of lead-poisoning and promoted the excretion of large amounts of lead in the urine. No toxic effects were observed.

The administration of para-thor-mone during treatment with versenate did not increase the rate of excretion of lead in the urine above that obtained by versenate alone.

The chemistry, pharmacology, and method of use of versenate are discussed.

We wish to thank Dr. Donald Hunter, Dr. Lesley Bidstrup, and Mr. B. J. Biles, of the Medical Research Council Department for Research in Industrial Medicine, for the lead estimations; and Mr. V. K. Asta for the chart.

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TRICHOMONAS VAGINALIS INFECTION IN THE MALE

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In recent years fungi, viruses, spirochaetes, and protozoa have tended to displace the gonococcus in the causation of acute and chronic inflammation of the lower genito-urinary tract in both sexes, and for this reason more examples of such infections are now seen at urological clinics. Some authors believe that the types of trichomonads described—*Trichomonas vaginalis* (genital), *T. hominis* (intestinal), and *T. tenax* (buccal)—belong to one species only, their morphological differences arising from their particular human "habitat" (*Standortsvarietäten-Flaskamp*). But Wenrich (1947) suggests that the different trichomonads infesting man belong to distinct species. Despite occasional reports of trichomonal infection of the male urethra, such infection has been regarded for many years as affecting women only. However, with the increasing occurrence of residual post-gonococcal urethritis following adequate penicillin therapy, and the higher incidence of non-

gonococcal urethritis in the male, *T. vaginalis* infection with its complications in both sexes is gaining wider recognition as a definite entity. Some authors (Pomeroy, 1948; Freed, 1948) refer to it as the "seventh venereal disease."

The Parasite and its Recognition

T. vaginalis is a pear-shaped, ovoid, or round pentagellated protozoon, 10–20 μ long by 8–10 μ broad, though much smaller forms, measuring 2 to 3 μ , are not uncommon. Four free flagella arising at the blepharoblast, part of the neuromotor system, emerge from the upper pole of the body of the parasite. The so-called fifth flagellum is attached to one of the borders of the body and forms part of the undulating membrane. Even the smallest forms have flagella, though occasionally only a single but very long, thin flagellum is present. Small, non-flagellated trophozoites have been observed; these are degenerative forms which recover their properties when they change habitat (Wenyon, 1926). Our own observations have led us to conclude that they represent evolutive forms of the life cycle.

In fresh preparations examined under dark-field illumination the free extremity of one or more flagella can be seen bending and unbending, inwards and occasionally outwards (Feinberg). This phenomenon can also be seen in fixed, unstained smears (Fig. 1). Occasionally in such preparations the flagella appear segmented. If fresh preparations are observed under dark-field illumination with interposed polarizing filters (Silva-Inzunza's technique), flagella appear coloured red. The flagellum of the undulating membrane is without colour, and for this reason we believe it to be an independent structure. Thus the parasite is really a tetra-flagellate (Silva-Inzunza and Coutts, 1954). When fixed, unstained smears are examined under dark-field illumination a cystostome is clearly visible in the upper pole of the body of some parasites, the common axis from which flagella branch off emerging from the borders of this opening (Fig. 2). At the lower pole another opening may be seen, through which the axostyle, a pointed, more or less rigid structure of doubtful significance, is probably ejected. Intracytoplasmic structures—nucleus, blepharoblast, and parabasal body—are too well known to need description. Little is known about multiplication and development of *T. vaginalis*; multiplication may be by simple binary division or by budding (Fig. 3). Cysts and pseudocysts have also been described.

The presence of *T. vaginalis* in secretions or urinary sediment can be established by examination of fresh preparations or of unstained smears fixed in 10% formol. This last type of preparation has the advantage that the sample can be collected anywhere and sent to a laboratory for diagnosis. Fresh preparations can be viewed with simple, dark-field, or phase-contrast microscopy; fixed, unstained smears are best studied under sunlight or lamplight dark-field. Less satisfactory results are obtained with stained smears. In fresh preparations treated with 5% aqueous solution of fluorescein (vital stain) all living forms of the parasite rapidly assume a brilliant green colour (trophozoites, cysts, etc.). This technique is very useful when the material contains numerous pus cells and few trophozoites (Coutts and Silva-Inzunza, 1954).

Pathogenicity

The subject of the pathogenicity of *T. vaginalis* has been much discussed (Rodecurt, 1952). Some authors doubt or deny that it has pathogenic properties, others favour a facultative pathogenicity, while still others stress the influence of co-infectors (anaerobes, viruses, spirillae). The experiments of Trussell and Plass (1940), of Hesseltine and others in women, and those of Lanceley and McEntegart (1953) in men, however, have established beyond doubt the pathogenicity of *T. vaginalis*.

In adult males contagion is usually of a sexual nature. We have seen a few cases in prepubertal boys, mostly vagabonds living promiscuously. We have seen pederasts fortuitously infected by another who shortly before had been

anally fornicated by a married invert harbouring numerous *T. vaginalis* in the prostate. We have also seen two cases of infection following oral coitus; in both these the woman, a prostitute, had probably recently performed the same act with a client infected with *T. vaginalis* and still harboured living parasites in her mouth.

Some symptomless virgins and others with leucorrhoea harbour the parasite in their vagina before marriage; the husbands must promptly be infected, but seldom develop

activity, fatigued, and killed. According to this hypothesis the latent and carrier stages would signify an electrical equilibrium between parasite and organism.

Infection in Males

Many thousands of cases of male genito-urinary trichomoniasis have been reported in the past decade. Since 1937 (Coutts and Monetta, 1938) we have studied genito-urinary trichomoniasis in both male and female at the Urologic Clinic of the School of Medicine, Chile University, and at the Central Antivenereal Polyclinic of the National Health Service (Coutts, 1942, 1948). Between 1951 and 1954 we have seen in the clinic and privately some 8,329 male cases of urethritis, 5,847 with gonorrhoea and 2,482 (29%) non-gonococcal. Amongst the latter *T. vaginalis* was found in 1,690 cases (68%).

In the male, infection by *T. vaginalis* may occur alone or in association with gonococcal,

fungal, viral, spirochaetal, or other infections, and clinically may be acute, chronic, or latent.

Acute Infection

It is not always possible to be certain that an acute urethritis is an initial trichomonal infection, as it may be a flare-up of a chronic process. Of the 1,690 cases, we have classified only 262 (15.5%) as acute primary trichomonal urethritis when the patient was seen within the first five days after the appearance of an intense discharge and after a careful urological investigation we were unable to find the parasite in the prostatic fluid.

The incubation period varies from three to eight days (Coutts and Silva-Inzunza, 1952; Silva-Inzunza and Coutts, 1953). Urethral discharge is the first objective symptom, which may or may not be preceded by an itching sensation around the urinary meatus or a slight burning on micturition. The discharge may be slight and watery or milky in appearance, or be abundant and purulent as observed in gonococcal infection. This last type is frequently accompanied by preputial oedema and intense burning during urination. Painful erections are occasionally present.

We recommend the simultaneous study under dark-field illumination of a Gram-stained smear and a fresh preparation of the urethral discharge in all cases. Mild trichomonal discharges contain epithelial cells in large numbers, numerous leucocytes, and actively motile parasites. Discharges containing large numbers of pus cells must be diluted before observation, as recommended previously (Coutts and Silva-Inzunza, 1954). Some authors have remarked the frequency of erythrocytes in trichomonal discharges, but according to our observations this has no pathognomonic significance. If the discharge is slight, the urine is clear in both glasses but contains numerous heavy threads in the first; when the discharge is very profuse, the urine is cloudy in the first glass and clear in the second.

In untreated cases the posterior urethra and prostate may be rapidly invaded: a sensation of weight in the perineum, dysuria, and varying degrees of tenesmus mark the invasion of these structures. We have observed several cases of prostatitis and one of prostatic abscess for which *T. vaginalis* was alone responsible. These complications are not accompanied by fever. Urine is cloudy in both glasses.

Acute epididymitis as a possible complication of genito-urinary *T. vaginalis* infection is still disputed by many authors. Only a few cases have been described, and we ourselves have seen three cases in which this complication developed during an untreated acute primary infection.

Photomicrographs taken under dark-field illumination ($\times 900$) of fixed, unstained smears of vaginal secretion from a case of *T. vaginalis* infection. FIG. 1.—*T. vaginalis* with flagella. FIG. 2.—Cystostome and caudal opening. FIG. 3.—Stage of division. FIG. 4.—Dichotomy of free extremity of flagella.

an acute urethritis. Only once have we seen a recently married man who during his honeymoon developed an acute trichomonal urethritis. On two other occasions men have consulted us with a mild urethritis appearing within the first month of their marriage; one of them had never previously had sexual intercourse, and the other regarded it as the recurrence of a former gonorrhoea. We have seen cases in which man and wife were infected but symptomless; the husband had intercourse with the wife of a friend, and shortly afterwards she developed an acute vulvo-vaginitis and intense cystitis, with numerous *T. vaginalis* in both the vaginal secretion and the urinary sediment. During the incubation period she had intercourse with her own husband, but he remained free of symptoms. On later examination *T. vaginalis* was found in the first sample of urine collected after prostatic massage.

Superinfection is another interesting aspect; in two couples with latent *T. vaginalis* infection the husband, after extramarital intercourse with an infected woman, developed an acute trichomonal urethritis. During the incubation period he had intercourse with his wife, but she remained symptomless. Superinfection from heterogeneous sources is undoubtedly very common among men, but in our experience usually remains symptomless. A common source of infection is the carrier, in whom the parasite is apparently harmless, but it may become pathogenic when transmitted to other human beings. In only a very few cases could we attribute infection in males directly to fomites—such as the use of infected underwear or towels—or to direct extragenital contact with secretions containing the parasite, such as from water-closets.

In papers published in 1947 and 1952 some of us (Coutts, 1947) have tried to explain the processes of infection and of infestation on the basis of electrical phenomena such as was demonstrated by Fairbairn *et al.* (1946) in the case of certain trypanosomes. According to these latter authors trypanosomes with positive electrical charges penetrate red blood corpuscles with negative charges, while the parasites with negative charges are repelled by the erythrocytes. In the above-mentioned papers we reported the frequent presence of vibrating polymorphonuclear leucocytes in fresh preparations containing spirochaetes or protozoa observed under dark-field illumination, owing to intense brownian movement of intracytoplasmic granules. We tried to explain this intense motility of the granules on the basis of their like electrical charge which causes them to repel each other. This charge would be of the same type as that possessed by the invader, and the phagocyte is thus repelled, kept in constant intracytoplasmic

Onset and evolution are similar to those of pyogenic epididymitis of urethral origin, but the vas deferens is little enlarged, and fever is slight or absent. Acute inflammation of the seminal vesicles during this stage is rare. In some cases acute cystitis sets in; pus cells and numerous *T. vaginalis* are found in an otherwise sterile urine. Some authors have reported simultaneous arthralgias, others arthritis or polyarthritis during the acute stage, and these symptoms have also been observed by us. The parasite has been found in the preputial sac whether local inflammatory signs have been present or not. Out of a group of 40 cases of acute balanitis studied by Lanceley and McEntegart (1953), in only one was the parasite not found in some part of the urogenital tract. We have seen three such cases, all associated with large numbers of spirilla.

Chronic Infection

Chronic infection with *T. vaginalis* is very common. We estimate that 85% of cases studied by us can be classified as chronic. *T. vaginalis* survives in the human host possibly by adaptation of structure, biochemistry, and life cycle. For reasons unknown most of these patients occasionally have a mild or intense urethral discharge, or the sudden appearance of acute prostatitis, epididymitis, or cystitis. It is often impossible to establish whether such cases are due to true reactivation or to superinfection from a heterogeneous source. The most common form of chronic infection is the morning drop containing a moderate number of pus cells, large numbers of epithelial cells, and actively motile *T. vaginalis*. Other cases present no urethral discharge, but numerous threads occur in the first portion of an otherwise clear, transparent, sterile urine, these threads containing pus cells and *T. vaginalis*.

Infection of the prostate is variable; Silva-Inzunza (1948) gives an incidence of 3%, and Turteltaub (1954) one of 20.9%. Like other authors, we have also found *T. vaginalis* in the prostatic fluid of a high proportion (40%) of husbands whose wives harbour the parasite in the vagina. Many of these males have never had a urethral discharge, but most of them have threads in the urine (Coutts and Silva-Inzunza, 1948). Of 182 men over 60 years of age investigated for cancer, dark-field examination of prostatic fluid revealed *T. vaginalis* in five (2.7%). In only one of these cases were pus cells present.

Ejaculatio praecox may be diagnosed in men with chronic trichomonal prostatitis, this symptom in some cases being the starting-point of a sexual neurosis; urinary symptoms such as imperative micturition and periods of dysuria also occur. Mild cystitis has also been observed; in such cases a moderate number of pus cells and some red blood cells as well as *T. vaginalis* are found in the sediment of bladder urine.

We have found the parasite in recently ejaculated semen in four cases of recurrent haemospermia; in three only a moderate number of pus cells were seen, but in the fourth case they were abundant. Culture of the spermatic fluid in all cases gave only a few colonies of bacteria considered to be of secondary importance. Chronic spermato-cystitis has been described, and Vargas-Zalazar, in over 1,000 sperm-cell counts in cases of infertility, has found pus and *T. vaginalis* in three.

Of greater interest is the sudden appearance of a sub-acute or acute inflammation of the epididymis in patients with clear or slightly cloudy urine containing a few pus cells but no bacteria. As in the form complicating acute infection, the vas deferens is not, or only very slightly, enlarged, and the corresponding seminal vesicle is usually normal on palpation and painless. Fever, if present, is very slight. The evolution is slow, and the clinical picture may suggest tuberculosis. Before the present study we had found *T. vaginalis* in scrapings of the surface of the epididymal canal in three cases of non-specific epididymitis. In one of these we observed the parasite in unstained sections of tissue examined under dark-field illumination (Coutts *et al.*, 1952). In the past two years we have carefully studied 30

cases of non-specific epididymitis before and after epididymectomy (Saavedra, 1954). In six cases the parasite was found in urethra and prostate, and in three of these in scrapings of the removed structure. In all three cases culture of epididymal tissue in appropriate media was sterile.

Many patients, especially women, suffering from chronic *T. vaginalis* infection are prone to mild attacks of arthritis or suffer periodic pains in the lumbo-sacral region. Ford, in 1953, after a careful revision of the arthritis records at the Whitechapel Clinic, London, supported the view that the common form of venereal arthritis is not gonococcal. We have investigated the articular fluid of women with arthritis and vaginal trichomoniasis, but so far have not found the parasite in any case. However, the joint symptoms are cured after adequate vaginal therapy.

Several authors (Glen and Bailey, Sorel, *etc.*) hold the view that chronic trichomoniasis may be the cause of urethral stricture. We do not favour this hypothesis, having for many years maintained that lymphogranuloma venereum was responsible for most inflammatory fibrous strictures of the urethra.

T. vaginalis has been found in cases of acute cystitis in both men and women chronically infected by the parasite. Sometimes it has been the only possible pathogen found (Silva-Inzunza, 1950); this is more frequently the case in women. In 21 women with attacks of mild or intense dysuria, with sterile bladder urine and absence of pus cells—endometriosis excluded—we have found *T. vaginalis* in large numbers in the urinary sediment. In two cases we have found the parasite in urine obtained direct from the kidneys; both were in men with chronic pyelitis. In one of them Koch's bacillus was also found after an exhaustive investigation.

In chronic cases urethroscopy, both of the anterior and posterior urethra, shows no specific changes which permit differential diagnosis. The same can be said with regard to cystoscopy; in women a chronic inflammation of the trigone may be the outstanding feature.

Latent Infection

We classify as latent a long-standing symptomless infection in which *T. vaginalis* can be found in urethral scrapings or in the urinary sediment after urethral or prostatic massage and pus cells are present in numbers that can be regarded as pathological.

Carrier State

As with the latent case, the carrier state cannot always be clearly defined. In order to accept the existence of healthy carriers one must be certain that the parasite from the beginning caused no reaction, either microscopical or subclinical, in the host. Both latent cases and carriers sometimes produce the most violent types of infection in women.

Associated Infection

Our knowledge of this aspect is derived from the study of 1,561 cases of post-gonococcal residual urethritis, representing 25% of the patients adequately treated with penicillin. *T. vaginalis* was found in the residual secretion of 611 (39%), non-syphilitic spirochaetes in 12 (1.9%), *Staphylococcus albus haemolyticus* in 16.5%, non-haemolytic *Staph. albus* in 17.2%, *Escherichia coli* in 10.8%, and *Streptococcus faecalis* in 6.5%. Judging from the high incidence of chronic *T. vaginalis* infection found by us in males, it is probable that in a large number of cases the gonococcus-trichomonas infection was not simultaneous. In a group of patients investigated the parasite was found in the prostate in 32% of cases. Culture of the urethral secretion of 1,000 males with *T. vaginalis* infection at all stages revealed the following bacteria: haemolytic *Staph. albus*, 20%; non-haemolytic *Staph. albus*, 16%; diphtheroids and *Sr. faecalis*, 5%; and *E. coli*, 3%. The remaining cultures were sterile.

Trichomonaemia

A better knowledge of *T. vaginalis* infection raises the question of the possible existence of an occasional transient trichomonaemia. During certain acute or chronic localized infections a transient bacteraemia may be established, as in the post-operative period following prostatectomy. *T. bovis* has been cultured from the blood of infected cows, and *T. vaginalis* from the blood of infected women (Hees; Wagner and Hees). The possibility of a generalized infection in human beings would be suggested by positive serological reactions (Wendelsberger). However, haemagglutination tests for the presence of *T. vaginalis* antibodies in experimentally infected men gave negative results (Lanceley), and so far such a test has been found positive only in bulls infected with *T. foetus* presenting very severe general symptoms.

Using the fluorescein technique in fresh blood diluted with normal saline we have found free, brilliant-green, rounded bodies, as well as single, but smaller, intracythrotic inclusions of the same colour, in two women with a very severe *T. vaginalis* vaginitis and cystitis with general symptoms. On several occasions we have searched for these structures in fresh blood from men and women chronically infected by the parasite, but have not found them. Our investigations of articular fluid in cases of arthritis have also been negative.

So far, evidence of trichomonaemia is not conclusive, but we believe that in certain circumstances the parasite passes into the blood stream. If such were definitely proved, the possible consequences of this passage must be carefully investigated, as the parasite may be destroyed, or live and multiply in different organs either as a saprophyte or as a pathogen. Trichomonads have been found in sections of lung tissue (Marx), in a subphrenic abscess (Navarro and De Alzaga), and in pus from an amoebic abscess of the liver (Gray and Andrews). Whether the parasites reached these unusual sites by the blood stream or otherwise is a question that must for the moment remain unanswered.

Treatment

So far there appears to be no specific treatment for *T. vaginalis* infection. A review of the literature by Bauer, of Erlangen, showed that up to 1943 nearly 100 chemical substances had been or were still being used and recommended. Since then 50 or more can be added to this list, thus signifying that none is completely satisfactory. Most drugs have been used locally, especially in women.

All chemicals so far employed are unquestionably trichomonocidal, but after cure has been achieved certain circumstances, especially in relation to sexual life, favour reinfection. With married couples, when the woman only is treated the husband remains as a permanent source of reinfection, and vice versa; prostitutes or promiscuous women and men are continuously exposed to reinfection.

Acute primary *T. vaginalis* urethritis, when treated immediately after its onset, will rapidly respond to local application of trichomonocidal drugs, such as silver salts ("argyrol," "protargol") and tincture of merthiolate.

Between 1951 and 1954 we have tried several types of treatment for acute and chronic *T. vaginalis* infection in males who were mostly (80%) between 21 and 40 years of age; only 1.7% were over 50 years. As 25% of all patients treated were married, their wives were, when possible, examined and simultaneously treated if found infected.

Treatment varies according to the clinical condition. Cases of acute uncomplicated anterior urethritis should be treated locally. The following substances have been used in urethral instillations: 5% argyrol, acriflavine (1 in 1,000), tincture of merthiolate, nitrofurantoin derivatives (1-2 in 10,000), and aureomycin (250 mg. in 5-10 ml. of distilled water). Previous anaesthesia of the urethra is recommended.

Patients with chronic trichomoniasis, with or without acute manifestations, should be treated both generally and

locally. We have obtained the best results with injections of emetine or nitrofurantoin derivatives, or the oral administration of aureomycin, erythromycin, or calcium mandelate. Combinations of these drugs frequently give satisfactory results. Locally, after urethral stretching, we recommend instilling into the urethra any of the solutions recommended for the acute stage.

Medico-Social Aspects

Medico-social aspects of trichomoniasis have been little considered and often underestimated, only a few authors having drawn attention to their importance. Headache, backache, and rheumatic pains in women are a frequent cause of lack of interest or inefficiency in the home or at work. Many improve or become normal after treatment of a chronic trichomonal infection. We have also seen men suffering from intense pains in the legs, others with severe backache of neuritic type who could hardly walk, who recovered completely after adequate treatment of a chronic trichomonal prostatitis. Cases, all in men, of osteomyelitis of the spine from urinary infections have been described (Mussey). The possible route of infection is connected with the valveless system of venous channels described by Batson (1940). These channels are primarily perivertebral and have connexions with the prostatic venous plexus, veins of both bony girdles, epidural veins, and veins of the cranial cavity, as well as with the veins of the lower extremities, thoracoabdominal wall, and head and neck. This system is connected to both venae cavae.

Invasion of the female internal genitalia may cause abortion or sterility (Rodecurt; Goodall; Cuppini). *T. vaginalis* has been found in the interior of the normal placenta, in the cut surface of the umbilical cord, and in the heart, liver, and peritoneal cavity of a foetus obtained by caesarean section. Inflammation of the Fallopian tubes may produce obstruction and subsequent sterility. Chronic inflammation of the posterior urethra, and especially of the verumontanum, may result in stricture or occlusion of the terminations of the ejaculatory ducts; epididymitis when bilateral may also cause sterility. Phagocytosis of spermatozoa by *T. vaginalis* has been observed (Kolessoff). We have not seen this phenomenon, but we have noticed that, when spermatozoa come into contact with actively motile *T. vaginalis*, many lose their tails.

Dyspareunia is frequently associated with chronic *T. vaginalis* vulvo-vaginitis; ejaculatio praecox due to a trichomonal verumontanitis is often the starting-point of impotence. Both are a frequent cause of neurosis, and many unhappy marriages can be traced back to the sexual frustration and despair engendered by these conditions.

Conclusions

Our experience indicates that *T. vaginalis* infection is a major disease problem. As in other protozoal infections of man and animals it is probably also a general disease, and this possibility needs thorough investigation. Because *T. vaginalis* infection has for so long been regarded as a local genital disease, and gynaecologists, obstetricians, urologists, and venereologists publish their findings in specialized journals, the general practitioner remains ignorant of many facts that might help him to associate significant phenomena. The time is ripe to investigate fully the problem of this infection and to emphasize its true importance.

Summary

Trichomonas vaginalis infection of the male is becoming increasingly recognized. The parasite is described and its pathogenicity and mode of spread are discussed. Infection is usually by sexual contact, but contagion

from fomites has been noted. Clinical and laboratory findings in both acute and chronic infection are described and references made to latent infection and the carrier state. The possible existence of a transient trichomonaemia is considered. Treatment of the acute stage is by urethral instillation of bactericidal drugs; chronic infection requires both general and local treatment. The medico-social aspects of trichomonal infection are discussed.

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Medical Memoranda

Huntington's Chorea in Northamptonshire

Since the report on the survey of Huntington's chorea in Northampton was published in the *British Medical Journal* of November 13, 1954 (p. 1121), a further choreic family has been ascertained in the county.

A member of the staff at the mental hospital noted that two patients with suspicious signs were related, and by tracing the family pedigree it was possible to confirm the diagnosis. At the time the survey was undertaken, therefore, (1) there were nine choreic families in the county; (2) 17 persons (not 13 as previously reported) were suffering from Huntington's chorea, giving an incidence of 6.5 cases per 100,000 of the population; and (3) 69 cases of the disease were revealed by tracing back the pedigree.

The accompanying pedigree illustrates that dyslalia presents as an early sign of the disorder, and it may be said that Huntington's chorea should always be considered in the differential diagnosis when difficulty or hesitancy of speech

occurs in early adult life. The pedigree also illustrates the frequency of mistaken diagnoses of Huntington's chorea, cases having been diagnosed as general paralysis of the insane, Friedreich's ataxia, and hysteria. It is probable that the rarity ascribed to the disease is to a large extent the result of such errors in diagnosis.

In this connexion it is worth noting that some members of the family were convinced that their relatives had suffered from syphilis which had recurred as a hereditary affliction in their descendants. Rational explanation of the facts did at least relieve them of this misapprehension.

The details of the family history are as follows:

I 1.—Stated to have died in a mental hospital.

II 1.—Age of onset 44. Violent, wildly excited. Diagnosed as hereditary insanity. Choreiform movements noted when admitted to the mental hospital aged 49. Dementia with delusions of persecution; locomotor ataxia. Death aged 51.

II 2.—It is stated that he died in a mental hospital.

III 1.—Onset aged 29. Transferred from the Poor Law hospital to the mental hospital when aged 41. Demented; choreiform movements of head and hands; noisy, violent, hallucinated; ataxia. Diagnosed as G.P.I. with dementia. Death aged 44. III 2.—Onset aged 45. Threatened suicide. Admitted to the mental hospital; violent; *indistinct speech*; choreiform movements of head and eyes. Diagnosis: partial dementia, secondary to Huntington's chorea. Death aged 47. III 3.—Aged 59. No evidence of the disease. III 4.—Killed 1915, aged 17 years. III 5.—Died aged 48 following diabetic gangrene. III 6.—Age of onset not ascertained. Present age 49. Occasional involuntary movements of trunk and limbs. She is peculiar in her manner. Diagnosis: Huntington's chorea.

IV 1.—Onset aged 35. Admitted to the mental hospital aged 27. Presenting signs: *slurred speech*, ataxia, choreiform movements, dementia. Present age 44. IV 2.—No evidence of the disease. Present age 42. IV 3.—No evidence of the disease from the history. Present age 38. IV 4.—Onset aged 34. *Difficult speech*, choreiform movements. Diagnosed as hysteria in the first instance. Present age 35. IV 5.—Onset aged 24. Slow movements, change in voice, *difficult speech*, difficulty in swallowing food, all reflexes exaggerated, stiff gait, mental hallucinations. Present age 32. IV 6.—Died aged 21 in a sanatorium. She was afraid of the family affliction and, hoping to avoid it, she dieted on beans and lost weight. IV 7.—Onset aged 6 years. Attended elementary school; made little progress. Certified ineducable aged 12. Irregular movements, jerking her head, *indistinct speech*, peculiar gait, ataxia, Romberg's sign positive. Admitted to M.D. institution aged 12. Diagnosed as Friedreich's ataxia. Died aged 12. IV 13 to IV 18.—The history does not indicate that any of these persons are as yet afflicted with the disorder.

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