

Dialogue on Diarrhoea

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The international newsletter on the control of diarrhoeal diseases



UNICEF photo by Murray-Lee

Diarrhoea and gut parasites

Parasites rely for food and shelter on other living things such as people and animals. All humans have harmless commensals living in their intestines and some play a useful part in the digestive process. But there are also harmful intestinal parasites which can cause gut damage leading to diarrhoea, bloody stools, abdominal pain and weight loss. This issue of *DD* discusses various common and less common gut parasites which are associated with diarrhoea and malnutrition in different parts of the world.

ORT — the life saver

Acute watery diarrhoea, caused by bacteria, viruses — and also by the parasite cryptosporidia (see page 4) — can bring about rapid death from dehydration. This type of diarrhoea is a major killer of young children in developing countries. Oral rehydration therapy (ORT), started early enough and given in adequate amounts can save lives by preventing or treating dangerous dehydration, allowing the body's natural defence mechanisms to overcome the infection. Continued and proper feeding during acute diarrhoea helps in this process (see *DD* 23). Drug treatment is rarely indicated, except for dysentery (bloody diarrhoea) due to infection with *Shigella* bacteria (see *DD* 25).

The long term answer

In contrast, intestinal parasitic infec-

tions associated with diarrhoea are less immediately dangerous and their significance should not be over-stressed. Nevertheless, the part parasites may play in chronic diarrhoea and malnutrition must not be overlooked. Not all produce obvious diarrhoea, although there are often noticeable changes in the stools — looseness, frothiness, streaks of blood and mucus — and some general debility. A parasitic infection should always be suspected where children fail to gain weight and lack energy, especially in areas where the environment is known to be contaminated. Outside the body, intestinal parasites can survive for long periods in the form of cysts and infection is carried by food, water and unclean hands. Within the body, the natural defence mechanisms have relatively little effect on parasites and immunity is slow to develop. Where health is being seriously affected, drug treatment is needed (see articles in this issue on amoebiasis, giardiasis and trichuriasis) but treatment is not likely to prevent reinfection if the environmental circumstances remain unchanged.

The long term answer is the same for all causes of diarrhoeal illness: improved hygiene both within and outside the home. Basic health education about the importance of handwashing, safer drinking water, safer faeces disposal and safer food handling can help considerably to diminish the contribution made by intestinal parasites to ill health in the Third World, especially among small children.

KME and WAMC

Clean hands help to prevent parasitic infections.

In this issue . . .

- *DD* describes the relationship between various parasitic infections and diarrhoea.

AHRTAG

Appropriate Health Resources & Technologies Action Group Ltd

Refugee camps: reducing diarrhoea

In Somalia, the Refugee Health Unit (RHU) of the Ministry of Health is responsible for over 700,000 refugees. The peak incidence of diarrhoea, 55 to 65 per cent of all cases and deaths, occurs every year between March and June. A campaign to reduce diarrhoeal deaths, started in 1984 in all regions, has halved refugee deaths from diarrhoea in one region, Hiran. The campaign included:

- Training of all doctors and nurses and community health workers (CHW) on the management of diarrhoea with oral rehydration salts (ORS).
- Establishment of under-fives clinics in every refugee camp. Every child taken to a clinic is weighed and measured. Malnourished children (70-80 per cent of the recommended weight-for-height) are sent to a supplementary feeding centre. Those who are less than or equal to 70 per cent of the recommended weight-for-height are taken to an intensive feeding centre.
- Every child in the refugee camps has a road-to-health weight card so that growth and immunisation status can be checked.
- Mothers are taught about diarrhoea, dehydration, preparation of ORS and infant feeding. They are shown how to make up a litre of oral rehydration solution using cup sizes available in the camps (for example,

if the mother has a 200 cc cup, she is told to add five cups of water to one sachet of ORS).

During "the months of diarrhoea", from March to June 1984, there were 5,352 cases of diarrhoea in Hiran, and 62 deaths due to diarrhoeal disease. In the same period of 1985, only 36 died out of a total number of 4,652 cases of diarrhoea — a fall in the case fatality ratio from 1.16 per cent to 0.77 per cent. Deaths from respiratory infections now outnumber deaths from diarrhoea for the first time in the history of the RHU.

A survey of 3,000 mothers revealed some problems with their understanding of ORS. While 90 per cent knew what an ORS packet was, and 80 per cent said it was for rehydration, only 30 per cent mixed the contents of the packet with the correct amount of water. This was partly because they believed that adding water to ORS would 'dilute' the medicine, and partly because the teaching sessions had not included practical demonstrations by mothers mixing up oral rehydration solution in front of the health worker. To overcome the problem a new campaign, with community participation, was organised, including marking a suitable household container to measure 1 litre.

Dr Hussein M. Mursal, Refugee Health Unit, Ministry of Health, c/o UNHCR, PO Box 2925, Mogadishu, Somalia.

Refugee camps: setting up a laboratory

Establishing a Refugee Camp Laboratory: A Practical Guide by Warren Johns is a new manual for expatriate and local laboratory technicians involved in establishing laboratories in refugee camps. The manual will also be of interest to staff in UN agencies, government and non-government organisations as well as to doctors, nurses and village health workers. It includes useful appendices on Laboratory Equipment Suppliers, Textbooks and Slides, Further Reading, Refugee Laboratory Kit, and

Materials for Establishing the Laboratory. Available from: *Overseas Department, The Save the Children Fund, 17 Grove Lane, London SE5 8RD, UK.* Price: £2.50 per copy (plus postage of £1.00 for Europe and the Middle East, £1.50 elsewhere, per copy).

Donation to DD

We would like to acknowledge a donation for DD from Memisa Medicus Mundi in the Netherlands. We greatly appreciate this generous support which has enabled extra copies of the *Dialogue* to be printed and distributed.

Feeding and diarrhoea

A report on **Nutritional Management of Acute Diarrhoea in Infants and Children** is available from the *National Academy of Sciences Press, National Research Council, Commission on Life Sciences, 2101 Constitution Avenue, Washington DC 20418, USA.* Price: US\$3.00 to readers in the United States and Canada; free of charge to readers from other countries.

Vitamin A publication

Vitamin A + Sieve is a new twice yearly publication which provides information on the latest research on vitamin A deficiency, the diseases it causes, and growing and preserving foods rich in vitamin A. Each issue will review current literature and research, as well as a specific topic of concern. Published by Prevention magazine and the Rodale Institute (a non-profit group aiming to improve agriculture and food systems), the newsletter is aimed at research scientists, field workers and administrators. It is available free of charge to DD readers. Contact *Janet Glassman, Rodale Press Information Services, 33 East Minor Street, Emmaus, PA 18049, USA.*

Symposium proceedings

The proceedings of the Ciba Foundation Symposium No. 128 on **Novel Diarrhoea Viruses** held in July 1986, and chaired by Dr Ruth Bishop, will be available in early 1987 from: *John Wiley & Sons, Baffins Lane, Chichester, Sussex PO19 1UD, UK.* Price: £27.50.

Nutrition poster

The Office de Recherches sur l'Alimentation et la Nutrition Africaine has produced a poster (in French) listing 150 African foodstuffs and their calorie and vitamin content. The poster also shows the daily requirement of vitamins and calories for adults, teenagers, children and infants. Available from: *Dr Ndiaye, Documentation/ORANA, BP 2089, Dakar, Senegal.* Price: US\$12.00.

An intestinal zoo

Anthony Radford describes some of the most common intestinal parasites, particularly those which may cause diarrhoea, and some of the factors predisposing towards infection.

More than half of the people in the world carry around inside them an 'intestinal zoo' of parasites: protozoa (microscopic, single-celled organisms), and helminths (worms), which come in all sizes. Individuals may have from tens to hundreds of parasites of several different species in their intestine. Most people are unaware of these internal 'passengers' but some intestinal parasites can cause diarrhoea, and other associated problems.

Transmission

The great majority of intestinal parasites are transmitted to humans by swallowing the egg or cyst forms of the parasite in contaminated food (e.g. roundworm), in water (e.g. giardia), or through contamination of the hands by infected faeces or faecally contaminated soil. Others, like the pig and beef tapeworms, are transmitted by eating infected meat which has been inadequately cooked. Most people who live where intestinal parasites are common (endemic) are frequently reinfected.

Factors influencing prevalence and transmission

The prevalence of intestinal parasite infection is influenced by:

- poor sanitation and hygiene

- the age of the individual and any previous exposure to the parasite:

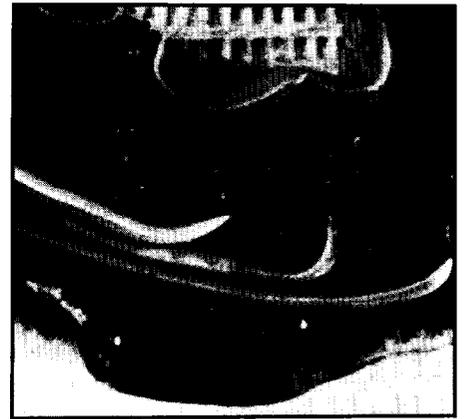
Infants are not commonly infected until the middle of the first year of life because they are largely protected from contaminated water, food and soil by an exclusive breastmilk diet, and by being carried around; and, at least for some of the protozoal infections, mothers' milk may carry protective antibodies. Because very young children live and play in contaminated environments, their rates of infection tend to be higher. Rates tend to fall as children acquire some immunity, learn to walk, and learn about hygiene.

- the particular characteristics and number of parasites:

At least one parasite, *E. histolytica*, occurs as both pathogenic (illness producing) and non-pathogenic strains. The presence of the former results in much disease in some communities, whilst the latter cause little or no disease.

- climate:

Warm, moist conditions are required for some parasites to develop. Thus, Australian Aboriginals in Northern Australia, where it is warm and moist, suffer more parasitic infections than those in drier, more southern areas, even with the same sanitation and hygiene patterns.



Roundworms and hookworms

Photo by Anthony Radford

- the presence of animals known to be involved in transmission of parasites.

Signs and symptoms

In most people, many parasitic infections do not produce clinical symptoms. In some, protozoal parasite infections can cause abdominal pain and diarrhoea or dysentery (bloody diarrhoea). Chronic infections, especially with giardia, may produce a malabsorption syndrome with intermittent frothy, foul-smelling, loose bowel actions, together with weight loss and, in children, growth retardation.

Most of the symptoms of worm infestation are due to the competition between worms and host for food, or to blood and protein loss or intestinal obstruction. Poor general health is also common with heavy parasitic infections.

Anthony Radford, Professor of Primary Care and Community Medicine, The Flinders University of South Australia, Bedford Park, South Australia 5042.

Parasites and diarrhoea: research needs

The 1985 meeting of the WHO Diarrhoeal Disease Control Programme Technical Advisory Group recommended research in the following areas:

- development of standardised, reliable techniques for diagnosing, and effective, inexpensive (and preferably) one-dose drugs for treating amoebiasis and giardiasis;
- more community-based studies for better understanding of the transmission and clinical patterns of amoebiasis and giardiasis; the relationship between parasites and other intestinal pathogens; the effect of

nutritional status on intestinal infections; and the natural course of *Entamoeba histolytica* and *Giardia lamblia* infections;

- further studies on pathogenesis, especially those related to different parasite strains and zymodemes and to the immunological responses of the host, including the role of the immune complexes.

Promoting research activities requires:

- identification of workers and institutions, especially in developing countries, with an interest and ability to carry out research;
- strengthening of those institutions

by providing adequate professional training in parasitology, equipment, materials and scientific information;

- inclusion, where possible, of aspects of parasite-related diarrhoea in clinical and field studies, bearing in mind that intestinal parasitoses may be closely linked with bacterial and viral infections as well as with the immune and nutritional status of the host;
- addition of *Cryptosporidiosis* to the list of priorities, as evidence for the importance of this parasite has increased greatly in the last few years.

Parasites and diarrhoea

Cryptosporidia

Leonardo Mata outlines current understanding of Cryptosporidia as a cause of diarrhoea.

Cryptosporidia were first discovered in mice at the beginning of this century and later in various species of mammals, birds, reptiles and fish. The importance of these tiny parasites in humans was recognised in the early 1970s when patients with immunosuppression or immunodeficiency were seen to become very ill with cryptosporidium diarrhoea, and many died. Recent experience of acquired immunodeficiency syndrome (AIDS) has shown the parasite to be an important 'opportunistic' agent, able to cause chronic, emaciating and fatal diarrhoea.

Cryptosporidia as a cause of diarrhoea

Cryptosporidia can also infect healthy small children, and sometimes adults with normal immune systems. This was shown in Australia where the parasite was found in about seven per cent of children with diarrhoeal disease. There have been similar findings among rural and urban children in Costa Rica. Cryptosporidia causes self-limiting, watery diarrhoea. Weight loss is likely and, if oral rehydration therapy (ORT) and proper feeding are not promptly established, dehydration and malnutrition will result. Although recurrence has been observed, the role of cryptosporidia in persistent diarrhoea is not

yet clear. Cryptosporidia diarrhoea is not, however, as severe or as important as bacterial and viral diarrhoeas.

Incidence and severity

Cryptosporidia have a high pathogenicity, and are almost always found in association with diarrhoea and only rarely when there is no diarrhoea. Studies show its presence in about 4 to 10 per cent of diarrhoea cases in many parts of the world, usually without other pathogens being present. It seems to cause more diarrhoea than other parasites, although giardia and *E. histolytica* may produce more serious disease.

Life cycle, epidemiology and transmission

Infection can spread between man and animals, and accidental infection of humans handling animals has been documented. However, the method of transmission is not clear. Animals, particularly calves, may be involved in rural areas, but in large urban centres other explanations must be found. Infection may occur throughout the year in tropical countries, but a marked seasonality has been observed in Costa Rica and Bangladesh with a peak of transmission in the warmer wetter months. In developed countries, infections seem more common in the sum-

mer. Exclusively breastfed infants are rarely infected, suggesting that breastfeeding has a protective effect.

Diagnosis and treatment

Cryptosporidia can readily be detected by finding the parasite cysts in the stools. Technicians can easily learn to recognise them under a microscope. Staining is recommended to avoid confusion with similar organisms. One popular technique is the modified Ziehl-Neelsen "in cold" or Kinyoun, which can be performed in any laboratory, requires simple reagents, and provides an accurate and rapid diagnosis. The cysts appear as ovoid (egg shaped) structures of uniform size and stained bright red. ORT, or intravenous fluid for very severe cases, is effective in correcting dehydration. Children should continue normal or extra feeding as soon as any anorexia and dehydration are corrected, usually a few hours after starting rehydration. No drugs have been found to be effective against the infection.

Prevention

Although not enough is known about transmission, the basic concepts of sanitation and personal hygiene should be observed to prevent infection: hand-washing; drinking clean water; avoiding touching faeces; safe disposal of faeces; and clean careful handling of food.

Dr Leonardo Mata, Director and Professor, Instituto de Investigaciones en Salud (INISA), Universidad de Costa Rica, Central America.

Trichuriasis

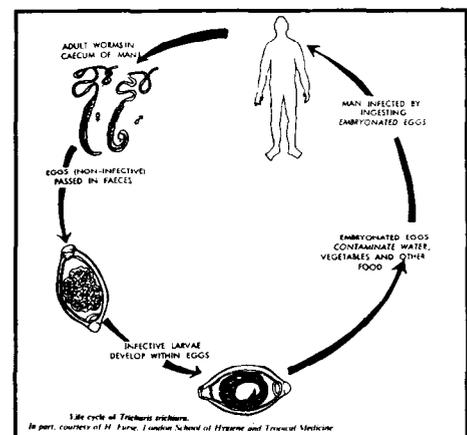
Donald Bundy describes the relationship between whipworm and diarrhoea in one community in the Caribbean.

In many communities, at least one in four people may be infected with worms — and will continue to be reinfected throughout their lives. The most commonly recognised worm is the large round worm (*Ascaris*), although the smaller whipworm (*Trichuris*) is in many areas actually more prevalent. Worm infections are less frequently considered to be a factor in diarrhoea than bacteria or viruses. One recent study in the Caribbean, however,

suggests there may be a need to reappraise this view.

Incidence and illness

Serious disease due to whipworm only occurs in a minority of cases where large numbers of whipworms are present. In these cases symptoms may include diarrhoea containing blood and mucus. The bloody diarrhoea may continue over a long period and result in the lower end of the bowel being



Taken from Medical Laboratory Manual for Tropical Countries: Volume I, Monica Cheesbrough.

Strongyloides

The role of Strongyloides in causing ill health and, in particular, diarrhoea is not always clear. Dick Ashford reviews some recent findings about the parasite.

The role of intestinal worm infections as a cause of ill health should neither be over-estimated nor ignored. For example, in Papua New Guinea, a new species of *Strongyloides sp.* infection was found to be a major contributing factor to infant deaths in one isolated community. Much still remains to be learned about the importance of intestinal helminths and *Strongyloides stercoralis* is one of the least understood, although it is a common infection among children in the tropics, especially in warm, humid regions.

Life cycle in the intestine

The adult female lives in the small intestine where it burrows, and lays eggs. After the eggs hatch, the larvae enter the faeces where they can become infective in as little as 24 hours. The larvae may also become infective before reaching the anus and penetrate the large bowel wall or skin round the anus (autoinfection).

The role of *Strongyloides* as a cause of diarrhoea is not always clear. In the small intestine the parasite causes malabsorption which results in offensive, but not necessarily liquid stools. Infection with *S. stercoralis* may start with frequent, pale, loose stools. This lasts about six weeks and there

may be some pain or discomfort. Following this phase, the body's immune processes limit the parasite numbers but allow the infection to persist indefinitely with minimal symptoms. The interaction between *Strongyloides* infection and other causes of diarrhoea is not clear; it is possible that the worms create conditions which facilitate other infections.

Incidence

The common *Strongyloides stercoralis* is not specifically an infant infection; a recent survey in Kenya showed a rise in prevalence with age, reaching a plateau around six years of age, very like hookworm. But the little known *Strongyloides fuelleborni* infection in the forested parts of Africa, and the



Photo by David Miller

Peak incidence of parasite infection in PNG is found in young children.

newly discovered infection in Papua New Guinea (PNG) are essentially parasites of the very young. In the heavily infected parts of PNG, the peak incidence is around four years of age, the highest worm loads occur at 12 months, and mortality is greatest around two months of age. The disease in PNG is characterised by peripheral oedema, a swollen belly and respiratory distress, as well as diarrhoea. It has not yet been recognised in Africa, but could easily have been missed in such young infants, and should be looked for.

Diagnosis and treatment

Effective drugs are available to treat *Strongyloides* infection. Although larvae of other parasites may be present, heavy infection with *Strongyloides* can usually be detected in a direct fresh stool smear. With the exception of heavily infected communities, it would be unrealistic to try to specifically control *Strongyloides* infection. The lifecycle is sufficiently similar to that of hookworm for most measures, such as the improvement of sanitation, to affect both infections. In the many areas where people are living in poor conditions, the use of thiabendazole or albendazole will eliminate not only hookworm but also *Strongyloides*.

Dr R W Ashford, Department of Parasitology, Liverpool School of Tropical Medicine, Pembroke Place, Liverpool L3 5QA, UK.

pushed out of the anus (a condition known as rectal prolapse). Such children may also lose weight, fail to grow and suffer from anaemia. Recent studies at the University of the West Indies have shown that this severe condition is associated with the presence of between 500 and 1,000 worms in the gut.¹

In heavy infections the surface of the large bowel, to which the whipworms are attached, becomes swollen and inflamed. It is thought that this inflammation (known as colitis) causes the bloody diarrhoea, and that it is the long term effect of repeated bouts of this diarrhoea which causes growth retardation. With light infections there may be

no symptoms or only mild illness.

A study in one village showed that children with significant numbers of whipworm tended to suffer from bloody diarrhoea and growth retardation, not those with large numbers of roundworms. The study also suggested that the effect of this protracted bloody diarrhoea on child health and growth very often goes unnoticed and children may not be brought to clinics for treatment.

Treatment

Whipworm infections are very easy to treat using drugs such as albendazole and mebendazole, although not, unfortunately, with the more commonly used

worm treatments. Controlling worms in the community is more difficult than treating individuals, however, and little progress is likely to be made until the extent to which trichuriasis is a problem in different communities has been established through further studies.

Dr Donald A P Bundy, Parasite Epidemiology Research Group, Department of Pure and Applied Biology, Imperial College, Prince Consort Road, London SW7 2BB.

¹ Bundy D A P, 1986. *Epidemiological aspects of Trichuris and trichuriasis in Caribbean communities. Transactions of the Royal Society of Tropical Medicine and Hygiene*, 80, 706-718.

Parasites and diarrhoea

John Ackers and Andrew Tomkins discuss amoebiasis and giardiasis as causes of diarrhoea.

Giardiasis

Giardia intestinalis is a protozoan parasite that sometimes causes acute and persistent diarrhoea in many parts of the world, especially among infants and young children. It may also contribute to malnutrition.

Modes of action

The parasite is usually swallowed in the inactive cyst form and then changes into the active trophozoite as it enters the duodenum which it colonises. Trophozoites stick to the gut wall and may damage or destroy the enterocytes immediately under the parasite.

Epidemiology

Giardia is most commonly found among older infants and young children in developing countries — in some population surveys, up to 50 per cent of subjects may be asymptomatic carriers of giardia. There are protective factors in breastmilk, and giardia is rarely found in infants less than four months of age.

A first infection with giardia, often in later infancy and early childhood, can cause diarrhoea of varying severity. If left untreated, symptoms improve spontaneously but many individuals become 'asymptomatic cyst passers'. Among adults without previous immunity, the first infection can pro-

duce severe diarrhoea. Furthermore, when immunity breaks down, as may occur in severe malnutrition, the parasites multiply unchecked and may cause serious damage to the lining of the gut.

Clinical features

Initial symptoms include watery diarrhoea, nausea, abdominal pain and flatulence. These often progress to persistent diarrhoea (more than fourteen days duration) with 'malabsorption' stools. There may be considerable abdominal distension and unpleasant 'bad egg taste' in the mouth. Some of the symptoms are due to secondary lactase deficiency from intestinal damage. Fever or the passage of mucus and/or blood are rare. Weight loss or growth faltering, vitamin A and folate deficiency can occur — as a result of a combination of decreased nutrient intake and malabsorption.

Diagnosis

Microscopic examination of a portion of moist stool mixed with saline on a glass slide will often reveal the characteristic cysts or trophozoites (active forms). A negative stool test does not exclude the existence of giardia infection since the parasites may be passed only intermittently. *Giardia* are also visible on jejunal biopsy specimens. Recently an ELISA test has been developed for detection of giardia antigens in faeces.



Photo by Andrew Tomkins

Shortening of the villi and increased numbers of inflammatory cells causing malabsorption in giardiasis.

Prevention

Giardia is transmitted in water supplies and food. Faecal contamination of municipal water supplies has been responsible for epidemics throughout the world. Contaminated food sources, especially vegetables which are grown or sold in areas where hygiene is poor, are also important. The outbreaks of giardia infection in nurseries and day care centres suggests that person-to-person transmission also occurs.

Treatment

There are several effective drugs but repeated courses of treatment may be necessary (see table) because reinfection is common. Nevertheless treatment is still beneficial where giardia occurs in children or adults with persistent diarrhoea, children with severe protein energy malnutrition, and adults or children with acute giardiasis in epidemic form.

Dr Andrew Tomkins, Departments of Clinical Tropical Medicine and Human Nutrition, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT.

Tomkins, A.M. Intestinal Parasites: Part 1. Nutritional Importance. pp. 61-67 In: Diarrhoea and Malnutrition in Childhood (1986), eds. Walker-Smith and McNeish, Butterworths.

Drug	Children	Adults	Comments
Metronidazole	20mgm/kg/day divided into 4 doses per day for 5 days (max 800mgm)	400mgm 3 times a day for 5 days or 2g daily for 3 days	Syrup is available (200mgm/5mls) but often expensive and has short shelf-life. Tablets can be crushed but bitter taste — needs sweetener to encourage child to take. Large doses cause nausea and dizziness in some individuals.
Tinidazole	20mgm/kg/day as single dose, for 3 days	2g daily for 3 days	Syrup is not available. Nausea and dizziness less prevalent than with metronidazole but still a problem in some children.

N.B. Metronidazole is only a "type" drug for numerous nitroimidazoles, including for example tinidazole, ornidazole, secnidazole and nimorazole. These last four have shorter treatment courses than metronidazole.

Amoebiasis

Amoebiasis means being infected with the protozoan parasite, *Entamoeba histolytica*, an amoeba with a simple life cycle. Infection starts by swallowing the amoebic cyst, which hatches out in the small intestine and divides to produce trophozoites or feeding stages. These pass into the large intestine where they feed (mainly on starch and bacteria) and multiply. Amoebae are shed in the faeces either as trophozoites during diarrhoea or in the cyst form.

E. histolytica as a cause of diarrhoea

Although amoebiasis is very common, the vast majority of infected persons are entirely free of symptoms. In these cases, the amoeba seems to live a completely commensal life within the gut. Problems arise when *E. histolytica* attacks the gut wall — a condition known as invasive amoebiasis, thought to affect 48 million people annually. After invading it, the parasites may remain in the bowel wall causing intestinal amoebiasis, spread to the liver causing amoebic liver abscess or, more rarely affect other parts of the body. Only intestinal amoebiasis causes dysentery. In typical amoebic dysentery, blood-stained stools containing mucus are passed each day or bloody diarrhoea occurs, with some colicky pain but no fever and patients do not feel particularly ill.

In contrast, fulminating amoebic colitis is an extremely severe clinical condition with sudden onset, swinging fever, chills, sweating and very severe diarrhoea, dehydration and prostration. Stools are liquid with varying amounts of blood and mucus. Severe intestinal haemorrhages or perforation followed by peritonitis may occur. The mortality in untreated cases is high.

Epidemiology

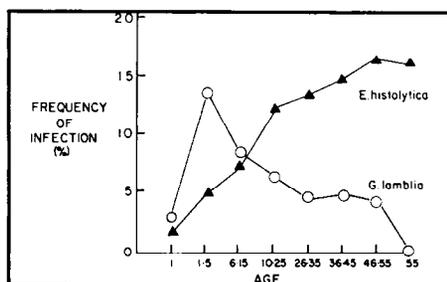
It is still not clear whether all types of *E. histolytica* have the potential to cause invasive disease, or whether specific invasive strains exist. Although many experts still regard invasive amoebiasis as a consequence of the failure of mechanisms (either of host immunity or related to diet or gut flora) which normally keep the parasite in

check, more recent evidence (particularly from isoenzyme studies) suggests that both invasive and non-invasive strains occur. The subject however, is still under intensive investigation.

The incidence of invasive amoebiasis varies greatly in different parts of the world, as does the ratio of cases of invasive disease to asymptomatic cyst shedding. The infection is considerably more common in tropical and developing countries but the organism is present in all countries, and male homosexuals throughout the world represent a newly recognised group with very high levels of asymptomatic infection. Unlike infections with *Giardia lamblia*, no effective immunity develops even after repeated infections (see below) and the highest prevalence of infection is found in adults. It is not clear how much of diarrhoea (and particularly childhood diarrhoea) in the tropics is due to *E. histolytica*.

Transmission and prevention

Infection invariably occurs by swallowing cysts, and there is both person-to-person and waterborne transmission. A



Prevalence of infection with *E. histolytica* and *G. lamblia* with age in Lagos, Nigeria.

Adapted by R Guerrant and J Ravdin in *Reviews of Infectious Diseases from J P Oyerinde et al in International Journal of Epidemiology*.

considerably higher concentration of chlorine is required to kill cysts than faecal bacteria. Water may be rendered safe by boiling, pasteurisation (at above 50°C), and by treatment with 3 ppm (parts per million) of iodine or hypochlorite, or by sand-bed filtration. If they dry out, cysts in soil or faecal material are immediately killed. If kept damp, they may survive for several weeks, depending on the temperature. Vegetables to be eaten raw should be steeped in vinegar or dilute hypochlorite solution for 30 minutes, followed by rinsing in boiled water.

Diagnosis

Diagnosis of infection is made by detecting the organisms in the faeces using a microscope. In asymptomatic infected patients the cysts should be sought in faecal concentrate after staining with iodine. Training and practice are needed to accurately distinguish cysts of *E. histolytica* from other protozoa.

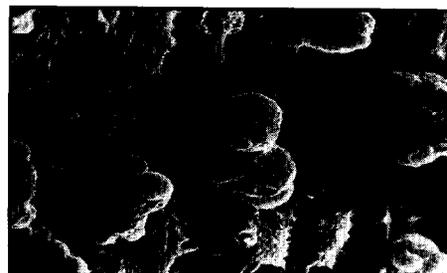


Photo by David Mirelman

Invasion of the epithelial cell layer of the intestine by amoebae.

In all cases, a fresh (preferably warm) specimen should also be examined without concentration or the addition of iodine in order to detect live trophozoites (feeding stages). These may be found, either in an asymptomatic infected patient where some other bacterial or viral diarrhoea is causing trophozoites to be shed before they have had time to form cysts; or in cases of invasive intestinal amoebiasis. In the latter, the parasites will be large, motile (but only if still warm) and contain red blood cells. Trophozoites containing red blood cells may also be found by rectal biopsy and are diagnostic for the intestinal disease.

Treatment

The treatment of choice for invasive amoebiasis is now one of the 5-nitroimidazole drugs (or diloxanide or chloroquine). Whether completely asymptomatic cyst passers should be treated is still controversial. If such amoebae are fundamentally incapable of invasion, then there is not justification for doing so, but some people do not yet accept that most isolates of *E. histolytica* are inherently harmless. On the other hand, in situations where rapid reinfection is probably unavoidable, the treatment of asymptomatic persons is widely regarded as a waste of scarce resources.

J P Ackers, Department of Medical Protozoology, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK.

letters...letters...letters...

Fighting incorrect beliefs

I have been working in general practice for two years, and I have experienced very good results when using ORT. I find it easy to use, economical and it avoids the hazards of dehydration. I have also tried honey in water, which seemed to work very well, and was accepted well by children. I have often found it difficult to convince people that ORT does work, they expect instant results and expensive medicines, which are often useless. Many doctors advise mothers to stop breastfeeding and feeding during diarrhoea, which I think is very wrong. I have experienced many problems in going against the beliefs of a majority of doctors, as I am only a junior practitioner, but I have full confidence and faith in ORT, so please send me your *DD* regularly.

Dr Subhash B Gawari, 1393 Ghodnadi, Pune, Maharashtra State, 412 210, India.

More on vitamin A

You are right to point out in *DD 24* that oral vitamin A should be used for prevention and treatment of those at risk of blindness due to malnutrition. In high risk areas all children with severe diarrhoea should be given 200,000 IU vitamin A orally when first seen, unless they have been given a comparable dose of vitamin A recently. All children should have their eyes checked, remembering that even breastfed children are at risk if the mother is herself severely malnourished, has little milk or weaning has been delayed.

Oral vitamin A has been shown in a controlled trial in Indonesia to give results similar to injectable vitamin A. It is unlikely that injectable vitamin A will be available extensively in the areas where the need is greatest, and oral vitamin A anyway works very well without all the other problems associated with injections. The dose must be high

though, and this is not mentioned in your update note. At least 200,000 IU should be given; a further 200,000 IU may be given the next day and again after seven days if there is severe corneal damage. Give half doses for very young children, under one year.

Nicholas Cohen MD, Department of Community Medicine and Epidemiology, The University of Nottingham Medical School, Queen's Medical Centre, Nottingham NG7 2UH, UK.

ORT in Turkey

The use of ORT and importance of breastfeeding are stressed to all mothers who visit the Gulveren Health Centre, near Ankara. Every health centre should have a diarrhoea unit for teaching parents and treating children with diarrhoea. Diarrhoea units do not need much equipment; a simple room, a few chairs, some cups and glasses and posters about diarrhoea and ORT are sufficient. Every parent whose child has diarrhoea, whether dehydrated or not, should be taught about diarrhoea and ORT, and shown how to prepare ORS. The doctor and nurse should watch while the mother gives the child the solution. First of all this procedure separates the patient with diarrhoea from the other patients, and mothers do not have to wait to see the doctor. It is also important not just to tell a mother how to use ORT and about the hazards of diarrhoea and then send her home as you will not know whether she actually gives the solution. We also show mothers that children with nausea and vomiting can be given ORS. Mothers are also visited at home to check the condition of the children and continue education. The unit was established in June 1986 and in one month, 300 diarrhoea patients were admitted. No problems with taking ORS with vomiting were seen.

Educating parents is not enough. You should show them how to prepare ORS, watch while they are giving the

solution to the child and call them back to the unit or visit them at home the next day. And the most important thing about ORT is that all the doctors and medical staff believe that it works.

Dr Atilla Buyukgebiz, Director of Gulveren Health Centre, Ankara, Turkey.

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In the next issue . . .

DD 28 will focus on home solutions for preventing dehydration and ORS for treating dehydration.

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