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THE PATHOLOGICAL EFFECTS OF *PHTHIRUS PUBIS*

BY

GEORGE H. F. NUTTALL, F.R.S.

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THE PATHOLOGICAL EFFECTS OF *PHTHIRUS PUBIS*.

By GEORGE H. F. NUTTALL, F.R.S.

(*From the Quick Laboratory, University of Cambridge.*)

CONTENTS.

Compared to *Pediculus humanus*, the part played by *Phthirus pubis* in pathology is inconsiderable because: (1) it is not known to convey any infective disease, (2) it is not so prevalent, and (3) it on the whole produces slight effects, for man may be infested more frequently without knowing it.

Imhof is cited by Brumpt (1910, p. 550) as believing that the crab-louse may convey tuberculosis, but loose statements of this kind abound in medical literature and bear no weight. On the other hand, secondary skin infections may arise owing to self-inflicted scratches by infested persons in response to the itching that the parasites may cause.

That the insect is less frequently encountered on man than *P. humanus* (*capitis* and *corporis*), is exemplified by Greenough's Boston statistics (already quoted, see p. 84) wherein out of 864 verminous persons admitted to hospital, only 27 (roundly 3 %) were found infested with *Phthirus*.

GENERAL EFFECTS OF PARASITISM.

Although Pinkus (1915, p. 239) states that crab-lice are not especially important in this war, I have had ocular evidence to the contrary in a limited way, given an instance in which a considerable number of soldiers in barracks became infested by these parasites which caused some of the men many sleepless nights.

Pruritus is the first symptom that draws attention to the presence of crab-lice; it can be violent and lead to much scratching day and night.

The itching may however be moderate or totally absent, but, as Payne (1890, p. 209) points out, the lack of reaction may be individual. Dubreuilh and Beille (1895, p. 135) relate that some heavily infested persons do not even show unconsciously inflicted scratches upon their skin, and Lailler, whom they cite, states that pruritus often begins only from the moment that the individual recognizes he is lousy, after which he may go on scratching himself subsequent to the removal of the parasites. Therefore, although the itching is primarily attributed to the toxic saliva of the louse it may be partly self-induced.

A remarkable case of long continued tolerance of crab-lice on the person is that described by Hewetson (1894, p. 19), to which reference will again be made, wherein an Austrian soldier intentionally remained parasitized for ten years. It is evident that the insects put the soldier to little inconvenience for he protested against their removal.

Apart from the discoloration of the skin that is commonly induced by the crab-louse and which will be presently referred to, the secondary inflammation is usually slight (Osler, 1892, p. 15), although there may be *papular eruptions* complicated by *eczematous inflammation* (Morris, 1911, p. 556). These effects, as Dubreuilh and Beille (1895, p. 135) point out, are *chiefly due to eruptions following scratching*, the papules having their tops scratched off, the eczema, etc., being localized in the pubic and axillary regions. In a soldier suffering from a heavy generalized infestation, whom I had under observation in the summer of 1915, besides numerous excoriations on the trunk and limbs, there was severe eczematous inflammation present in both axillae where hundreds of *Phthirus* were found, the hair being glued together by partly inspissated secretion, the armpits and shirt beneath being bloody from continual scratching. Where, as in Hilgenberg's (1854, vide Bibliography, p. 20) and also Fischer's case (see p. 387) crab-lice are present on the upper eye-lids, they may cause considerable irritation, whilst Dubreuilh and Beille (loc. cit) state that the lice may cause blepharitis of the ciliary borders of the lids with a variable amount of pruritus.

Fever, headache, etc., attributable to no other cause according to Payne (1890, p. 209), may perhaps be due to the toxic action of *Phthirus*[1]. It is conceivable that crab-lice may cause a rise in body temperature like that Payne has seen occur after mosquito bites; a similar case has

[1] As bearing on this matter, I append a note by way of an addendum to what is stated on p. 78 regarding *P. humanus* producing fever by its bites. Jamieson (1888, p. 321) records two cases in which body-lice caused fever: (1) girl of 14 years, severe pruritus, covered with lice; temperature fell from 103° F. at once when she was freed from parasites.

also come to my notice. Crab-lice may therefore produce effects which cannot be belittled.

Maculae caeruleae.

The occurrence of *Phthirus* upon the body is usually signalized by the presence of bluish spots in the skin to which French authors have given the frequently quoted names of "taches bleuâtres" or "taches ombrées." These spots were formerly included among the rashes met with in typhoid fever and were thought to possess some relation to this disease whereas they are purely adventitious. As Dubreuilh and Beille (1895, p. 137) correctly point out, the bluish spots were doubtless formerly associated with typhoid because clinicians frequently examined the abdomen closely for the specific rose rash of typhoid, a corresponding degree of attention not being given to abdominal inspection in other affections.

Character of the spots. The maculae are few in number. Osler (1892, p. 15) describes them as pale blue, "sub-circular, from 4 to 10 mm. in diameter, of irregular outline and most abundant about the chest, abdomen and thighs. They sometimes give a very striking appearance to the skin. It can be readily seen that the injection is in the deeper tissues and not superficial." After Osler's attention was drawn to the association of these spots with lice, he "met with no instance in which these were not present." I may add that the spots are painless and do not disappear on pressure; more accurately speaking, their colour is pale bluish-grey, a good light being required in which to see them. The spots may at times measure 2 and even 3 cm. across, they are most noticeable in skin regions that are sparsely haired, and usually disappear in about a week after removal of the lice. It should be noted that the maculae do not occur on all persons that are infested with the louse (Moursou, Duguet, Gibier).

Phthirus the causative agent. That the maculae are attributable to crab-lice only was first shown by French authors. Falot (1868)[1] regarded

(2) Healthy youth of 19 years, admitted to hospital on two occasions with a temperature of 106·2–106·4° F., much pruritus, infested with an immense number of lice; the lad was bathed and his clothing changed, after which his temperature at once fell to normal. This case was communicated to Jamieson by Dr Wood, who has seen febrile attacks due to *Pulex irritans*, cured in the same way.

[1] I have been unable to trace this reference. The date is given as 1860 by Knott (1897); Brumpt (1910) cites Falot and Moursou (1868); Dubreuilh and Beille (1895, p. 138) who cite Falot (1868) give the fullest account, and I quote from them. Gibier, Hewetson, Blanchard, and others give no reference. Simon (1881) and Mallet's (1882, vide Bibliography) papers are unfortunately inaccessible.

them as the cause, and his pupil Moursou (1877–78)[1] published the results of many clinical observations which showed that the spots were invariably associated with the presence of crab-lice, although the latter might be present without the maculae[2]. Moursou found no spots in the early stages of infestation, they only appeared 12–21 days later, i.e. when the lice had reached the adult stage (compare with my experimental observations described on p. 380 *infra*).

Duguet (1880–1–2) first *demonstrated experimentally* that the spots are due to *Phthirus*, by puncturing the skin with a lancet charged with the substance of the crushed lice, typical spots appearing at the points of inoculation after an interval of 12 hours. He next cut the lice in pieces and inoculated men with the substance obtained from the head, the forepart, middle, and hind part of the louse's body. The only part of the insect which produced the spots when inoculated was the thoracic region, corresponding to the portion whence spring the second pair of legs, i.e. the region which includes the louse's *salivary glands*. If these glands were torn out with the head, then the crushed head produced a spot when inoculated. When Duguet inoculated the substance of crushed nits, the result was negative.

Ciuffu (1907, p. 260, cited by Tièche) also produced the spots by subcutaneous inoculation, but was unable to do so by scarifying the skin.

Cause of the coloration. Oppenheim (1901*a*, p. 451)[3] states that *Phthirus*, by means of a ferment (oxydase) that is present in its salivary glands, is capable of forming a pigment, similar to biliverdin, which is derived from human blood and is deposited in the insect's fat body. According to Oppenheim, this pigment is likewise formed in the human body when the louse bites, the pigment giving rise to the maculae.

Oppenheim mentions that the pigment was observed by Ehrmann to occur in the cells of the insect's fat-body at the sides of the thorax and abdomen, and that it is not identical with biliverdin. In following the development of *Phthirus*, I observed that the green coloration of the louse's body in the regions indicated, appeared as the insect attained sexual maturity, being most marked in the oldest adults. The significance of this pigment remains to be determined. Oppenheim's statement that the pigment is formed by a ferment in the salivary glands, (*a*) in the louse's body, and (*b*) beneath human skin, appears to me to be an

[1] For references see Bibliography, p. 27.

[2] Brault and Montpellier (1914, p. 78) record a case of general infestation in an Arab on whose dark skin no spots were visible.

[3] I cite from the author's abstract, the full paper being inaccessible.

unwarranted assumption, there being no evidence whatever that the bluish spots are caused by the pigment which occurs in the louse's fat-body.

Huguenay (1902, *Gaz. des hôp.*, p. 591, cited by Tièche) believes that the saliva of the louse is toxic and that it alters the haemoglobin in some way about the seat of the bite. Vignolo-Lutati (1909, pp. 365–378) cites Gravagna (no reference) as attributing the pathological effects of crab-lice to a toxin, but he does not share this author's views. In other words, the authors above quoted regard the spots as due either to a genuine pigmentation (Oppenheim) or to a toxic erythema (Huguenay, Gravagna).

According to Ciuffu (*loc. cit.*) an extract of crab-lice is not haemolytic. He remarks that the maculae do not go through the series of colour changes that bruises do in fading, and therefore concludes that blood has nothing to do with the causation of the spots. He found, moreover, that the extract of *P. humanus* does not produce similar maculae. Finally Tièche (1908, p. 327) took up the problem experimentally. He cut up crab-lice in water or salt solution upon a slide, mixed the substance with blood and observed that the blood assumed a violet colour after 1–5 minutes in the vicinity of the louse fragments. He concluded that this colour change was merely due to the reduction of the oxyhaemoglobin by the fresh louse tissues, the violet colour disappearing when he admitted air by lifting the coverglass from the preparation. Spectroscopic examination confirmed him in his belief. He found that fragments of flies, *corporis*, or rabbit muscle, produced an identical effect when mixed with blood.

Like other observers, Tièche noted that the maculae disappear if the skin is irritated. *Phthirus* usually does not irritate the skin, whereas *P. humanus* does, whence he explains the absence of maculae in cases of infestation with the latter species. Tièche concludes that the maculae are probably due to the infiltration of the skin with corpuscular elements beneath the epithelial layer, the blood colour being altered.

EXPERIMENTAL OBSERVATIONS ON THE EFFECTS OF PHTHIRUS BITES.

Tièche (*loc. cit.*) states that the first effect of the bite, observed under experimental conditions, is to produce a brown spot which turns bluish after eight hours. He saw maculae attain a diameter of 3 cm. in susceptible persons and it took twelve days for them to disappear.

Having found no other record of such experimental observations in the literature available, I carried out two experiments to which the following protocols relate:

Exp. 1. An adult crab-louse, the sole survivor of about 200 insects taken from a soldier the previous evening, was placed on my arm on 31. VII. 15. The louse was confined in a cell. It proceeded to feed at once, and after 25 hours, not having shifted its position, it was removed and the seat of the bite marked. The bite produced no itching, but a faint, deep-seated violet spot 2 mm. in diameter was visible, and it took a week in which to disappear.

Exp. 2. Some *Phthirus* eggs, taken from a soldier, were allowed to hatch in a tube carried in the inguinal space next to the body. The freshly emerged larvae were placed on my laboratory assistant's leg and confined in a stocking on 5. v. 17. The larvae shortly began to feed, remaining fixed to one hair. There was no itching or any effect observable for four days during which the larvae stayed in the same spot. On the fifth day, in the morning, the lice being still in the same position, the seat of the bite appeared faintly pink, and by the afternoon it had darkened slightly. The larvae then moulted and moved to another place, the seat of the first prolonged feed no longer being discernible after two days, although its position had been marked from the start. *As the insects attained the adult stage, the effects of further bites became more marked, typical maculae appearing* in places where the insects had anchored themselves for 12–24 hours at a time[1]. These spots disappeared in about a week. The bites at no stage produced any itchiness.

MELANISM.

Some authors state that the pigmentation due to *Phthirus* may be generalized, the discoloration amounting almost to blackness and involving the mucous membranes and nails. Thus Le Play and Déhu (1906, p. 141) describe such a case in a woman of 60 years, but they add

[1] Vide p. 72 where it is stated that *P. h. capitis* when maturing or adult produces more lasting effects than larvae.

that she was likewise heavily infested with *P. humanus capitis* and *corporis*, therefore, it appears to me that the melanism may have been due partly or entirely to the latter. There is no doubt that melanism may arise in the course of phthiriasis as it does in pediculosis, using these terms in their strict sense. There is nothing specific about the melanism in either case. When itching, due to the presence of ecto-parasites, is maintained, it is the scratching that largely leads to the hyperaemia, pigmentation and desquamation. I regret that I have been unable to gain access to the papers by Fabre (1902, vide Bibliography) who appears to have made a special study of the melanodermia due to lice.

SUMMARY AND CONCLUSIONS.

Phthirus pubis is not known to serve as a vector of any infective disease.

The pathological effects of its parasitism on man are on the whole of slight degree. Some persons are more sensitive than others to its presence; on the one hand the louse may produce no reaction by its bite or it may be tolerated upon the person for years, on the other hand it may induce pruritus of a more or less severe character, especially in parts of the body that are most infested and where the skin is most delicate, i.e. about the genitalia, the axillae, and eyelids. All grades of pruritus are observable, scratching of which the individual is unconscious may occur, or in the severest cases the scratching goes on day and night, so that by day it may be evident to spectators and aid in diagnosis. The scratching may only begin from the moment when a person realizes that he is infested.

The pale bluish-grey maculae are a specific sign of the presence of *Phthirus* upon man, but they are not always present. They are induced by the adult louse, are few in number, painless, deep seated, do not disappear on pressure, and measure 0·2–3 cm. in diameter. The maculae mark the site of the insect's bite; they appear 8–24 hours after the louse commences to feed on the spot affected. The bites of *P. humanus* do not produce maculae caeruleae. The salivary glands of *Phthirus* and *Pediculus* give correspondingly positive and negative results when inoculated subcutaneously. The maculae disappear usually within a week after the removal of the offending parasite, and they disappear more rapidly when the skin is irritated. The nature of the maculae remains to be determined, they may be due to extravasated and altered blood.

Apart from the maculae, *Phthirus*, like *P. humanus*, fleas and mosquitoes, may cause a febrile condition owing to skin irritation, although this appears to be rare; with the removal of the lice, the fever promptly subsides. Papular eruptions and eczematous inflammation may supervene upon the presence of the louse, but they appear to be largely due to the added insult of scratching the infested skin. The melanism is of non-specific origin, being due to continued scratching which leads to hyperaemia, pigmentation and desquamation. The lesions induced thereby may lead to secondary skin infection with pyogenic bacteria.

REFERENCES.

See Bibliography, pp. 4—42, and supplementary Bibliography to follow.