

## THE PROBLEM OF TRICHOMONIASIS OF THE LOWER GENITAL TRACT IN THE FEMALE\*

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Trichomonal infestation has spread in every continent, in every class, in every race and climate. It may be asked whether this is due to the misfortunes of war or to improved methods of detecting the organism. Does it affect the vagina or the whole uro-genital system? Is it acquired and transmitted solely by sexual contact? What are the different forms of *T. vaginalis*? Does the parasite infect the uro-genital system only, or does it sometimes give rise to serious general symptoms? Has the trichomonad an affinity with a follicular endocrinology, or with a lower sensitivity of the vaginal mucosa to oestrogen? Why does the parasite so rarely give rise to clinical symptoms in the male? What is the subjective and objective, local and general symptomatology of trichomonal vaginitis?

This vast and complex problem with all its implications and varied interpretations was discussed at the first European symposium which was held at Rheims in May, 1957, and from the therapeutic point of view it still remains unsolved.

The discovery of the flagellate in the vaginal secretion of the female and in the preputial sac in the male was reported by Donn  (1836) who described it as follows:

“Un animalcule particulier . . . d'un volume plus que double d'un globule de sang humain . . . son corps est rond . . . est muni   sa partie anterieure d'un long appendice flagelliforme, d'une esp ce de trompe . . . au dessous de cette trompe, plusieurs cils  galement tr s fins . . . se rapproche des Monas par sa trompe et des Tricodes par ses cils . . . pourrait porter le nom de Trico-monas vaginale.”

Hoehne (1916) confirmed the pathogenicity of the parasite, described the acute type of vaginitis, and emphasized its resistance to treatment and the frequency of relapses.

The trichomonad and its habits have been described in detail by various authors (Mandoul and Pestre, 1957; Powell, 1936; Chappaz, 1957; Kissling,

1934; Schmid and Kamniker, 1926; Bender, 1935; Molinero, 1951; Hees, 1936; Bensen, 1908; Stein and Cope, 1931; Reuling, 1921; Willcox, 1960).

The flagellate is never found in pure culture in the vaginal secretions, but is always associated with other organisms such as *N. gonorrhoeae*, non-haemolytic streptococci, coliform bacilli, and micrococci (Kissling, 1934; Haussmann, 1870; Hoehne, 1916; Schr der and L ser, 1919; Candiani, 1953), staphylococci (Candiani, 1953), *Haemophilus vaginalis* (Lutz and Burger, 1957), and yeast-like fungi. Michon-Adjoubel (1939) and Candiani (1953) have always found the flagellate in secretions at pH 5–6 as measured by the colorimetric method.

### Identification

Three methods of identifying the parasite are in use:

- (i) Examination of fresh smears of the vaginal secretion.
- (ii) Microscopic examination of stained preparations.
- (iii) Culture in artificial media.

Balbi (1952) examined fresh smears obtained from the posterior or lateral fornices.

The most popular staining procedure is that using May–Grunwald–Giemsa.

Various methods have been used to obtain cultures. Jirovec and Peter (1950) used 1 per cent. maltose broth with 10 per cent. human serum and 300–500 units of penicillin per ml.; Candiani (1953) and Mandoul and Pestre (1957) added 5 per cent. serum from pregnant women and penicillin and streptomycin to inhibit bacterial growth. de Carneri (1956) thought that cysteine hydrochloride was a necessary growth factor, and did not agree with Swift (1937) that the addition of oestrogen and progesterone inhibited its growth. Sorel (1957) since 1954 has used a peptone broth with added meat and penicillin, and Roiron-Ratner (1957) since 1956 has used meat infusion broth with added peptone, ascorbic acid, liver extract, glucose, and monopotassium phosphate.

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### Incidence

The parasite is found in from 6 per cent. (Schröder and Löser, 1919) to 91 per cent. (Bland and Rakoff, 1956) of women. This great difference is due to many factors, including age, race, condition of the genital organs, sexual customs, phase of the menstrual cycle, season, climate, and technique of examination. All authors agree that it is most common at the period of greatest sexual activity, most rare in infancy, rare in childhood, and frequent at and after the menopause.

It is more frequent in Negro women and those of mixed race than in white women (dos Santos and Zagury, 1943; Karnaky, 1936), in summer (Hees, 1936), and in the lower social classes.

Reports differ on the influence of pregnancy on the incidence of trichomonal infestation. Jirovec (1957) found it in 42 per cent. of pregnant women against 14 per cent. of non-pregnant, and Perez and Blanchard (1957) agreed with this. Balbi (1952) had no explanation for this greater incidence in pregnancy, and Chappaz (1957) observed it less frequently during pregnancy.

There is a marked disagreement about the association of the flagellate with the gonococcus, but the incidence is higher in cases coming to venereal disease clinics than in obstetric cases.

### Transmission

The infrequency with which it is found in healthy women compared with those clinically affected by leucorrhoea or colpitis, has led most authors to think that the condition is transmitted through sexual contact and should be classed as a venereal disease (Lapierre, 1957; Jira, 1957; Jirovec, 1957; Keutel, 1957; Ottolenghi-Preti, 1957; Perju, 1957; Picinelli, 1957).

In female children and adolescent girls the infection is probably transmitted by clothing, bath tubs, or bidets, and in women perhaps rarely by rubber gloves, vaginal cannulae, or specula.

Balbi (1952) said that the upward trend in the spread of the disease could only be due to venereal transmission. Bauer (1957), in a world-wide statistical survey, stated that no other logical source of contamination could be found apart from coitus. Chappaz and Chatellier (1951) said that "trichomonal vaginitis may be transmitted to a woman by a clinically healthy man, the penis being merely a vehicle for the parasite . . . the infection is spread by towels, bidets, or simply by coitus". Durel (1957) said that "by treating the woman one may very often

cure the man . . . abstinence from sexual intercourse being an important condition for cure". Bedoya (1957) said that the only way to cure trichomoniasis was to treat the man and woman simultaneously.

Trichomoniasis is thus undoubtedly a venereal disease, even in virgins; in fact five patients who were virgae intactae admitted to the author that they had experienced coitus ante portas (intercourse without penetration). Certain infected patients who were also virgins, described by Peter (1950), had had sexual contact of this kind. Dellepiane attributed the frequency of relapses to the infection of the husband, and advised that both husband and wife should be treated simultaneously.

### Pathogenesis

The pathogenic nature of the organism is recognized by the majority of authors because the flagellate is always present in cases of vaginitis, its disappearance coincides with clinical healing, and it may be made to reappear by an inoculation which produces the recognized clinical symptoms.

However, some authors (Haupt, 1924; Schröder, 1921, 1925; Hibbert, 1933; Hesselstine, 1933) consider it to be a saprophyte, and others (Carretti, 1938; Debiasi, 1939; Mohr, 1937; Pundel, 1950) have reported finding it in "healthy" virgins.

Balbi (1952) said that "the variety of vaginal flora is misleading, since many organisms are considered to be normal and benign, and the cause of the inflammation is not found without very careful examination". According to their nature and abundance, they prepare the ground for the action of the trichomonad and may increase the purulent inflammation once it has become established, and so increase the clinical symptoms.

The vaginal acidity is considered by many to be the most effective barrier against infection; trichomonads can be cultivated only in pH 4.9 to 7.5 (Morenas, 1945, gives 7.5-8). This is due to the continuous production of lactic acid from the glycogen of the vaginal epithelium, and to the operation of Döderlein's lactobacilli, which decrease or disappear as the flagellates and associated flora flourish (trichomoniasis microbialis—Jirovec). Very rarely *T. vaginalis* is associated with flora of the first grade (the epithelial cells flaking off, few leucocytes, the bacteria consisting only of lactobacilli), but it prefers flora of the third or fourth grade (Witzig, 1948). One author, who has recently rejected this idea that normal vaginal acidity and abundance of Döderlein's lactobacilli render the survival of the flagellate impossible, is

Feo (1956), who found the protozoon existing in a pH 3.6 to 4.7 with a rich flora of Döderlein's bacilli in 92.5 per cent. of a series of pregnant women in the third trimester.

The normal acidity of the surrounding vagina and a normal density of lactobacilli favour a normal increase of folliculin (Sannicandro, 1949) and healthy nutrition of the vaginal epithelium. This, when destroyed, frees the glycolytic enzymes which break down the glycogen into lactic acid; and the excess acid provokes an intense cytolysis of the epithelial cells. When the oestrogenic hormones are few, the Döderlein's bacilli are scarce or absent. Chappaz and Chatellier (1951) put it like this: "It is certain that, if a normal healthy vaginal flora prevents *T. vaginalis* from establishing itself or becoming harmful, it is the quantity of circulating oestrogens which is the primary cause of this". Laffont and Bourgarel (1947), Bedrine (1949), Sannicandro (1949), and Feo (1956) all agree that the parasite develops in an environment which is deficient in folliculinizing hormones. But this opinion is opposed with convincing arguments by Netter and Lambert (1957); in a series of sixty patients, 55 showed on investigation normal ovarian function—that is with lowered oestrogens and 17-ketosteroids in the urine, normal temperature, normal menstruation, biopsy of the endometrium in the 14–20th days of the cycle. The same authors, in another series of eighty young women with amenorrhoea, deficient follicles, and raised metabolism, found only one case of infection. Candiani (1953) pointed out a local decreased sensitivity of the epithelium to the stimulus of oestrogens.

Three important statements cannot be overlooked. Candiani (1953) added an abundant vaginal secretion rich in flaked-off cells obtained by pipetting from a healthy vagina without any trichomonads to a culture of *T. vaginalis* of low vitality, and noted that the mobility of the flagellates increased and that they began to reproduce themselves; he deduced that the products of cellular metabolism were necessary to the development of the protozoon. Feo (1956) succeeded in keeping *T. vaginalis* alive for 20 months on an S.T.S. medium without maltose, and concluded that: "Atrophic and easily damaged mucous membrane allows the exudation of the factor which is favourable and indispensable to the growth of *T. vaginalis*, i.e., serum", which furnishes all the requirements for culture. The possibility of keeping the flagellate alive in a medium without maltose, refutes the theory of Hees (1936), which is shared by Perju (1957). Savel (1957) asserts also that the associated flora prolong the life of the flagellate and make its reproduction more plentiful.

### Symptomatology

Our cases were collected during the first 10 months of 1958.

The patients came from V.D., gynaecological, and medical clinics, and from private practice. Of 148 cases of more or less profuse leucorrhoea, sixty (40 per cent.) were positive for *T. vaginalis*.

*Age.*—Two (3.3 per cent.) were 16 years old;  
45 (75 per cent.) were 20–40 years old;  
13 (21.67 per cent.) were 41–52 years old;

These figures are a little lower than those given by Jirovec (1957).

*Season.*—In the first, second, and third quarters, and in the month of October, the incidence was 20, 18, 15, and 7, which shows no seasonal fluctuation, unlike the findings of Hees (1936), and Perez and Blanchard (1957).

*Other Infections.*—The flagellate was found with *N. gonorrhoeae* in six cases (10 per cent.), and with *Monilia* in five cases (8.3 per cent.), the pH being 4.5, 5.4, 5.5, 5.5, and 5.0.

*pH.*—In one case it was 6, in forty cases it was 5.5 (66.6 per cent.), in seven cases it was 5 (28.6 per cent.), and in two cases it was 4.5 (4.8 per cent.).

*Marital Status.*—Of the sixty infected cases, one was a virgin, seventeen were unmarried or prostitutes (two pregnant), and 42 married (ten pregnant).

*Duration of Disease.*—It was not easy to find out when the infection had first started.

*Ovarian Function.*—Twenty patients had normal menstruation, two had ovarian hypoplasia, 21 had scanty, irregular, or painful flow, ten had abundant and prolonged flow, and seven were menopausal.

*General Health.*—This was good in 35 patients (58 per cent.) and poor in 25 (42 per cent.).

### Severity of Disease

*Acute Type.*—The patients complained of leucorrhoea, pruritus vulvae, dyspareunia, and general symptoms. The discharge was enough to cause the patients to wash frequently, change their garments, and wear an absorbent towel at all times. They had the sensation of an abundant menstruation.

The secretion was nearly always fluid, yellow, frothy, offensive, milky, sometimes white in colour but turning yellow on the towel. It was always worse after a menstrual period and also in some cases 2 or 3 days before the start of menstruation; in a few cases the discharge was the same all through the cycle. Also the secretion was increased by work, emotion, or, rarely, by hot weather.

There were severe bouts of irritation of the external genital area, lasting a few minutes and sometimes for a quarter of an hour, and recurring throughout the day and less frequently at night, usually worse just before and after menstruation. This was unaffected by work, food, or weather.

There was also a burning sensation in the labia majora, labia minora, and vaginal orifice, usually continuous; occasionally a tickling sensation, heaviness in the bladder, and dysuria; very frequently polyuria, sometimes nocturia, and often diffused pain in the lumbosacral region.

A constant symptom was dyspareunia; the pain was more or less acute during the passage of the glans penis and the penis into the vaginal orifice, where it was felt more sharply. Often the pain was increased by the movements of coitus and became so unbearable as to cause the interruption of coitus. With this pain in the woman the man would feel a dryness at the introitus.

Only in three cases was there fever with shivering after midday; there was sometimes loss of weight, often very marked; always anorexia and more or less marked asthenia; sometimes lack of will power, depression, loss of affection, irritability, inferiority complex, venereophobia, and psychic disturbance. Ten per cent. of my patients complained of insomnia or drowsiness; 30 per cent. had headaches, pain in the eyeballs, light-headedness, heaviness in the forehead, pins and needles, burning, and itching—quite independent of menstruation, weather, medicines, or food. They sometimes had asthenopia, vertigo, loss of libido leading to frigidity, aversion to coitus with feelings of hostility to the husband (probably due to the dyspareunia), and in some cases vaginal haemorrhage after coitus or between menstruations.

The objective examination was confined to a superficial inspection of the external genitalia. There was a red or pink erythema of the labia majora and groin with abrasions and erosions, with an offensive white crust caused by the breaking up of the epithelium. There was marked redness of the skin caused by the stagnation and abundance of the discharge together with scratching, and a characteristic odour from the vulva. A fine coating of moisture covered the inner aspect of the labia majora and minora, the vestibule, the lower part of the vagina, and less often the clitoris. A stream of offensive yellow fluid ran down from fornix to fourchette. Sometimes the orifice of Skene's glands and the urinary meatus were obstructed by a little blister, the former being surrounded by little round scarlet dots, and the latter being congested and frequently oedematous; in one case only I found early kraurosis with atrophy of the labia minora and closing of the lower vaginal orifice. The entry into the vagina was painful as the inflammation spread over the labia minora and majora; one was aware of an apparent closure of the passage. The use of the speculum provoked spasms and acute pain; in a few cases it was necessary to use the type of speculum reserved for virgins. There was also hyperaemia of the vaginal passage, which was moist with an almost invisible layer of moisture, swollen, and covered with erosions (like haemorrhoids) as big as a pin-head, round, and quick to bleed, on the outer edges; from the vaginal walls the discharge collected in the posterior fornix, usually about 5–6 ml. of yellow or greenish yellow fluid, dotted with little bubbles, with a characteristic smell. If all the liquid was removed with a wad of cotton wool it could be seen that the external orifice of the cervix was dry or obstructed by mucus or thick muco-pus.

When the speculum was withdrawn a stream of yellow, often frothy, fluid followed it, trickling down the posterior crease of the labia majora.

I have never observed inflammation of Bartholin's glands, but it was almost invariably present in Skene's glands, the urethra, and the bladder. It was not possible to find the flagellate in urine drawn off by a catheter. In two of the above-mentioned cases I observed an eosinophil count of 5 to 7 per cent., after excluding the effects of enteric bacilli and allergy.

*Chronic Type.*—The subjective and objective symptomatology is much milder, usually with one symptom predominating—*i.e.* pruritus, dyspareunia, or dysmenorrhoea. The pruritus, and dyspareunia may be very slight and infrequent, while the secretion is scanty and mixed with mucus. The general symptoms include occasional headaches, periods of asthenia with changeable moods, and neurovegetative disturbances. According to Jirovec and Peter (1950), about 26 per cent. of cases are chronic, and about 68 per cent. acute, but in my series this ratio was reversed.

This form of the disease is most important from the epidemiological point of view, for these patients are the main source of the spread of the parasite, the other reservoir being the male patients. According to Coutts and Silva-Inzunza (1957), of 8,239 cases of urethritis in the male, 71 per cent. were due to *N. gonorrhoeae*; of the 1,690 cases of non-gonococcal infection, 68 per cent. were thought to be due to the flagellate. Jira (1957) found the flagellate in 154 of 1,961 cases of urethritis (7·8 per cent.).

In our series we examined the secretion from the prostate gland and bladder of nine men and the parasite was found in only two. Cavalcanti and Sprovieri (1959) in a series of 66 consorts of women with trichomoniasis, found the organism in fresh smears in 42 (63·6 per cent.), in stained preparations in fifty (75·7 per cent.) and in cultures in 51 (77·2 per cent.). They failed to find it by any method in only fifteen cases (22·8 per cent.).

Almost all authors assert that the male is usually merely a carrier, but in a few cases the parasite becomes pathogenic and causes inflammation of the urethra or prostate. In the male conditions are unfavourable to the establishment of the flagellate, not only because of the narrowness of the urethral meatus and the flow of urine (Durel, 1957), but also through some inherent sexual factor, probably the androgen-oestrogen ratio, such as frequently has an influence on the development of acne vulgaris.

#### Indications for Treatment

Although there are many drugs with a trichomonocidal action and power to modify the pH of the vaginal flora, the treatment of trichomoniasis in the female is, as Jirovec states, exceedingly "tricky". First, the parasite is not widely known and may be overlooked, and the easy means of identifying it in fresh smears may not be understood. Secondly, one is not often able to give simultaneous treatment to the consort. Thirdly, as already mentioned, the

vagina offers the protozoon many hiding places which are not reached by local treatment. Fourthly, the "carriers" do not come for examination and treatment, and disregard the slight local symptoms which are often masked.

Various drugs are used as douches, pessaries, ovules, pastes, and jellies, *e.g.* carbarsol, acetarsol (Devegan), oxyginolin sulphate, phenylmercuric salts, silver nitrate, Orthogynol (a jelly compound), tetronyl (an ammonium derivative), vioform, and sodium chloride (Rosenthal, Schwartz, and Kaldor, 1935). Lactic and acetic acids are also used to promote acidity.

Normogin is useful to modify the vaginal flora, and Chappaz and Chatellier (1951) use high doses of natural oestrogen. Candiani (1953) advises low doses of synthetic oestrogen. Sulphonamides in pessaries will kill bacteria. Perl, Guttmacher, and Raggazoni (1956) used amino-nitrothiazole with good results, and Thiéry (1957) reported that he had had a 54 per cent. cure rate after using this drug orally and locally.

Jirovec advised local vaginal tablets containing 50 per cent. sulphathiazole, 10 per cent. Marfanil, 10 per cent. carbasol, 5 per cent. boric acid, and 25 per cent. excipient. After irrigation with a 0.1 per cent. solution of Marfanil, two pessaries were introduced into the lateral fornices twice a week for 3 months and once a week for another 2 to 4 months, intercourse being forbidden during the time of treatment.

Special compounds include Fluocid and Triflocid with arsenic in Czechoslovakia, Anafluose in France, and Trikolpon in Holland.

Many trials have also been made with antibiotics. Penicillin and streptomycin attack the flora seen in the acute form, but have no trichomonocidal action. Chloramphenicol was used with good results by Luisi (1952) and Lomuto and Ciaula (1954). Terramycin was used by Greene and Patelski (1952) and by Candiani (1953) in association with thymol. Aureomycin is unsatisfactory and favours the growth of *Monilia*. Trichomycin, obtained from actinomycetes in the soil (*Streptomyces hachijoensis*, isolated by Hosoya in the Island of Hachijo: Hosoya, Komatsu, Soeda, and Sonoda, 1952), has also been tried. Magara (1957) and Magara, Yokouti, Senda, and Amino (1954) obtained very good results with combined oral and local therapy, which have been confirmed by Chappaz and Bertrand (1957) and Nicoletti (1958) but not by Catterall (1957).

### Conclusions

The discovery of the growing spread of trichomoniasis is due to improved methods of research. Increased morbidity has accompanied inadequate

treatment and is especially due to the confused view of the problem, which is a joint task for gynaecologists, venereologists, and urologists. It may be described as a venereal disease because it is transmitted in the great majority of cases by sexual intercourse. It is so widespread and causes so much ill-health among young women that it is becoming an important social problem.

It is necessary to treat both man and woman to eliminate the parasite from its innermost hiding places (prostate, Skene's glands, etc.). It is fortunate that the pharmacologists are discovering new and efficient drugs for treating both the local infestation and the attendant pathological conditions (urethral stricture, cervicitis, etc.)

Trichomoniasis does not affect only the lower genital tract. We do not know what gives it its special powers of re-infection, and its particular ability to lurk in the most remote corners (uterus, vesicles, etc.). The glands of Bartholin and Skene, the crevices and folds of the vagina and urethra, the glands of Littre and Cowper, and Morgagni's lacuna, all offer safe hideouts to the flagellate.

No favourable opinion can be given regarding the ultimate predisposing factor of the diminution in folliculizing hormones and the reduced reaction of the vaginal mucosa to the stimulus of oestrogen.

There is need of many combined efforts to combat this disease effectively as we have done with gonorrhoea and syphilis, so as to conquer a malady which can profoundly upset the balance of good health in an active young woman, reducing her to a nervous, melancholy, and worried person, in physical discomfort and mental distress leading to an inferiority complex.

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#### Le problème de la trichomoniose des voies génitales inférieures chez la femme

##### RÉSUMÉ

L'auteur passe en revue l'historique, l'identification, la fréquence, la transmission et la pathogénie de la trichomoniose vaginale.

Il rapporte la présence du *T. vaginalis* dans 60 sur 148 cas d'écoulement vaginal plus ou moins abondant.

La symptomatologie de la maladie est décrite minutieusement. A la période aiguë, un écoulement abondant, fluide, jaune, quelquefois écumeux, et à odeur caractéristique constitue le symptôme prédominant. Parmi les symptômes secondaires on trouve la dyspareunie, le prurit vulvaire, le malaise général et, quelquefois, un désordre psychologique marqué. Une éosinophilie fut présente dans 11 pour cent des cas examinés. Selon l'auteur, la forme chronique, qui peut se manifester seulement par un léger écoulement vaginal, est plus fréquente; ceci est important du point de vue épidémiologique parce qu'elle crée ainsi une source d'infection occulte. Le partenaire peut aussi être un porteur asymptomatique et on pense que le quotient androgène/folliculaire pourrait y jouer un rôle.

Différentes méthodes de traitement local sont décrites et la thérapie antibiotique est mentionnée.

En conclusion, l'auteur déclare que la lutte contre la trichomoniose vaginale est "une tâche commune des gynécologues, vénéréologistes et urologistes. On peut la décrire comme maladie vénérienne, parce qu'elle est transmise dans la plupart des cas par le rapport sexuel. Elle est si répandue et occasionne tant de souffrance à de jeunes femmes, qu'elle commence à devenir un problème social important".