that with less than three injections relapse is likely to occur. Three to six injections are advocated. Local and other treatment is symptomatic.

Case History

A married woman, aged 40, with a previous medical history of cholecystectomy, 1-para and no miscarriages, deliberately, and of set purpose to kill the animal, trod on a rat in a farmyard. She was wearing slippers, and the rat turned and bit the dorsum of her foot. There was little to be seen at the time, but she applied tincture of iodine at once to the two small puncture wounds. Apart from a little soreness no pain followed, and the lesion healed in the usual way in the course of a day or two. No scar resulted.

On the fifteenth day, when the patient was first seen, she complained of "pain and swelling of the leg." No definite rigor had occurred, but she "felt shivery." The tongue had a white fur, and she had no appetite for food. A bluish-red, indurated, unbroken swelling was found on the dorsum of the foot. Surrounding this, and below the level of the raised lesion, considerable oedema was present. The lymphatic glands in the corresponding groin were "sore" but not appreciably enlarged at this stage.

On the sixteenth morning a rigor occurred and the lesion had become black in the centre, with a circumscribed, very painful red area fading into the oedematous tissues. The temperature had risen from normal to 99.6° and the pulse was 64. She felt ill.

On the eighteenth evening the temperature had risen to 101.2°, but the pulse remained low at 86. The black central slough had begun to separate. One small separation was removed for examination. The ulcerated area was treated by eusol fomentations. As these seemed to give more pain than plain hot-water fomentations, the latter were substituted and used afterwards. The whole extremity was aching and the portion of the limb within six inches of the ulcer was exquisitely tender. The patient vomited once during the day.

On the nineteenth day the general disturbance was marked, the temperature being 101°. There was restlessness, retching, and much flatulence. Vomiting occurred at intervals. A dusky-red rash appeared on the body, with several spots on the face. The first injection of novarsenobillon in a dose of 0.3 gram was administered intramuscularly on the nineteenth day. Owing to the combined facts that the patient was rather obese and intravenous medication was difficult, this route was chosen. No immediate reaction followed.

In the evening of the twentieth day the temperature had risen to 103°, and the pulse again appeared low at 80. She felt better, and vomiting ceased. The next day improvement was considerable. The temperature was normal. The wound was less painful. From this time she improved in every way. The ulcer became cleaner and swelling lessened with a great diminution of the pain. She was able to get up on the twenty-eighth day. The site of the bite was still discharging a slightly purulent fluid. It is to be noted that throughout the case history the discharge was never frankly purulent, but more sanious in type. The blood Wassermann reaction was negative. A differential white count showed: polymorphs, 58 per cent.; lymphocytes, 28.5 per cent.; eosinophils, 1.0 per cent.; hyalins, 12.5 per cent.; basophils, none seen. Red cells showed distinct anisocytosis and slight poikilocytosis with fairly frequent polychromasia, but no definite punctate basophilia. No nucleated red cells were seen. No parasites were detected (dry film). A recent film did not show any organisms recognized as such.

The patient was fairly well until the fortieth day, when the temperature rose again to 99°. This was the same each evening for four nights. After subsiding it rose again on the fifty-first evening, and the patient became very ill once more. The rash returned, and on this occasion there was marked aching in the joints. The local lesion became angry and inflamed; the discharge increased, but, as before, this was not definitely purulent.

On the fifty-third morning I decided to give another injection of N.A.B., the dose being increased to 0.45 gram, given again intramuscularly. It is difficult to dissociate psychical reaction from that due to the actual preparation. She complained of much flatulence and vomited repeatedly. No symptoms which may be ascribed to anaphylaxis were

definitely present. A colleague who saw the case at the time ascribed the reaction to neurotic apprehension. Within the following twenty-four hours the temperature and general symptoms had subsided.

The ulcer healed for the first time on the fifty-ninth day, and has given no trouble since. The patient has regained her usual health.

Comment

Throughout the periods of pyrexia the pulse rate was comparatively slow. Even when the temperature reached the highest recorded, the rate was only 80.

Although the blood picture is not typical of that of previous records, the case is assumed to be a genuine example of rat-bite fever in view of the positive history of an injury, the relapsing fever, and the symptoms shown. The response to organic arsenicals renders the diagnosis more certain.

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INTESTINAL OBSTRUCTION BY ROUND- WORMS FOLLOWING ADMINISTRATION OF AN ANTHELMINTIC

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A case of intestinal obstruction by *Ascaris lumbricoides* following upon the administration of an anthelmintic seems worth placing on record.

Case Report

A boy, aged 10, was admitted to hospital one evening with the following history. In the early morning he had taken a mixture of chenopodium and castor oils; his bowels had acted about two hours later, but no worms had been expelled. Shortly after this motion he was seized with severe colicky abdominal pain and an urgent but ineffectual desire to empty his bowel. The pain continued throughout the day, and vomiting set in. A doctor was summoned in the evening. He advised the administration of an enema, and as this was returned without faeces or flatus he referred the child to hospital with a diagnosis of intestinal obstruction.

Condition on Admission.—The patient was a well-nourished lad. The tongue was moist, the temperature 98.6°, and the pulse 120. The abdomen moved well with respiration; there was slight distension; no visible peristalsis. An ovoid mobile lump could be felt below and to the right of the umbilicus. The sudden onset of colicky abdominal pain, vomiting, and absolute constipation shortly after the administration of an anthelmintic, coupled with the finding of an abdominal tumour, was strongly suggestive of intestinal obstruction by a mass of worms, and immediate laparotomy was decided upon.

Operation.—The abdomen was opened by a right rectus incision below the umbilicus. The lumen of the small intestine, about four inches above the ileo-caecal junction, was found completely blocked by a spindle-shaped mass, over which the intestinal wall was thinned; the characteristic "bag of worms" sensation was obtained in palpating the swelling. The coils above the obstruction were moderately distended. An incision one inch long was made over the

convex border of the gut, and fifty-seven dead ascarides, of different sizes and all matted together, were extracted through the opening. The intestine was repaired by two rows of sutures and the abdomen closed up in layers. The patient made an uneventful recovery.

Cases in the Literature

In considering this case the question which occurs to one is whether or not the administration of the anthelmintic was responsible for the obstruction. It is impossible to say. *Ascaris lumbricoides* has acquired a reputation for liability to cause spontaneously acute intestinal obstruction, sometimes resulting in the death of the patient in the absence of surgical intervention or if surgical intervention is late. Garcia¹ describes the case of a girl, aged 3 years, in whom the extensive resection necessitated by the occlusion of the gut on a length of eighty centimetres by ascaris proved fatal. Levin and Annie Porter² record four cases of sudden intestinal obstruction due to ascaris, in which the main interest lies in the large numbers of parasites harboured by the patients. One patient, a Hottentot boy of 11 years, was relieved of 851 worms through incisions made in the jejunum. He subsequently passed forty-eight and recovered. Another patient, a European girl aged 9 years, had 737 worms removed at operation and afterwards passed 253; she also recovered. In two girls in whom the effects were fatal hundreds of worms were found. Allis³ describes a fatal case from Ceylon, in which 547 ascarides were removed from the intestine of a woman admitted with symptoms of intestinal obstruction, while Ryrie⁴ reports a fatal case in Malaya from which 1,488 worms were removed.

In contrast to these a scrutiny of the abstracts published in the *Tropical Diseases Bulletin* over the same period reveals only the two cases recorded by Watkins and Moss⁵ of intestinal obstruction by *Ascaris lumbricoides* following the administration of an anthelmintic, on this occasion santonin followed by calomel. Both children, aged 3 and 4½ years, developed intestinal obstruction, and at operation forty-nine worms were removed from the first and fifty-three from the second child.

It will be observed that the cases of spontaneous acute intestinal obstruction have been recorded only from patients harbouring large numbers of worms. It may be that a certain minimum number of worms is necessary before the conditions leading to the obstruction are produced. Verdelet and Lacouture⁶ ascribe the symptoms of ascaris occlusion to "segmentary hyperperistalsis"—that is, an intestinal spasm produced reflexly by the irritation of the bowel by the worms. If the probability of this hypothesis is acknowledged it is conceivable that there must be certain given conditions before actual obstruction occurs. The parasites are mobile and presumably would tend to avoid compression by the spasm by moving to other parts of the bowel. If, however, owing to the numbers present or to diminished mobility a traffic block should occur in the alimentary tract of the host symptoms of obstruction would arise until, with continuance of the blockage, the patient's condition would become acute. Dilatation of the bowel would then be insufficient to relieve the jam, there would be thinning of the intestinal wall, giving a liability to perforation, which, should it occur, would lead to peritonitis if already the patient had not succumbed to the intoxication. In such a case surgical intervention would hold out the only hope of recovery.

The Anthelmintic as a Factor

That the anthelmintic may be a factor might be deduced from the cases recorded by Watkins and Moss, as well as in the one recorded here. The numbers of worms causing the obstruction are almost insignificant when compared with the large quantities recorded in the cases of spontaneous obstruction. But the effect on the worms of the

anthelmintic in therapeutic doses is narcotic, though this may be preceded by a transient stimulation. It is possibly this which tends to make the worms entangle themselves into the doughy masses found at operation or post mortem, of which obstructions the bowel is unable to relieve itself.

On the other hand, infection by *Ascaris lumbricoides* is widespread in Mauritius. About 80 per cent. of the rural population harbour this parasite. During the past eight years the staff of the hookworm campaign have given over 250,000 anthelmintic treatments, and yet obstruction by ascaris has occurred on only four occasions in the past. The anthelmintic used in the hookworm campaign (carbon tetrachloride and oil of chenopodium, separate or combined, according to circumstances) are effective for ascaris infections as well as for hookworm, and were the anthelmintic the only factor one would expect to find that cases of intestinal obstruction due to ascaris occurred much more frequently than has actually been the case. One is therefore driven to postulate some other unknown factor, conveniently designated idiosyncrasy, to account for the comparative rarity of the condition.

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Clinical Memoranda

Successful Breast-feeding from one Breast only

The following case is a good illustration of the factors controlling lactation, and an example of how the "will to feed" a baby on the part of a mother can triumph over considerable disability.

Mrs. X., aged 33, fed her first baby normally from both breasts. During the second pregnancy, six years ago, a severe inflammatory condition developed in the left breast at about the fifth month, with abscess formation, necessitating admission to hospital and two operations for drainage, with a long period of illness. The baby on this occasion was not breast-fed. With her third baby, however, three years ago, and with the fourth baby, now aged a few months, breast-feeding from the right breast only has been successfully accomplished. According to the mother's description a certain amount of enlargement of both breasts has occurred during the last two pregnancies, the right (normal side) being much more obvious than the left. Some colostrum has been squeezed from both nipples. Following confinement milk appeared in both breasts on about the third to fourth day, much more in the normal breast. The baby was only allowed to suck from this side, and within twenty-four hours the enlargement of the left breast had subsided. Examination of the breasts on occasion of the mother's attendance at a welfare clinic showed that the right breast was in a full state of lactation. The left breast showed several large scars, more or less radiating from the areolar tissue and, apart from this, presented the appearance of a non-lactating breast in a multipara. No milk could be expressed from the nipple on this side. Palpation suggested that there was little breast tissue present in this organ.

The facts recounted illustrate that maturation of the breast during pregnancy and the establishment of lactation are under systemic hormonal control, but that once this has occurred the maintenance of lactation depends upon local stimulation and efficient emptying of the breast.

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