

probably, at present, the most salubrious area of its size in the plains of India with a death rate which compares favourably with that of many countries in Europe.

### IS *TRICHOMONAS HOMINIS* PATHOGENIC?

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EVER since the discovery of *Trichomonas vaginalis* by Donne in 1837 in vaginal mucus, and of *Trichomonas hominis* by Davaine in 1854 in enteric and cholera stools, opinions have varied as to the pathogenicity of this protozoon. Schaudin was of opinion that *Trichomonas* becomes an amoeba, and this view was corroborated by Gauducheau in 1912, who thought that it was parasitic in the tissues in the amoebic stage, saprophytic in the lumen of the bowel, and a free flagellate in the free living state in stools. It was Gauducheau who found out that *Læschia undulans* of Castellani was really allied to this species. There is no doubt that *Læschia undulans* is nothing but a dying *Trichomonas* in its preliminary stage before rounding up. When a *Trichomonas* loses its active motility, it emits a finger-like protrusion in front and passes it on one side towards the back. This protrusion is then withdrawn near its back and is again emitted in the front. The figure of *Læschia undulans*, given on p. 319 of Castellani and Chalmer's "Manual of Tropical Medicine," shows an undulating membrane, and there is no doubt that this was a picture of a dying *Trichomonas*. Sometimes this protrusion assumes a club-shaped extremity.

There is a general opinion amongst protozoologists such as Dobell, O'Connor, Knowles and others that *Trichomonas* is not pathogenic. Dobell gives three reasons in favour of his assertion:—

(1) He does not consider that these flagellates are more common in cases of diarrhoea than in healthy persons.

(2) These flagellates do not attack the tissues of the host.

(3) No methods of treatment have yet been discovered by which this infestation is removed.

As regards the first point of Dobell, I would like to point out that out of 43 cases in which *Trichomonas* was found in human stools in Eastern Bengal, no less than 36 were suffering from either diarrhoea or dysentery. Stools of three such dysentery cases were "plated" but no colony of dysentery bacilli was discovered. Seven cases with normal formed stools showed motile *Trichomonas*. I consider them carriers in analogy with *Entamoeba histolytica* carriers. Just as some persons may harbour *E. histolytica* without showing any signs of dysentery, so *Trichomonas* may be found in persons passing healthy stools.

Coming to the second point of Dobell, that these flagellates do not attack the tissues of the host, I would like to point out that in six of my cases *Trichomonas* was found to contain red blood cells. These were all cases of diarrhoea, in the stools of which the red blood cells were very scarce, although the occult blood test was positive in all the cases. On the other hand, no red blood cells were found within any *Trichomonas* found in dysenteric stools containing numerous red blood cells. Knowles points out that the presence of red blood cells in *Trichomonas* is no proof of its pathogenicity. But no other non-pathogenic intestinal flagellate has been found to have ingested the red blood cells. Even *Giardia intestinalis*, an admittedly pathogenic flagellate, has not been seen to ingest red blood cells. Again the amoeboid character does not always impart the power of ingesting the red blood cells, as proved by the fact that none of the non-pathogenic entamoebæ found in the human stools ingest them, although they have got to wade through the red blood cells when found in dysenteric stools. There is not a single instance of a non-pathogenic amoeba, flagellate or ciliate that I know of which ingests red blood cells. *Balanitidium coli*, a pathogenic ciliate, ingests red blood cells.

Besides ingestion of red blood cells, there is another point in support of its pathogenicity. Wenyon's discovery of this flagellate set deeply in sections of the mucosa of the human intestine disproves Dobell's second point. Wenyon himself believes that it must have some connection with pathogenicity.

Dobell's third point is the intractability of the infestation to any medication. *Trichomonas* infestation can be easily removed by exhibition of oleum terebinthinæ. All my cases readily yielded to big doses of oil of turpentine given with castor oil emulsion. The patients showing *E. histolytica* in their stools in addition to *Trichomonas* required emetine as well.

There is another interesting point in this connection. In two cases passing dysenteric stools, both *E. histolytica* and *Trichomonas* were found. The pH of both the stools was 6.8. In nearly all the cases the reaction of the stools showing *Trichomonas* was distinctly alkaline; but in these two cases, although the reactions of the stools were acid, the flagellates were found to be as active as ever.

### TRICHOMONAS INFECTION IN THE URINE.

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*Trichomonas hominis* is a well-known intestinal flagellate protozoal parasite of the intestine; and several writers have described infection of the vagina with *Trichomonas vaginalis*. *Trichomonas* infection of the urethra in the male,

however has not been previously described as far as I am aware. In routine examination of some thousand specimens of urine from both sexes, I had never encountered this parasite until recently, but have lately encountered urinary infection in four individuals, three of them males. These cases were as follows:—

*Case 1.*—B. C. S., Hindu male, aged 62 years. On March 16th, 1924, the urine gave a specific gravity of 1010; reaction slightly acid; a trace of albumin present; no sugar. Microscopic examination of the deposit shewed a few pus cells and numerous and actively motile *Trichomonas*. On the 21st April, 1924, the urine was neutral in reaction; neither albumin nor sugar was present, and neither pus cells nor *Trichomonas* could be found.

*Case 2.*—S. B., Mahomedan male, aged 50 years. On the 24th May 1924, the urine had a specific gravity of 1005 and an acid reaction; shewed no albumin or sugar; and on microscopic examination a few pus cells and *Trichomonas*. On the 13th July 1924 the reaction was neutral; and neither pus cells nor *Trichomonas* were found.

*Case 3.*—N. M., Hindu female, aged 19 years. On the 8th November 1924, the urine had a specific gravity of 1010 and acid reaction; shewed no albumin or sugar, but many *Trichomonas* on microscopic examination of the deposit.

*Case 4.*—S. C., Hindu male, aged 40 years. On the 20th January 1925, the urine had a specific gravity of 1008 and acid reaction; shewed no sugar or albumin; but on microscopic examination some pus cells and numerous *Trichomonas*.

All the samples of urine were collected in clean glass urinals by myself, so no question of faecal contamination can arise. It is interesting to note that in two instances where a second examination was carried out, the infection had spontaneously cleared up within a short time, without any treatment, and that the pus cells present at the first examination when *Trichomonas* was present, were absent at the second examination when it was absent. It would appear that *Trichomonas* may cause a mild urethritis, attended with smarting and burning on micturition, or the discharge of pus per urethram, but that this urethritis cures itself on the disappearance of the *Trichomonas*.

#### ON THE TECHNIQUE AND SIGNIFICANCE OF THE ROSINDOLE REACTION, APPLIED TO URINE.

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THE derivatives of tryptophane, which are known to be formed by putrefactive bacteria in the intestinal canal, are indole-propionic acid, indole-acetic acid, indole and skatole. Small quantities of indole are absorbed and undergo

further oxidation to indoxyl, which is excreted in the urine combined with sulphuric acid (indican) and glycuronic acid. The formation of indican is thought to be one of the many functions of the liver, and the quantity present in the urine is regarded as an index of the degree of intestinal stasis. It is probable that other derivatives are also absorbed from the alimentary canal. Putrid purulent conditions are sometimes accompanied by an increase in urinary indican, and this observation has been cited as evidence that endogenous formation may occur.

The purpose of the present paper is to point out that products of tryptophane, other than indican, are frequently present in urine and that variation in the excretion of these products appears to have some correlation with certain pathological conditions.

Since indole production has been regarded as a determinative characteristic in bacteriology, considerable research has been carried out on the indoles and their colour reactions. Ehrlich's rosindole test has been found delicate, but is also given by tryptophane and many of its derivatives, though confusion is unlikely to occur with skatole as a blue violet tint is produced instead of the usual rose colour.

It has been suggested that the rosindole reaction could be rendered more specific by its application to a distillate, as tryptophane and indole-acetic acid are non-volatile in steam, while indole and skatole are known to be readily volatile. Working along these lines Goré<sup>1</sup> devised the ingenious cotton wool plug (C. W. P.) test for indole, which was shown by Malone and Goré<sup>2</sup> to give positive results with an indole dilution of one part in two million.

In a recent communication to the Medical Research Section of the Indian Science Congress, Goré<sup>3</sup> suggested that the application of the cotton wool plug test to urine would serve to indicate the presence of indican, but based this conclusion on the parallel results obtained with his test and the Obermeyer test for indican on ten specimens only. For the convenience of readers Goré's technique of the cotton wool plug test for urine is given below:—

"Put 2 c.c. of urine into a small test tube (5 ins. by  $\frac{3}{4}$  in.) and fit it with a plug made of white absorbent cotton wool. Remove the plug, moisten its under-surface with a drop or two, first of potassium persulphate solution (potassium persulphate 1 grm.; distilled water 100 c.c.) and then of p. dimethyl-amino-benzaldehyde solution (p. dimethyl-amino-benzaldehyde 1 grm.; absolute alcohol 95 c.c.; concentrated hydrochloric acid 20 c.c.), and replace it. Bring the urine to the boil by intermittent heating in a low flame, and if the urine contains indican, half a minute or a minute's further such boiling imparts a pink colour to the moistened under-surface of the plug. In the case of a negative result, i.e., absence of indican, no pink colour is seen on the cotton wool."