CLINICAL PATHOLOGY IN GENERAL PRACTICE

EXAMINATION OF FAECES FOR INFECTION AND INFESTATION

BY

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When a patient has diarrhoea it is usually desirable to know the cause of the attack. The symptoms may be so mild that the doctor is inclined not to have the faeces examined, but an early investigation can provide valuable information, particularly if the disease does not clear up as quickly as expected. Also, even if the patient is only slightly ill, the same pathogenic agent could produce a severe illness in other members of the house.

The bacterial infections are those caused by the dysentery, the food-poisoning, and the *Bact. coli* groups of organisms. Bacillary dysentery is usually associated with diarrhoea, often accompanied by colic, and the organisms causing this disease belong to the genus *Shigella*. In England the commonest of these is the Sonne bacillus. *Salmonella* is the food-poisoning group, and one of the most often encountered in this country is *Salm. typhi-murium*. The patients usually have severe diarrhoea and often vomiting. The enteric group (typhoid and the paratyphoids) also belong to the genus *Salmonella* but are not usually included among the food-poisoning group.

During the past ten years many fulminating food-poisoning epidemics have been caused by organisms which do not belong to the salmonella group, such as the enterotoxin-producing *Staphylococcus aureus* and the heat-resistant strains of *Clostridium welchii*. The symptoms in this type of food-poisoning are caused by toxins produced in the food by these organisms, and for this reason the incubation period is a very short one of only a few hours. In this form of toxic food-poisoning it is nearly always possible to isolate the causal organisms from the faeces.

Diarrhoea can also be caused by protozoal infections. Apart from the importance of diagnosing the cause of an attack of diarrhoea, an examination of the faeces is often necessary to prove whether or not there is a worm infestation or whether there is a metabolic disorder which affects the intestinal tract.

Collection and Delivery of Specimens

Rectal Swabs.—The passage of an ordinary sterile throat swab through the anal canal is a convenient way of obtaining a specimen that will not be contaminated after it leaves the body. Apart from any aesthetic objection to this method, these specimens are very often anal and not rectal swabs. Once the swab has passed the external sphincter the cotton-wool can be caught by the loose anal mucosa, which makes it feel as if any further pressure would tear the mucosa. Anal swabs, as distinct from rectal swabs, can provide misleading false cultural results.

Sheathed Rectal Swabs.—Some laboratories surround the swab with a suitably sized glass sleeve with rounded ends. These swabs are sterilized with a small quantity of liquid paraffin at the bottom of the containing test-tube and the lower end of the glass sleeve is lubricated. This lubricated glass tube is inserted through the anus with a to-and-fro rotary movement until the internal sphincter is felt as a distinct obstruction. The tube is pushed gently through the internal sphincter and the swab is then passed up into the rectum, after which it is withdrawn within the glass sleeve. Both are then removed and reinserted into the test-tube. In babies with acute diarrhoea this method is very convenient, as on touching the internal sphincter the whole of the glass sheath is filled with liquid faeces, which otherwise would have soaked into a nappy.

Faeces.—Care must be taken to avoid contamination of the specimen after it leaves the body. All laboratories provide sterile containers which incorporate a spatula with which faeces can be picked up. In hospitals it is relatively easy to obtain uncontaminated faeces, and there are several ways of doing this in the home. One is to pour boiling water into a chamber-pot, which is then emptied; when it is cool the motion is passed into it. Another method, which avoids using a chamber-pot, is for the patient to empty his bladder and then fill the lavatory pan with many layers of toilet paper, on to which the motion is passed. The specimen is obtained with the spatula, after which the toilet is completed. Before using the technique it is convenient to remove the nether garments, as otherwise it is awkward for the patient to turn round to obtain the specimen.

Delivery to the Laboratory.—When cultural examinations are required a delay may reduce the numbers of the viable pathogens, especially if the specimen is on a rather dry rectal swab. When the specimen is being examined to establish a diagnosis, this delay may be dangerous to both the patient and his contacts. Very often some member of the patient's household can deliver the specimen to the laboratory if it is not too far from the home. Some laboratories issue tubes containing glycerol-saline into which a specimen of faeces is placed. This helps to prevent pathogenic organisms dying in transit, and it may be convenient for the practitioner to keep a supply of these bottles in his surgery. A specimen with only an occasional pathogen present will give entirely negative results if tested when 18 hours old—that is, if posted to the laboratory. Examinations for *Entamoeba histolytica* must be made on very fresh specimens, as only the cysts will be seen in faeces which have been allowed to cool.

Information Provided

Most laboratory examinations of the faeces are carried out to exclude or confirm the presence of pathogenic organisms or parasites. Therefore normal appearances and results are not usually reported, merely whether or not abnormalities are detected.

Routine examinations should enable infections caused by salmonellae, shigellae, the specific serological types of *Bact. coli*, *E. histolytica*, and *Giardia lamblia* to be diagnosed. The presence of an infestation with ascarides (roundworms) or with rarer worms such as whipworms is usually relatively easy to determine.

Direct Wet Smears.—Many laboratories make a direct examination of the faeces, without which the presence of amoebae, amoebic cysts, and *G. lamblia* would be entirely missed. In the acute stages of a dysentery and of many salmonella infections the finding of pus and red cells in excess of mucus may indicate the need to institute barrier nursing within a very short time of the specimen having been received in the laboratory. In infants the presence of many fat globules may be the earliest indication of fibrocystic disease of the pancreas; these babies are sometimes first seen as cases of diarrhoea. In ulcerative colitis there is usually a great deal of blood and mucus as well as pus in

the faeces, but the proportion and amount of each of these are very variable. Except that there is usually more blood present, this exudate may be very like that of a dysentery and may be misleading at first.

How Soon?

Immediately

The direct examination, outlined above, allows an immediate diagnosis of amoebiasis and *G. lamblia* infestation, but it must be remembered that the latter is not uncommonly associated with Sonne dysentery, both infections having been acquired at the same time. Worm infestations will be diagnosed immediately but they are more conveniently dealt with separately.

The laboratory may also be able to suggest that dysentery is present by demonstrating an exudate in the direct smears: this could allow early segregation of the case, which might help to prevent the infection spreading.

After 18–24 Hours

The specific serological types of *Bact. coli* which cause epidemic enteritis in infants are primarily identified by slide agglutinations of 18-hour-old cultures. These results have to be confirmed by further laboratory tests, which take a day or more to complete. False-positive reactions are relatively common when a laboratory first undertakes these examinations, so the confirmatory tests are extremely important. With experience the number of false-positive results becomes much smaller, as the technician soon learns which type of reaction is a false-positive result if he is constantly checking the slide-agglutination results by tube agglutinations. Therefore laboratories which are constantly making examinations for these *Bact. coli* types can fairly safely diagnose their presence within 18 hours of the receipt of the specimen.

The Sonne bacillus gives very characteristic colonies on desoxycholate citrate plates, and slide agglutination of 18-hour-old cultures provides an answer which further laboratory tests usually confirm as correct.

The colonies of salmonellae on selective media can be examined by slide agglutination, and experienced workers will often be able to make a tentative diagnosis of a salmonella infection after one day's incubation. As the danger of a false-positive result is much greater in this type of infection than it is with Sonne dysentery, some pathologists prefer to wait another day, when confirmatory tests would be available.

After Two Days

Confirmatory biochemical and tube agglutination tests on organisms isolated on the first day will be nearly completed after 24 hours. The more specialized selective media, such as Wilson and Blair's bismuth sulphite plates for the enteric group, will be producing their first identifiable colonies. The enrichment media, such as selenite, tetrathionate, and brilliant green, will be subcultured after 24 hours, and the subcultures will be giving recognizable colonies after 48 hours.

It will thus be seen that after 18 hours a tentative diagnosis of infections due to *Sh. sonnei*, specific types of *Bact. coli*, and a few species of *Salmonella* can be made, but the confirmatory tests will take a few days longer. However, it is not unusual to isolate the pathogens by means of the enrichment techniques only, which means that the first positive results might not become available for three to four days.

Reference Laboratories.—Because of the great complexity of the antigenic structure of the members of the shigella and salmonella groups, in which there are over 250 types, reference laboratories have been established by the Medical Research Council. Laboratories are encouraged to send all salmonella and shigella cultures, except those of *Sh. sonnei*, to these reference laboratories so that the identity of the organisms can be confirmed. Therefore a provisional report naming a salmonella may be followed by a second giving an entirely different name. However, the treatment of the condition will be the same: correct identity of the organism is of importance only to the public health authorities in their efforts to trace the origin of the cases and the connexion between them.

Infestation with Worms

If the whole worm or segments can be sent to the laboratory so that its identity could be confirmed any clean convenient container is suitable.

Threadworms (Oxyuris vermicularis) (Fig. 1) can occasionally be seen adhering to the surface of faecal scybala, otherwise they are rarely found in faeces. If there is any doubt about the identity of threadworms, it is advisable to send the specimens to the laboratory, as vegetable fibres can be mistaken for these small worms (about ½ cm. long). The ova of threadworms (Fig. 2) are never found in the faeces, as they are deposited on the perineum by the female worms. A "sellotape" slide produces a very convenient and easy method of diagnosing threadworm infestations. The slides can be prepared by placing a strip of 1-in. (2.5-cm.) sellotape on a glass slide. In the morning, before the child dresses, the mother detaches from the slide nearly the whole length of the sellotape. The sellotape is stuck on the skin near the anus and is immediately slowly removed. It is then stuck back flat on the glass slide and sent to the laboratory. These slides are much easier to examine than the old N.I.H. "cellophane" swabs.

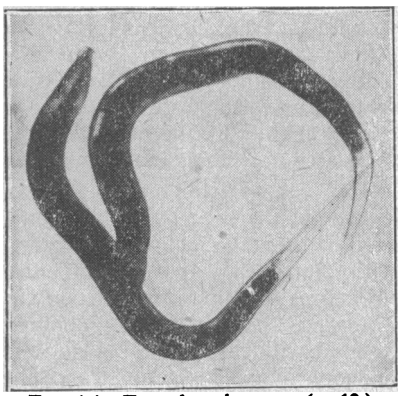

FIG. 1.*—Two threadworms. (× 12.)

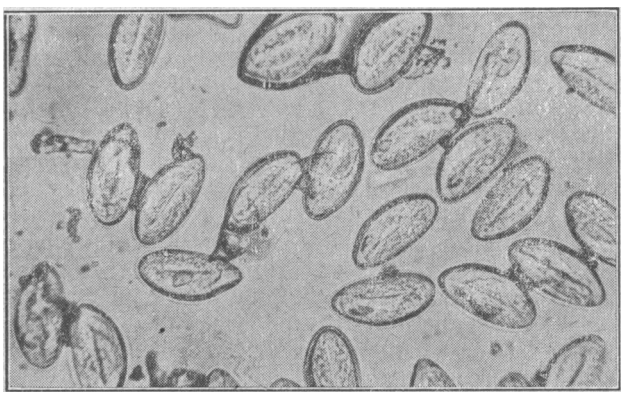

FIG. 2.—Threadworm ova photographed through a sellotape slide. The coiled larvae can be seen within the transparent shells. (×280.)

Roundworms (Ascaris lumbricoides) can be between 3 and 8 in. (7.5 to 20 cm.) in length.

Tapeworms (Taenia saginata and *Taenia solium).* When mature segments (Fig. 3) are passed they measure about ½ by ¼ in. (1.3 by 0.6 cm.), are coloured pinky grey, and may show slow movements. The type of taenia infection can be ascertained easily if one of these segments is blotted very thoroughly so that the adherent mucus is removed, dried, and then pressed firmly between two microscope slides. When held up against a bright light the number and arrangement of the uterine horns are easy to see. The commonest tapeworm in England is *T. saginata*, which has 20–30 uterine horns. If the laboratory is to look for the head of the

*All the photographs in this article were taken by Mr. J. G. Williamson, of the Children's Hospital, Birmingham.

tapeworm (Fig. 4), all the faeces passed after the administration of the saline aperient should be sent for examination. A search is made for the head by washing the faeces through a metal 28-mesh sieve. Unless such a sieve is used the head of the worm may be lost, so no attempt should be made to concentrate the specimen before it is sent to the laboratory. Specimens should be sent to the laboratory as

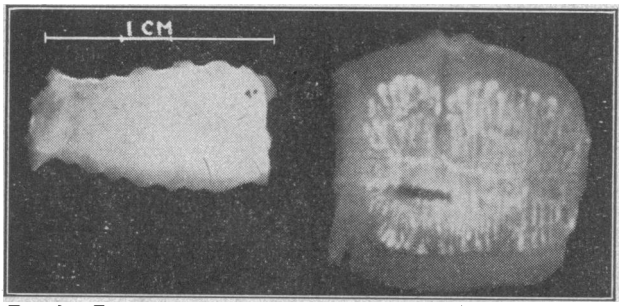

FIG. 3.—*Taenia saginata:* mature segment and flattened segment showing uterus.

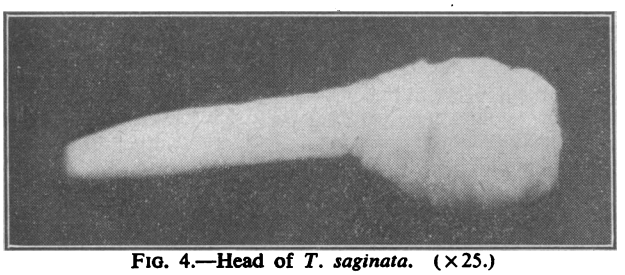

FIG. 4.—Head of *T. saginata.* (×25.)

soon as possible, for once the worm has been passed it tends to degenerate. It is worth remembering that tapeworm ova are very rarely found in the faeces, because they are not liberated until the mature segments degenerate.

Criteria of Cure

If any of the antibiotics, such as chloramphenicol, aureomycin, or terramycin, have been given, or one of the intestinal sulphonamides, tests of cure should not be started until about five days after the drug has been stopped.

Salmonella and Shigella.—At least three consecutive negative examinations are necessary before a cure can be established. Because salmonella organisms often localize in the gall-bladder, it is best to obtain a specimen of faeces after a saline aperient, which will act as a cholagogue.

Specific Serological Types of Bact. coli.—Before it is safe to allow a child who has been excreting these organisms to enter an uninfected community of infants at least six faeces cultures, taken on alternate days, should be negative. If the baby is living in a community in which a specific type of *Bact. coli* is endemic, then it is preferable for the clearance tests to be made when the baby is away from that community. If the infant is going to its home, and other babies are not in the house, three negative results would be sufficient.

G. lamblia.—Three daily specimens should be examined three days after the mepacrine course has finished. It must be remembered that other members of the household may be infected and in this way the patient may easily become reinfected.

Ascaris, etc.—Examination for the ova of worms is preferably made on faeces obtained following a saline aperient, and at least six negative specimens should be obtained.

E. histolytica.—At least six daily specimens obtained after saline aperients should be examined for the cysts. It is also advisable to repeat these examinations six months later.

Next article on Clinical Pathology.—"Chemical Examination of the Faeces," by Dr. W. W. Payne.

"STATUS LYMPHATICUS," THE GROWTH OF A MYTH

BY

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The latest edition (the sixteenth) of *Principles and Practice of Medicine,* originally edited by Osler, defines status lymphaticus as "a combination of constitutional anomalies, among which are hyperplasia of the lymphoid tissues and of the thymus gland, hypoplasia of the cardiovascular system and peculiarities of configuration, with frequent sudden death." Results of the condition are various, among them are: (1) Liability to sudden death—this may be from anaphylaxis, cerebral haemorrhage, or, in young children, pressure on the trachea by the enlarged thymus gland. (2) Increased susceptibility and decreased resistance to acute infections. (3) Increased danger in childbirth. (4) Psychical instability; these subjects forming a large proportion of cases of drug addiction and suicides.

The most circumstantial account of the condition is given by Hewer (1953). According to him the findings of Kemp (1932), Campbell (1937), Moncrieff (1938), and the late Sir Bernard Spilsbury, in spite of several attempts to discredit their work, have definitely established the existence of the syndrome. It would seem that Hewer bases his case that status lymphaticus exists as a clinical entity upon three claims: (1) that the condition has been recognized for some 300 years; (2) that there is a recognized clinical picture with three classical signs; and (3) that there are well-recognized post-mortem findings. I propose to show that not one of these claims is supported by the available evidence.

Attitude of the Textbooks

In contrast to the above the attitude of the textbooks of pathology is much less positive, although the writers of such works must have much greater experience of the post-mortem findings in such cases; or is it for just that reason that their attitude is one of doubt or of definite scepticism?

Thus Boyd (1947) states that "there is no proof that the thymus gland has anything to do with stoppage of the heart." Dible and Davie (1950) state: "There is no doubt that ignorance of the great variation in size to which the thymus gland is subject in health and disease has often led to an unjustifiable resort to the convenient diagnosis of status lymphaticus in cases of sudden death. . . . Many pathologists of experience are of the opinion that there does exist some abnormal constitution or condition which is associated . . . with a liability to sudden death from relatively trivial stimuli, such as excessive sensitivity to stimuli of the autonomic nervous system, but no constant anatomical or pathological abnormality." Muir (1951) quotes the findings of the Joint Committee of the Medical Research Council and of the Pathological Society of Great Britain and Ireland, its general conclusions being that the facts that have been ascertained afford no evidence that the so-called status thymo-lymphaticus has any existence as a pathological entity.

The conclusion in Muir's textbook is that "this does not imply that there is not a constitutional condition of low resistance power, with a tendency to sudden death; simply that it is not possible to relate it definitely to thymic or lymphoid hyperplasia."

Green (1949) states that there are "no manifestations of the condition during life, but violent exertion, rapid temperature change or anaesthesia may lead to sudden death," and, finally, "it has been agreed that status lymphaticus