *Distomes*. No history of any kind was obtainable.

Dr. Leidy⁴² reported a case in which the larvæ of the bluebottle fly (*Lucilia cæsar*) had been found in the stools.

In the cases given by Krause¹¹⁰ and Senator¹¹⁴ a description of the symptoms is given. These are identical with those observed in other cases of intestinal myiasis.

Larvæ of *Muscidæ* have also been found in wounds and in ulcers, in the ear, nose and vagina.

A patient presented himself to Dr. Zeit, complaining of severe pain in one ear accompanied by some discharge. Several days previously one of the common species of flies had got into his ear and lodged in the canal, but after a moment or two it ceased to discomfort him and he supposed that it had escaped. On examination the remains of a fly were found in the canal, while the skin and the connective tissue over the cartilage were riddled with small burrows in which were numerous larvæ. These were removed by means of forceps and antiseptic washes. The species was not determined.

The following species of *Muscidæ* have been reported occurring in the intestine: *Musca pendula*, *Musca domestica*, *Musca stabulans*, *Calliphora vomitoria*, *Lucilia cæsar*.

The following species have been reported in wounds and in other external affections: *Musca domestica*, *Musca stabulans*, *Calliphora vomitoria*, *Calliphora erythrocephalus*, *Lucilia cæsar*.

Compsomya (Lucilia) macellaria.—The screw-worm, the larva of *Compsomyia macellaria*, is by far the most frequent cause of myiasis externa in the United States and the one which causes the most serious consequences. It is found throughout the southern part of the United States, in Mexico, South and Central America. Occasionally a case of infection by the larva has been reported in the northern states.

The larva is about three-fourths of an inch long. Between each two of the segments is a row of bristles which cause it to resemble a screw. The larva is pointed anteriorly and the head bears two sharp, pointed, strong black hooks. It is found in fresh and decaying meats and in infected wounds in cattle, sheep and other domestic animals, occasionally in man.

In man it is found in wounds, ulcers, in the ear and especially in the nasal sinuses and the pharynx. It has even invaded the eye-ball. Several fatal cases are reported and some idea of the extremely destructive nature of the infection may be gathered from Snow's case in which he found, after death, the cervical vertebræ denuded of all tissue, the hyoid bone destroyed, and the nasal bones held only by the superficial fascia. The palate bone broke on the slightest pressure.

A large number of these larvæ are often found in a single infection; and as many as two or three hundred have been removed.

Ochromyia anthophaga (Blanchard).—The larva of this fly infects man in South Africa in about the same manner as the *Dermatobia* larva in South America. The fly belongs to the *Muscidæ*.

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