# INFECTION WITH DERMATOBIA HOMINIS OCCURRING IN BRITISH GUIANA

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## Clinical Notes

AT the beginning of June 1965, an officer (Lt.R) complained of a boil on his leg. It was thought to be a septic insect bite and he was given oral penicillin. Before he could be followed up he was posted to the other end of the country. On 17th June, 1965 he telephoned to say that he had become disenchanted with the boil which would not heal and had given it a good squeeze. Out had come a bug (sic) which was in fact a larva about 5/8 inch long and 3/16 inch in diameter. On 23 June, 1965 Lt. R wrote and sent the specimen preserved in spirit; he remarked that the incubation period had been about four weeks. Lt R enclosed a second and larger specimen of a larva which he had extracted from Pte C's leg (behind the knee) on the morning of 23 June, 1965. Pte C. had been feeling pain and suffered a non-healing boil for about four weeks. Lt R. remarks " I can only assume that we were bitten by something while on our expedition to the Upper Demarara River ".

Case three came to notice on the sick parade on 22 June, 1965 at Atkinson Field when Pte R. complained of a septic spot on his thigh which would not heal. He gave a history of having been bitten at Cannister Falls about six weeks previously. The probability of larval infestation was now in mind and with substantial pressure a larva about 1 inch long and $\frac{1}{4}$ inch in diameter was expressed. This specimen was sent to The Royal Army Medical College where it was identified as a larva of *Dermatobia hominis*.

Case four (Cpl. L) arrived on sick parade on 22 June, 1965. He was the telephone operator at Atkinson Field and denied being at other locations in British Guiana. He complained that he had had a septic toe for some weeks and stated that that morning his 'mate' had seen a worm protruding and had obligingly cut off the visible part! Aware that a dead larva might have more complications than a live one, the lesion was opened with a scalpel but no remains of the worm were found; presumably it was *Dermatobia*. Three weeks later the scar on the plantar aspect of the great toe remains but there is no inflammation.

Pte B., the fifth and final case in the series, reported sick on 23 June, 1965 complaining of multiple boils on his back which he had had for three days and attributed them to having been bitten at Wineperu on 6 June, 1965 when he slept in the jungle. A more careful assessment of the lesions was made with a view to specifying the criteria for diagnosis of infestation with *Dermatobia Hominis*. The appearances were those of localised boils with puncta centrally at their summits. From the puncta exuded, or could be expressed, an opalescent brownish fluid and in one punctum movement could be seen. The boils lacked the exquisite tenderness of bacterial infection but induration was constant and substantial. The photograph (showing punctum being incised) gives an idea of the size of the induration (Figure 1)—that area between surgeon's thumb

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and middle finger. There was no associated adenitis. In this case there were five discreet lesions scattered over the right lower thorax at the back and one double lesion.

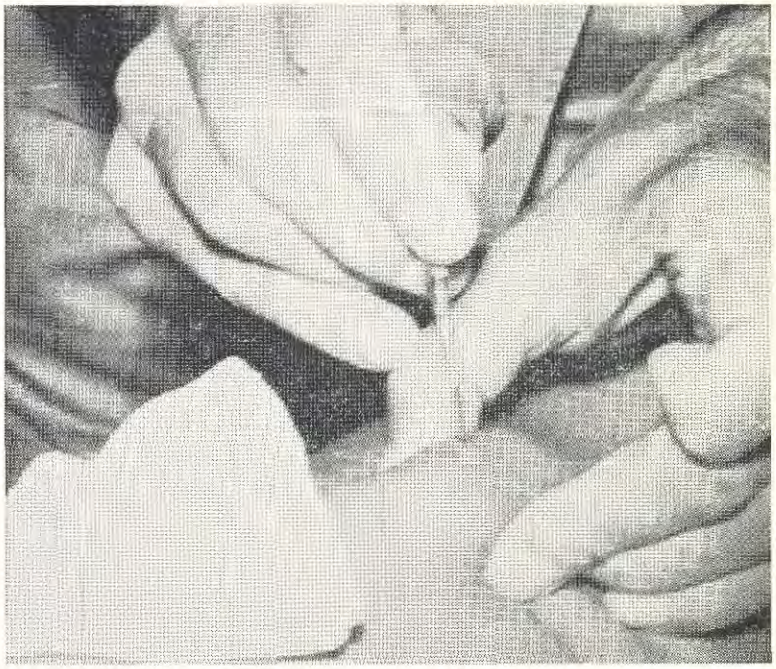

Fig. 1 Case Five. Incision under L.A. Size of induration gauged from tissue between thumb and middle finger of surgeon

The movement seen in one boil suggested that the larva was superficial. The punctum was extended therefore in either direction with a scalpel. All movement ceased and the larva could no longer be seen; the suspicion was raised that the larva was deeper than appearances suggested. An occlusive dressing in the form of paraffin molle and gauze was applied for twenty four hours to all lesions. On 28 June, 1965 the dressings were removed and there could be seen waving from each punctum a fine tubule rising 1 to 2 mm. above the surface. In turn, each was grasped with fine forceps and gentle traction for a few seconds produced the larva from all but one. The exception defied all attempts to grasp it; on the least touch the waving tubule retracted. It was decided to leave it to grow for a few days but on 6 July, 1965 it still refused to be caught.

The depth of the cavity in which the larva lay was still unknown and it was decided to explore the remaining active lesion under local anaesthetic. 5 ml. lignocaine 2 per cent with 1 : 80,000 isoprenaline was infiltrated close to the induration and 1 ml. was placed directly under the larva. An incision $\frac{1}{2}$ inch long was made in the direction of the ribs and the tract from the punctum followed down. The tract was indefinite and a probe to the depths was used as a guide. The bottom of the cavity was about 5/8 inch from the surface. No view of the larva was obtained as it lay in its bed; it was thought unwise to extend the dissection indefinitely. Forceps were inserted several times before the tubule was caught. Extraction, as before, was by gentle traction applied for a few seconds.

The photograph shows the ultimate delivery of the whole larva. (Figure 2).

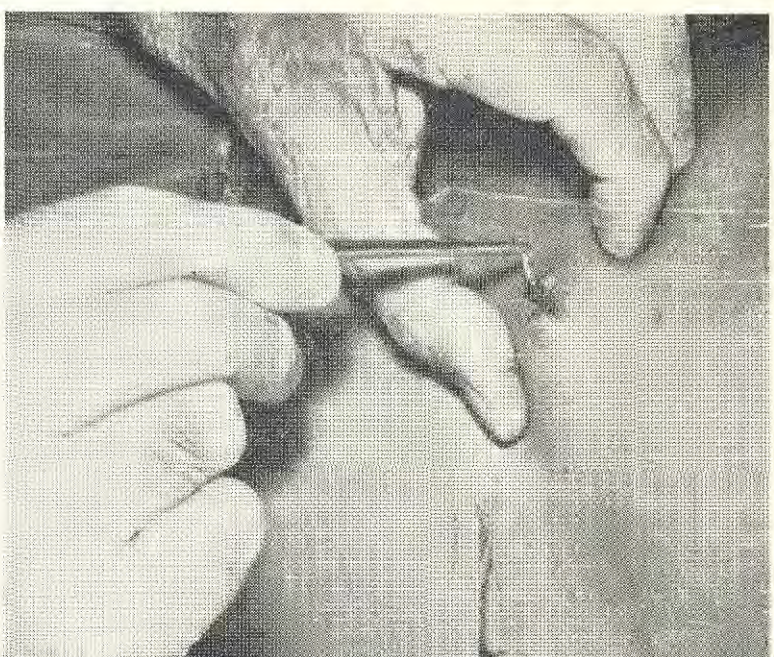

Fig. 2 Case Five. Showing extraction of larva at moment of delivery

## Incubation Period

The incubation period bears some relation to the size of the larva. The longest period is six weeks.

The relations as found are:—

| *Patient* | *Size of Larva* | *Approx. period of Incubation* |
|---|---|---|
| Lt. R. | $\frac{5}{8}$ inch | Four weeks |
| Pte. C. | 1 inch | Four weeks |
| Pte. R. | 1 inch | Six weeks |
| Cpl. L. | Not known | 'Some weeks' |
| Pte. B. | $\frac{3}{4}$ inch | Two weeks |

## Treatment

It would appear that treatment in the earlier stages is best initiated by the application of an occlusive dressing for several hours. Paraffin molle was used in these cases but doubtless other oils and greases are equally effective. The exclusion of air causes the "breathing tubule" to extend above the surface where it can be grasped with fine forceps. The larva is extracted by gentle and continuous traction. No special treatment

has been needed for the empty cavity, though it is noted that they are slow to heal.

In mature cases where the larva is large and presumably nearer to the surface, squeezing may be all that is necessary.

## Postscript

Since the foregoing was written the following communication has been received from Major Flew. " On 29th July, 1965 I felt an irritation on the ulnar aspect of my left arm, about its middle. Rubbing my fingers along it I felt something which I took to be a splinter; there was slight reddening round it. The medical orderly pulled it out with forceps but the object was unrecognisable and it was put into formalin. The following day another splinter was felt at the same site. This time I took a scalpel and prized and scraped it from its bed. As before it was put into formalin. The tissues surrounding the site were indurated for about $\frac{1}{4}$ inch diameter.

Finally case six has arrived, a soldier with the larva in the medial aspect of his left elbow. This specimen is enclosed but it adds nothing, except weight, to the paper already submitted."

Under the microscope these three objects have similarities and I suspect they are very early *Dermatobia* larvae. They were a dirty fawn colour, and there was some thinning to show certain structures at the edges. These damaged pieces of tissue are probably first stage *Dermatobia* larvae, as depicted on the black and white diagram—J.H.G. (Figure 3).

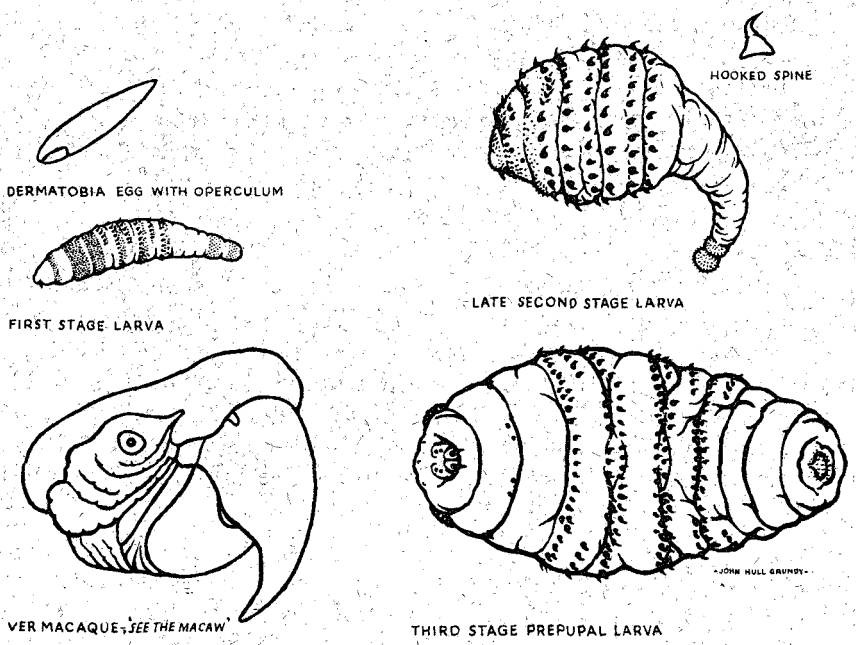


Fig. 3 Egg and larval stages of *dermatobia hominis*

**Entomology Notes**

*Dermatobia hominis*, originally described and named *Oestrus hominis* by Linnaeus Junior, is also known in some books as *Dermatobia cyaniventris* Macquart. It is a two-winged (order Diptera), Calypterate (aquames on sides of thorax covering the hind wing remnants), largish ' blue-bottle-like ' fly of the family Oestridae, the bot or warble flies, which also include *Hypoderma* (deer and cattle warble flies), Oestrus (sheep bots), and *Rhinoestrus* (Russian horse bots), though some authors place *Dermatobia* (the only species is *D. hominis*) in the family Cuterbridae, and others in the Hypodermatidae.

The inhabitants of tropical America, the home of *Dermatobia hominis*, also use various names for this species, though most are descriptive of the larval stages, which, because of their parasitic habit, appear to them more important than the adult forms. Examples are *gusano* (small worm or maggot), *hura* (walnut-shaped boil), berne (possibly referring to the prepupal stage being found in sleeping blankets), *nuche*, *torsalo*, *colmoyote*, *ver moyocuil*. Some of these names are of old standing, and demonstrate accurate observations of local people which were at first regarded with incredulity by entomologists. Such a name is " *gusano de zancudo* (worm or maggot having long legs) " or the 'mosquito (carried) worm ', and refers to the method by which *Dermatobia* females transfer their larvae to various warm-blooded host animals by the capture of day-biting mosquitos, on the underside of which they lay a batch of eggs, after which the ' long-legs ' is freed to enable it to obtain a blood-meal in due course. During this blood-feed some of the bot-fly larvae will escape from the egg shells attached to the mosquito on to the skin of the host, where they will endeavour to burrow in.

Another vernacular name in common use is " *ver macaque* " ('see the parrot') or macaw worm. This term refers particularly to the second stage larva, which somewhat resembles a macaw's head and bent beak, and which is the stage usually seen when extracted by the native method of tying soft fat over the hole in the skin where the larva has burrowed, so as to deprive its tail spiracles of atmospheric air. This occlusion causes the maggot to wriggle out of the living subcutaneous tissue into the fat itself, to search for air, in which situation it will be found on removal of the fat. A somewhat similar method is described in the article. Another descriptive name, which refers particularly to the third larval (prepupal) stage is " *torcel* " (the twister).

The adult *Dermatobia*, as is the case with all the Oestridae or bot-flies, does not bite or feed, as the mouth parts are vestigial, hidden and without palps., *Dermatobia hominis* is primarily a damp woodland or forest-edge species, found from sea-level to 4,500 feet, and, since the introduction of cattle-ranching to its distribution range, it has become one of their greatest scourges, being able, not only to debilitate grown bovines and spoil their hides, but also to kill calves by multiple larval infestations. Children, also, may become malformed and even die, if not treated in time. Other domestic animals parasitised are pigs and dogs (which are sometimes killed), although there appears to be an unexplained avoidance of horses. The primary wild hosts include monkeys, agoutis, jaguar and birds.

*Dermatobia hominis* (Linnaeus Junior) is the so-called ' human bot-fly ', because the greatest number of cases of human myiasis (invasion of living tissue by fly maggots) throughout its range, are caused by its maggots, with the tropical screw-worms *Callitroga americana* and *Callitroga macellaria* second to importance. The exudation from the abscesses referred to in the article—" opalescent brownish fluid "—is most

attractive to tropical screw-worm flies, which avidly lay eggs in the lesions of a *Dermatobia* infestation, and so start extensive and serious deep tissue myiasis, if not prevented. A number of non-myiasis flies are also attracted to the sores, and these flies are regularly utilized by the female *Dermatobia* as egg-transports in the absence of suitable mosquitos, thus leading to continuous infestations.

*D. hominis* is also termed the neotropical bot-fly, because it is strictly limited in its distribution to suitable areas between Mexico and Northern Argentina, including Guatemala, British Honduras, Costa Rica, Panama, Colombia, Ecuador, Venezuela, British Guiana, French and Dutch Guiana and Brazil, also Peru, Paraguay and Chile. Though found in Trinidad, it is absent in the Windward, Leeward and Antilles Islands of the West Indies.

The adult *Dermatobia* are unmistakable if taken in their distribution range. They are some 12-16 mm. in length, very stoutly built but almost bristleless and of a general brownish-grey colour. The head is yellowish, darkening dorsally, the thorax is dark blue with a sprinkling of pollen-like scales, while the abdomen is a metallic violet blue. The aristae (large single antennal bristles) are plumed on the upper side only. The head is heavy and bull-like in appearance with a bulging width that forces the compound eyes to occupy a lateral position. Both males and females are dichoptic (eyes widely separated) and the ocellar triangle bearing three simple eyes on the vertex is small. The wings and squames are brownish, and the legs somewhat yellow in colour.

The females, after fertilisation, seek a day-flying insect likely to visit the larval host animals, to act as a phoresic egg-carrier. This is singular, since other Oestrid females tend to hover near their larval hosts and then dart in to slap an egg or eggs on the animal itself. The fly-transports most frequently chosen by *Dermatobia* are the large, showy jungle *Psorophora* (subgenus *Janthinosoma*) *ferox* and *lutzii*, for, not only are these large and distinctive in colour pattern and thus easily seen by the female bot-fly, but above all they are strong flyers and determined day-biters, almost certain to find a warm-blooded host for any larval *Dermatobia* adhering to their abdomen. *Psorophora* are most numerous after the rains (which is also the optimum period for *Dermatobia*) since they breed rapidly in transient pools (though their eggs remain viable for years, awaiting the hatching stimulus of water). These mosquitos bite singly or a few at a time, and do not usually enter houses. *P.* (*J.*) *lutzii* is found mainly in the tropical forests between Mexico and the Argentine, including Trinidad, while *P.* (*J.*) *ferox* has a wider range from Southern Canada to Argentina, including many of the West Indian Islands not favoured by *lutzii*.

The *Dermatobia* female is so well equipped by instinct that she will lurk around water-pools, waiting for the female *Psorophora* to emerge, and avoiding the males which do not bite. About 20 eggs or so are laid on the ventral surface of the abdomen of each mosquito before it is released by the bot-fly, though the number of eggs to some extent is governed by the load capacity of the carrier. In Honduras six species of other flies have been found transporting the eggs of *Dermatobia*. If they are not blood-sucking species such as *Stomoxys*, then they are invariably species likely to be attracted by the exudation from existing bot-fly maggot abscesses.

*Dermatobia* hominis, in adaption to its modern mainstay host, cattle, is able to invade damp scrubby pastures, but is adversely affected when the tall weeds and bush are levelled. If deprived of dipteran carriers the bot-fly will use the underside of ticks for

its obligatory egg laying, and if these are not available, then it will oviposit on damp leaves, or in the laboratory, on the sides of the cage.

The eggs are small, elongate, torpedo-shaped cylinders with their narrower pointed end glued to the carrier, and with the outer or downward end having a slanting operculum or lid to facilitate the exit of the young maggot. The heat of a suitable warm-blooded host stimulates these developed first-stage larvae (which have a normal maggot appearance apart from the narrowing of the 5 posterior segments which is preparatory to the formulation of the ' tail ' of the 2nd maggot) to leave the chorion egg case and attach to the host's skin with their paired mouth hooks and spiny anterior segments. In about 4 minutes to a little over an hour they will have effected an entrance, though sometimes they are helped by finding the skin puncture made by a biting fly. If they fail in their first attempt, they will withdraw into the egg tube and try later as the carrier again settles on a host. When the first larva, which is about one millimetre or more long, has managed to penetrate the skin, it begins to feed on the tissue cells, which it attacks with its pair of mouth hooks and powerful digestive enzymes. In this way a boil-like pocket is formed in which the larva lives and develops. There is no creeping eruption, or migration through the deeper tissues as in *Hypoderma*.

When grown almost to bursting, the young *Dermatobia* maggot moults its skin within the burrow and becomes the second stage or ' parrot-head ' larva. This is markedly ' pear-shaped ' and has bands of sharp, stout backwardly pointed hooked spines on the anterior bulbous portion. It is these hooks on the enlarged segments that make the second stage larva so difficult to extract when the thin breathing tubule or ' tail ' is seized with forceps. This second stage is the one usually illustrated in text-books and it is able to hollow out a pocket extending for more than an inch below the skin surface. In the article the peculiar posterior trunk which bears the pair of breathing spiracles on the delicately formed rounded tip, is described as " waving in the air ", after the paraffin molle occlusion of its breathing hole in the skin was removed.

This second period terminates in a further moult within the lesion, leading to the development of a third stage maggot, which, however, lacks the long ' tail '. This stage is fatter, broader and more grub-like (reminiscent of a wasp-grub), with plump wrinkles capable of neutralising the function of the stout body hooks (which were so effective as mechanical anchors in the second stage) when the time comes for it to enlarge the aperture in the skin and twist itself out to drop on the ground. This it does with remarkably little pain to the host, considering that this prepupal stage may be over an inch in length and almost half an inch across. It may however, be helped by the curious feature often reported during an infestation, that human hosts suffer a marked loss of energy, leading to drowsiness and an increase in the hours of sleep. For purposes of recognition it should be noted that the prepupal maggot of *Dermatobia* carries a pair of fan-like anterior spiracles, often likened to flower heads, one on either side of the vestigial head, while the posterior spiracles are somewhat difficult to see, being recessed in a cavity on the last segment. For one or two days this big maggot will try to find a suitable place to pupate, by burrowing in whatever soil is at hand. It apparently dislikes a dry environment, and *Dermatobia* populations typically lessen during drought conditions.

The adult bot-flies emerge from the buried pupa after some two to eight weeks, and the preoviposition period of the female is about two days. The number of eggs laid during her comparatively short life of a week or so, is about 200. These develop on

the carrier and are ready to hatch on the host's skin in less than a week to a fortnight, and the life of the larvae as obligate parasites lasts normally from five to ten weeks, though it may take three months or even longer. The normal time required from the laying of the eggs to the emergence of the adults is approximately 100 days.

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| | |
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## ERRATUM

**Volume 113, No. 2, 1967**

**From the New Year Honours 1967, Page 91.**
Line 22, please delete (QM) after Tatford, Major.

**Academic Achievements, Page 86.**
Line 5, for D.P.H. please read D.P.M.