

study to be taken before the student begins his professional work, care will have to be observed by the authorities of the medical schools to see that the credentials brought cover the right ground. In the future of medicine the higher chemistry will undoubtedly play an important part. These lines are written mainly with the object of calling attention to the relatively great value of general and physical chemistry in this work.

### TROPICAL CUTANEOUS MYIASIS IN MAN.

J. LEE ADAMS, JR., M.D.  
WASHINGTON, D. C.

At the present time, when the construction of an isthmian canal has turned the attention of medical men toward the tropical diseases of the Isthmus of Panama, I believe it will be of both scientific and practical value to bring forward a few observations I made on the isthmus, in regard to one of the most troublesome and common diseases of that locality.

Tropical cutaneous myiasis of man is caused by the *Dermatobia noxialis*, sometimes called the *Gusano-peludo* or *Muche*. Since 1749 numerous authors have treated the subject, but usually from the entomologic standpoint. Among the authors may be mentioned Linnaeus,<sup>1</sup> Say,<sup>2</sup> Clark,<sup>3</sup> LeConte,<sup>2</sup> Verrill, Goudot, Matas, Blanchard,<sup>4</sup> Railliet,<sup>5</sup> and others.<sup>6</sup> Blanchard's<sup>4</sup> article is the most extensive and complete. It contains a synopsis of the writings of thirty-one authors, extending from 1749 to 1889, and gives a detailed description of numerous larvæ which he has examined. Dr. Matas<sup>7</sup> published an article on the larvæ, which he took from the epidermis of two of his patients.

Cutaneous myiasis, as a result of the deposition of the eggs of the botfly, though common in animals of the temperate climate, is rare in man. In the tropics, no other disease is so common to man.

The *Dermatobia noxialis* belongs to the family *Oestridæ*, which includes the botflies. Various species of the family attack the horse, ox, sheep, rabbit, dog, monkey and man. In the horse, the disease is caused by the *Gastrophilus equi*, or botfly, the larvæ of which develop in the stomach and the intestines. In the sheep, it is due to the *Oestrus ovis*, and the larvæ develop in the nose and the adjoining cavities. In the ox, the disease is due to the *Hypoderma lineata* and *bovis*, and is a cutaneous myiasis. In the rabbit, it is due to the *Cuterebra cuniculi*, and results in a cutaneous myiasis. In man, monkey and dog of tropical America, it is caused by the *Dermatobia noxialis* and *cyaniventris*, and produces a cutaneous myiasis. Other forms of botflies, however, do produce a myiasis in man and dog, and at times the ox and sheep botflies attack man.

#### GENERAL DESCRIPTION OF THE PARASITE OF THE ESTRIDÆ FAMILY.

These parasites pass through three stages—adult, larval and pupa. The adults are heavy-bodied insects,

1. Linnaeus: Systema Natura.

2. Say: Complete writings, edited by LeConte.

3. Clark: Rees, Cyclopaedia, article on "Bots."

4. Blanchard: Sur les *Oestrides américaines* dont la larvæ vit dans la peau de l'homme. Annales de la Société Entom. de France, vol. lxi, p. 109, 1892. Note additionnelle sur les *Oestrides américaines* dont la larvæ vit dans la peau de l'homme. Bull. Soc. Entom. de France, Paris, vol. xiv, p. 209. Also Nouvelles observations sur les larvæ de *Dermatobia noxialis*. Bull. Soc. Centr. de Med. Vet., Par., v. 50, n. s., vol. xiv, pp. 527-538, 1896.

5. Railliet: Traité de zoologie médicale et agricole, Paris, 2e édition, 1895, voir page 779.

6. Insects affecting domestic animals, U. S. Dept. of Agriculture, Bureau of Entomology, Bulletin No. 5.

7. Matas, R.: Insect Life, vol. 1, p. 76, 1889.

somewhat resembling the fly and the bee. The larvæ are thick, fleshy grubs living a parasitic life in the bodies of various animals; they are composed of twelve segments more or less covered with rows of large black spines. The cephalic and caudal segments are provided with breathing tubes. The larvæ leave the host, then enter the earth, where they remain a certain length of time and finally emerge as flies.

#### DESCRIPTION OF THE DERMATOBIA NOXIALIS (FROM BLANCHARD).

Of the adult stage nothing is known other than it is a fly. "The larva is grayish white, pyriform in shape, 14 mm. long, 5 mm. thick, and is composed of seven distinct segments and a long caudal extremity. The anterior part of the first or caudal segment is invaginated and has hooked mandibles, which are scarcely visible. The second, third and fourth segments are covered with fine spines, scattered without order, and most abundant on the anterior half of the second segment. On the posterior border of the fourth segment there is a crescentic row of large black spines or hooks, nineteen in number, and confined to the dorsal surface. The anterior border of the fifth segment is capped by a girdle of large black hooks, twenty-five in number, which correspond dorsally with the half circle above. On the posterior border of this segment there is a dorsal demigirdle of nineteen hooks, similar to that on the fourth segment. The surface of the segment is covered with a small number of spines. The anterior border of the sixth segment has a girdle composed of twenty-three hooks, while the posterior border has a demigirdle of fourteen hooks, which are confined to the dorsal surface like the preceding demigirdle. The spines on the surface of this segment are few in number. On the seventh segment there is but one row of hooks, twenty-two in number, forming a complete girdle on the anterior border of the segment. The small spines and half girdles are missing in this segment. Following the seventh segment, the lines of division between the segments are very indistinct, the portion directly beyond is without spines or hooks, but what would correspond to the tenth, eleventh and last segments are covered with small spines." This description corresponds to the parasites found in my cases.

#### MODE OF INFECTION.

The method by which the parasite gains entrance to the body of its host is still clouded in mystery. There are, however, three theories. First: That the fly lays the egg on the skin, where it hatches and the larva bores its way into the skin. This is the theory most generally accepted. Second: The fly lays the egg into a wound previously made by her in the skin, where it hatches, and the larva bores deeper. Third: Recently it has been suggested that the eggs are carried into the mouth, where they hatch; that the larvæ attach themselves to the mucous membrane of the esophagus and pharynx, remaining there for a time to disappear, wander through the tissues of the body and finally locate in the subcutaneous connective tissues. This theory is based on the investigations of Dr. Curtice<sup>8</sup> in the cutaneous myiasis of cattle, a disease due to the *Hypoderma lineata*, a species closely allied and belonging to the same family as the *Dermatobia noxialis*.

#### A STUDY OF CASES.

In March, 1900, I was physician in charge of a party of seven whites and twenty-five natives, then exploring

8. Curtice (Cooper) Journal of Comparative Medicine and Veterinary Archives, vol. xli, No. 6, 1891.

for a canal site at Caledonia Harbor, Isthmus of Darien. Of the seven whites, six became hosts of the parasites, and had a total of nineteen lesions. One white man who never took off his clothing escaped. Another, equally opposed to removing his clothing, had one parasite located in his ankle, which he constantly exposed to the attacks of the fly by going around in slippers and pajamas. Of the five remaining whites, all had at least two parasites, the writer having five. Among the natives, no record was kept as to the number of lesions, but it was noticed that, although they were in no sense immune from attacks of the parasites, they were seldom the hosts of more than one or two of the larvæ at the same time. The white members of the party were first exposed to the attacks of the parasites March 14, 1900. April 7, 1900, several complained of small boils, which later proved to be parasitic. The locations of the parasitic tumors in the whites were as follows: ankle 4, elbow 2, abdomen 3, thigh 2, calf 2, upper arm 2, buttocks 1, back 3.

The deposition of the eggs on the skin usually occurs while the individual is in bathing, as has been attested by numerous observers and victims. That the individual attacked is ever aware of the exact moment of the deposition of the eggs, must be viewed with doubt. Few of those stung in a tropical country pay any attention to such a trifling and common occurrence as a sting, much less remember the exact location with reference to the development of a boil sixteen days later. The

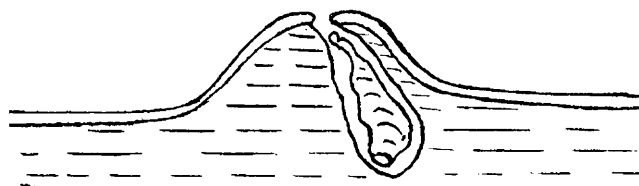


Fig. 1.—Diagrammatic drawing of parasitic tumor giving natural size of tumor and parasite after two and a half weeks' growth, and showing oblique position of parasite, capsule, central opening and relations.

period of incubation is from sixteen to twenty-three days.

The first indication of the disease is denoted by the appearance of small red papules, about the size of a pin head, each of which has a clear, well-defined, minute central opening. For about a week no symptom other than an increase in size of the papule with a corresponding increase in size of the central opening, is manifest. The patient usually imagines it to be, and the growth strongly resembles, a boil. On the seventh or eighth day after the discovery of the papule, a sharp pain, lasting a few minutes, occurs during the night, and is not unlike that which would be produced by a gimlet boring into the flesh. This is repeated at intervals of an hour or more. During the day no inconvenience results, but during each night the larva becomes more and more active as it increases in size and the tumor continues to grow. No one who has not been the host of one of these developing parasites can imagine the excruciating agony which it nightly produces. The tumor is now about the size of a twenty-five-cent piece, and the central opening one-sixteenth of an inch in diameter. At the end of a week of larval activity or two weeks from the first indication of papule, the patient becomes desperate and procedures for expulsion are at once instituted. In no cases under my observation has the larva remained in the subcutaneous connective tissue of man more than two and one-half weeks. The

activity of the larva, the rapid growth of tumor, and progressive enlargement of the central opening, would lead to the supposition that if left alone it would make its own exit in a few days to enter the pupa stage. When expelled after two weeks' growth, the larva is from one-half to five-eighths of an inch in length. They differ in form according to the situations in which they develop. Those developing in portions of the body well covered with muscular tissue show a grad-

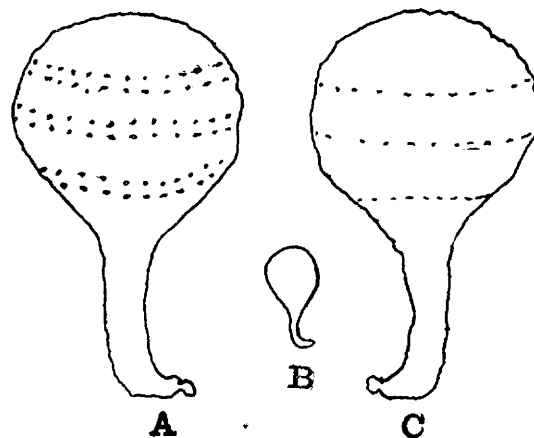


Fig. 2.—*Dermatobia noxialis*; larva. Shape of parasite when developed over bony prominences. A. Dorsal aspect showing double rows of spines. B. Larva, natural size. C. Ventral aspect showing single rows of spines.

ual tapering from the cephalic to the anal extremity, while those developing over bony prominences, like the ankle, have a marked cephalic bulb and a long caudal extremity.

#### TREATMENT.

As the parasite or larva is firmly attached to the tissue in which it is located, it is best and, indeed, necessary to institute some preliminary procedures,

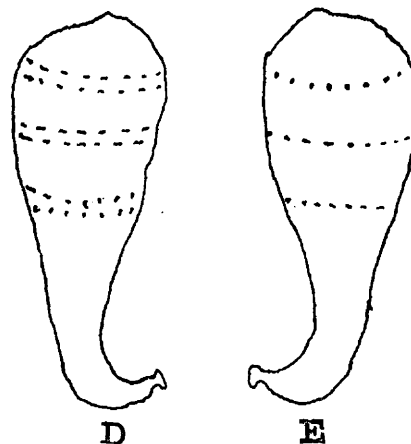


Fig. 3.—*Dermatobia noxialis*; larva. Shape of parasite when developed where muscular tissue is abundant. D. Dorsal aspect. E. Ventral aspect.

causing the parasite to lessen its hold before attempting manual expulsion. As an abundant air supply is necessary to the life of the developing parasite, this is shut off by closing the central opening in the parasitic tumor with adhesive plaster, cotton and collodion, postage stamp, tobacco leaf or other measures. After twenty-four hours the larva is thoroughly asphyxiated, the plaster is taken off, and only slight pressure is necessary to cause its expulsion. Ulceration, abscess and fatal results mentioned by some writers and attributed to this parasite are due to the improper treatment, and

are the result of forcible attempts at expulsion, without asphyxiation of the parasite. In these cases the larva is crushed and only partially expelled, the surrounding tissue is bruised and the capsule inclosing the parasite is broken down. The portion of the parasite remaining undergoes decomposition, germs enter and an abscess is the result.

## SUMMARY.

1. Cutaneous myiasis in Darien is usually due to the *Dermatobia noxialis*.
2. Man and dog are host by preference. The *Dermatobia noxialis*, though not confining its attacks to man alone, can not be called an occasional parasite of man, as it attacks all who are properly exposed.
3. White-skinned races are more susceptible to the disease than the darker races.
4. The period of incubation is from sixteen to twenty-three days, from exposure to the development of the first symptoms.
5. Larvæ differ in shape according to anatomic location.
6. Grub or larva, if left alone, will not produce injurious results. Abscess and ulceration are the results of attempted expulsion without proper preliminary treatment.

## CARCINOMA OF THE LUNG; PANCREATIC CYST.\*

W. W. GRANT, M.D.  
DENVER.

I report two cases of carcinoma of lung because of special interest attached to each—one recurring after an unusually long interval, and having at one time coincident tubercle bacilli, and while occurring several years ago is worthy of record; the other recently, and seemingly primary.

J. M. D., aged 48, Davenport, Iowa, school teacher. Personal and family history good. In February, 1894, had a dry cough. By fall the cough had increased and weight diminished. At this time Bierring, the pathologist at the Iowa University, found tubercle bacilli in the sputa. He went to Santa Fé, New Mexico; returned in the spring of 1895, having gained fifteen pounds, with the disappearance of bacilli. In June, 1895, he was examined by me in consultation with his brother, Dr. De Armand of Davenport. He had resumed his work, was pale, suffering much from dyspnea on slightest exertion, cough dry and expectoration slight. Slight circumscribed dullness was manifested about bifurcation of right bronchus, with some roughness in respiration. With this condition and history I thought, with all others who had examined him, that he was suffering from tuberculosis. In the fall of 1895 he went to Phoenix, Ariz., and lost weight and strength rapidly. Glandular enlargement of neck, axillæ and head, I was now informed by letter, was conspicuous, which caused me to suggest to his brother that the disease was malignant. He then informed me that six years before the left nipple was excised on account of a persistent ulcer, which was caused, it was believed, by a suspender buckle. This cleared up the history of the case, for it was undoubtedly a carcinomatous ulceration, though the interval of secondary infection was unusual.

He died June 2, 1896, after several months of extreme suffering from asphyxia. Postmortem by Dr. W. L.

Allen of Davenport: effusion in both pleural cavities. Left lung in condition of atelectasis; right lung partially so. No evidence of tuberculosis. First bifurcation of left bronchus was surrounded by a fibrous mass, constricting the tube and completely excluding air. Same condition at same point of right lung, but permitting a little air to enter the lung. Pathological examination by Bierring showed the disease to be undoubtedly carcinoma. The coincidence of tuberculosis with carcinoma of lung or bronchial tubes has been repeatedly observed, but its existence and disappearance, as in the foregoing case, and the interval of at least four years from the excision of the nipple (no glands being removed) to the appearance of glandular infection and cough, make a history of unusual interest.

Shaw<sup>1</sup> reports a case of primary carcinoma of lung, and notes the similarity of tuberculosis in certain phases of the history. More recent cases are reported.

Mirklen and Girard<sup>2</sup> report a case constricting right bronchus, close to bifurcation. In thirty-one autopsies of carcinoma of lungs by Wolf, thirteen were complicated by tuberculosis. A great majority of cases of lung cancer are in men.

The second case is A. V. Rider, Davenport, Iowa, aged 57, railway engineer. He was in a collision in January, 1902, and suffered, he says, a fractured rib (left side), and from this he dates the beginning of his illness. May 14 he was seen by Dr. De Armand, who observed congestion of larynx and hoarseness, but did not regard his condition as serious. He continued to grow worse and Dr. De Armand examined him more thoroughly, and believed the case malignant. On June 4 he was seen by Dr. Allen. Paralysis of vocal cords and suffering from severe asthmatic symptoms, temperature normal and pulse 80. On June 22 I was passing through Davenport and was asked by Drs. De Armand and Allen to examine the man. He was suffering extremely from dyspnea, with loud crepitant and sonorous râles, and mucopurulent expectoration abundant. No bacilli; had lost thirty or forty pounds in the last three months. Dr. De Armand called my attention to a hard growth deep in the neck on left side of trachea, with fixed point in chest. No glandular enlargement and no pain. I had no doubt he was suffering from carcinoma of lungs or bronchi.

He died asphyxiated on June 25. Postmortem by Dr. Allen, who writes me that he removed a large, hard, irregularly shaped mass involving the bifurcation of bronchi, partially enveloping esophagus and aorta, with apparently some connection with connective tissue of anterior mediastinum. The lungs in the vicinity were involved and small nodules scattered through both lungs. There was also a prolongation of the growth into the neck on the left side. This was the mass felt on deep palpation of the neck on June 22.

Postmortem showed no disease whatever of stomach, but in the duodenum was a circular scar involving mucous and muscular coat with some narrowing of the intestine, indicating a perfectly healed ulcer.

There were no adhesions between costal and lung pleura, or other evidence that the railway accident had injured the lung at all.

The history and condition did not indicate a fractured rib. A section of the pathology was sent me, and examined by Dr. W. C. Mitchell with the following result:

"All of the specimens of tissue sent me proved to be carcinomatous, the areas surrounded chiefly by fibrous

\* Read at the Thirteenth Annual Meeting of the Western Surgical and Gynecological Association, held at Denver, Dec. 28-29, 1903.

1. British Med. Jour., June, 1901.

2. Presse Médicale, June, 1902.