I am grateful to Drs. J. F. Buchan, W. E. Clarke, R. Greene, and N. S. Plummer, under whom these patients were admitted, for permission to publish the case summaries.

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WHIPWORMS IN A CAMBRIDGESHIRE VILLAGE

BY

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The human whipworm, *Trichuris trichiura*, is the third most common helminthic infestation, only the roundworm and hookworm surpassing it in world frequency (Watson, 1960). In Western Europe it is generally regarded as an interesting but unimportant parasitic inhabitant of the bowel in a small percentage of the population, and most doctors are not aware of its existence as the cause of a disease entity. Only one previous case of the whipworm having caused symptoms has been reported in this country (Ross, 1942). The present paper concerns two cases of severe infestation with *T. trichiura*.

Case 1

In September, 1961, a 2½-year-old girl was brought to the surgery with an eight-months history of passing four or five loose stools daily. In the past few weeks she had become listless, anorexic, and somnolent. She often complained of abdominal pains, and, despite the looseness of her motions, had to strain hard to pass them. Physical examination revealed a very pale, chronically ill little girl who was both apathetic and irritable. Her skin was dry, but she was not emaciated, weighing 26 lb. (11.8 kg.). The liver and spleen were not palpable, there was no abdominal tenderness, and digital examination of the rectum was negative. The stools were watery and very offensive, and contained some mucus and blood. Microscopy revealed ova of *T. trichiura* + + + +. No *Salmonella* or *Shigella* organisms were found. A blood count showed: haemoglobin 5.7 g./100 ml.; packed cell volume 25%; M.C.H.C. 22.8%; M.C.D. 7.3 µ; white cells 16,000/c.mm., with 17% eosinophils.

Treatment was started with "imferon" 2 ml. intramuscularly twice weekly for two weeks and dithiazanine iodide 25 mg. four times a day for five days. The child began to improve very rapidly both in her general condition and in her diarrhoea. Her motions became less frequent but were still loose and offensive. Examination of them after treatment revealed that *T. trichiura* ova were still present in very large numbers. She was given a second course of dithiazanine iodide, the dose being raised to 100 mg. four times a day. After this treatment no ova were seen in the stools. A repeat blood examination showed a haemoglobin of 11.8 g./100 ml. and a leucocytosis of 14,000 with an eosinophilia of 25%.

On November 9 the child was seen again, having passed 100 ml. of dark red blood per rectum. Digital examination of the rectum was negative, but examination of the stools showed that she was still passing *T. trichiura* ova in large numbers. She was given a third course of dithiazanine iodide, 200 mg. three times a day, which failed to eradicate the infestation.

On December 6 sigmoidoscopy was performed on her as an out-patient under general anaesthesia. Mr. R. E. B. Tagart, who performed the sigmoidoscopy, reported as follows: "The bowel contained large amounts of liquid faeces. The instrument was passed to 20 cm. from the anus. The bowel wall was reddened, oedematous with complete loss of vascular pattern, and bled on very light contact. A number of whipworms were seen moving sluggishly and were removed with forceps. They were found to be attached to the bowel wall by an anterior filiform process. Through the sigmoidoscope, they can be distinguished from threadworms, which are commonly seen in the sigmoid colon and rectum of children, by the more uniform calibre of the body of the whipworm. The threadworm tapers gradually to a point."

It was then decided to try a course of hexylresorcinol enemata by the method described by Basnuevo (1956). In this a stock powder is made up to the following formula:

Hexylresorcinol	..	..	1 g.
Colloidal aluminium hydroxide	..	..	12 g.
Colloidal kaolin	..	..	12 g.
Gum acacia	..	..	to 50 g.

A fresh colloidal solution is made up in a mortar by adding 100 ml. of water to each 15 g. of powder, giving a dilution of hexylresorcinol of 1:300. The recommended enema volume for infants and young children is 12 ml./lb. (26.4 ml./kg.) body weight, and for older children is 100 ml. per year of age. It is important to clear the bowel with a saline enema both the night preceding and again two hours before treatment. The emulsion of hexylresorcinol is allowed to flow slowly through a catheter introduced 15 cm. into the rectum. After half the volume has been run in the patient is turned on to the right side to encourage the flow of emulsion to the caecum. Basnuevo recommends a course of three enemata 5 and 10 to 15 days apart respectively.

On December 21 the first enema was administered in the patient's home after the district nurse had given the two saline bowel wash-outs. No difficulty was experienced and the buttocks were well smeared with petroleum jelly to prevent skin burning when the enema was expelled. Stools were collected for three days following treatment and carefully filtered through black nylon mesh. Many hundreds of whole and partly disintegrated *T. trichiura* were collected together with threadworms (*Enterobius vermicularis*). After the second hexylresorcinol enema the child passed fewer worms, although the mother reported seeing "clumps of whipworms in the stools" after the third day of collection. These, unfortunately, were not kept. No worms were found in the stools after the third enema. Stools examined two months later showed that there were very few ova still being passed. Clinically there was an impressive and gratifying improvement in the child. She was bright, cheerful, and full of energy. The stools were well formed and were passed once a day.

In order to establish the incidence of the disease in the village, stools were collected from 41 neighbours and close relatives. This revealed that 16 (40%) specimens contained ova of *T. trichiura*. Of these, 11 had only "light" or "very light" degrees of infestation and the remaining five had "moderate" infestation. All were apparently symptomless. Full blood counts were carried out on all this latter group but in only one case was an abnormality detected.

Case 2

A 2-year-old boy, a first cousin of Case 1, had an anaemia with a haemoglobin of 9.8 g./100 ml., and a leucocytosis of 15,000 with 9% eosinophils. He was similarly treated with a course of hexylresorcinol enemata and passed many hundreds of whipworms (see Fig.) after the first and second

Case 2.—Whipworms passed after first hexylresorcinol course.

treatments. Although his parents had not been aware of any ill-health in him, the improvement that followed treatment, which included oral iron, was most impressive. Like the first patient, he quickly lost his irritability and poor appetite.

In an attempt to trace the possible sources of infestation in these two cases it was elicited that both children vied with each other in geophagy when 12–15 months old. At that time there was no mains sewerage in the village, and it was the common habit for the night soil to be emptied on the vegetable garden. As neither parent of the first case was infested and as they had lived in the same house for four years it was interesting to speculate whether the previous occupant, who had moved away from the area, might have been responsible. He was contacted but refused to have his stools examined. Samples of soil from different parts of the garden were collected and examined for the presence of *T. trichiura* ova, but none was found.

Discussion

T. trichiura is found only in man. It is unisexual, the female being 3–5 cm. in length and the male slightly smaller and distinguished by its coiled caudal extremity. It attaches itself to the bowel wall by a long anterior hair-like process which serves to anchor the worm to its host and through which it derives nutrition. There

is no secondary host in the life-cycle, infestation being acquired by ingesting the embryonated ova from the soil in food or drink or by geophagy (which may be ritual in some countries). The characteristic ova are easily recognized under low-power magnification and appear as "tea-trays," 50 by 25 microns, in faecal smears. Unlike threadworms, the ova are not infective immediately they are passed and therefore direct person-to-person spread of the disease is not possible. The ova must undergo a period of embryonation in the soil after they are passed, and this may take 14 to 21 days under optimum conditions of warmth and moisture.

Nolf (1932) showed that *in vitro* 90% of the ova fail to embryonate after being exposed to a temperature of 0° C. for more than nine days, and that, unlike the ova of roundworm (*Ascaris lumbricoides*), they rapidly succumb to desiccation. Nakladova (1956) showed that both the fresh and the embryonated ova could withstand the winter climatic conditions of Kiev. What is not known with certainty is the maximum length of time that the ova remain viable in the soil. Davaine (1877) thought a period of many years to be quite possible. The combination of poor sanitation—or the use of human faeces as a fertilizer—with favourable climatic conditions, explains the high incidence of infestation in West Africa (Jung and Jelliffe, 1952), Cuba (Basnuevo, 1956), southern states of U.S.A. (Swartzwelder, 1939), and Panama (Whittier *et al.*, 1945).

Bellingham (1837), in a most interesting paper on *T. dispar* (as it was then called), states that whipworms were first found in the bowels of French soldiers dying in Göttingen of "morbus mucosus" (? cholera) and were thought to be the cause or effect of this disease. He found whipworms in the large bowel at 26 out of 29 consecutive necropsies in Dublin and concluded that the infestation was widespread and harmless. No recent attempts have been made to estimate the incidence of whipworm infestation in this country. French and Boycott (1905) examined the stools of the 500 in-patients of Guy's Hospital, and found that 7.8% were passing ova. It is interesting to note that they found only one child under 5 years of age (out of 42 infants and children examined) to be infested, and concluded that the disease must be acquired by ingesting a food like watercress that children do not normally like. A similar examination of the patients in hospitals in Paris revealed that 71% of them harboured whipworms (Chamtemesse and Rodriguez, 1908).

Boycott (1904), in his investigations of hookworm (*Ancylostoma*) infestation in Cornish miners, noted that 79% of them had concomitant whipworms. Still (1927) found that whipworms were present in 8% of children at necropsy but admitted that he had never diagnosed the condition in life. MacCarthy (1954) investigated 10 children in an orthopaedic ward in Dublin who were passing roundworms and ascertained that they were also infested with whipworms. Manson-Bahr (1938) found the condition in rural workers in Kent, and it was from this county that Ross (1942) described his case with symptoms of chronic diarrhoea, and he concluded that eating lettuce from a garden on to which the night soil was emptied was the source of the infection. Hucker and Schofield (1956) reported severe degrees of infestation at a hospital for mental deficiency in the West of England but did not mention any symptoms caused by the disease. They carried out a trial of four piperazine compounds and concluded that this drug had no therapeutic effect in the treatment of trichuriasis.

The symptoms of whipworm infestation are protean, and this helminth, if found, may be blamed for any coincident vague mental or physical ill-health. Massive infestation causes severe cachexia, anaemia, chronic bloody diarrhoea, rectal prolapse, and even death (Gajardo and Atias, 1956). In lesser degrees of infestation abdominal pain is a characteristic symptom with or without diarrhoea (Swartzwelder, 1939; Whittier *et al.*, 1945). In most cases there are no symptoms and the worm can be regarded as a harmless inhabitant of the bowel.

Treatment

The treatment of trichuriasis is difficult, as the worm is attached to the bowel. For many years the only effective remedy was the crude sap of the bastard fig-tree (*Ficus glabrata*). The latex (*leche de higuérón*), once collected, rapidly decomposes, thus making distribution of it impossible. Hexylresorcinol has been tried for many years both by mouth and by enema with varying degrees of success. The method of administration described by Basnuevo has been successful in his hands, and this may be due to the drug being administered in the form of an emulsion which coats the lining of the large bowel even after the main bulk of the enema has been expelled.

More recently the blue dye dithiazanine iodide has been found to possess powerful anthelmintic properties (McCowen *et al.*, 1957). It has generally been proved to be an effective drug in the treatment of whipworm dysentery, and its ease of administration gives it an advantage over hexylresorcinol enemata. Swartzwelder *et al.* (1958) reported complete elimination of whipworm ova from the stools in 37 children treated for 10 days, but no stools were examined after two weeks following treatment. Wong and Tan (1961) treated 20 children in Singapore and obtained clinical cures in all of them after five days' treatment with dithiazanine iodide; they admitted, however, that many children continued to have ova in their stools, and in two children symptoms recurred after three months. Winship and Hennessy (1959) reported on the value of the drug in the treatment of 14 heavily infested children in South Africa. They obtained clinical cures in 12 cases after five to seven days' treatment, but in only half of these were ova completely eliminated from the stools. One child, very similar to Case 1 described above, failed to respond to three courses of treatment. Seaton (1962) believes that the drug should be given continuously in maximum doses for not less than two weeks.

The degree of infestation in any community can be regarded as a measure of the efficiency of sewage disposal. It must be regarded as an indictment of the low standard of sanitation that within four miles of Cambridge almost 40% of the population examined at random were harbouring whipworms and must all therefore have swallowed the remnants of human faeces at some time. The village was not connected to the mains sewerage until February, 1961, and out of a total of 691 houses in the village 142 (20.5%) are still not connected and the majority of their inhabitants continue to empty the night soil on their gardens.

Summary

A case of a 2½-year-old girl with chronic diarrhoea and severe debility due to infestation with whipworms (*Trichuris trichiura*) is described. The results of a survey

of her neighbours and relatives is presented, showing that 40% of these were passing *T. trichiura* ova in their stools. One further child with moderate debility due to trichuriasis was revealed by this survey. Details of treatment are given. It is concluded that the existence of this disease in a community is a measure of the standard of public health prevailing.

I wish to express my gratitude to Professor R. T. Leiper, F.R.S., for his advice and encouragement and to Dr. Sheila Willmott, Director of Commonwealth Bureau of Helminthology, for the loan of literature. I am indebted to Dr. J. M. Boissard and the staff of the Public Health Laboratory and to Dr. J. Drummond and the staff of the Public Health Department, Chesterton Rural District Council, for their constant help. I thank Mr. R. E. B. Tagart, consultant surgeon to Newmarket General Hospital, for the sigmoidoscopy report; Mr. S. J. Hopkins, group chief pharmacist, Addenbrooke's Hospital; and Mr. L. Beard, medical photographer to Addenbrooke's Hospital.

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A Report of the Working Party on Workshops for the Blind (H.M.S.O., price 8s. 6d.) attributes the existing unsatisfactory economic position of the workshops primarily to their continuing reliance on the traditional crafts, most of which were regarded as laborious, unpleasant, and unprofitable and, therefore, either obsolete or rapidly declining in ordinary industry. The Working Party also found much evidence of a need to improve the quality of management, and strongly criticized the existing wages structure in the workshops. These, it states, were the principal reasons why the average cost of employing blind workers in these workshops rose from £104 a head in 1947-8 to £474 in 1960-1. The Working Party concludes that it is essential for the satisfactory future development of workshops for the blind in Great Britain that a strong central organization should be established, directed, and staffed with appropriate business and technical experience which could guide the workshops in introducing more up-to-date and economic methods and processes.