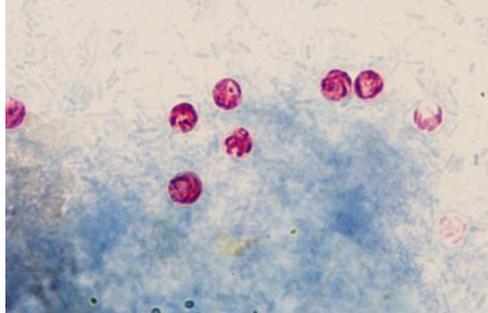


Protozoan intestinal parasites

Cryptosporidium

Image: Ziehl-Neelson – stained microscopy of *Cryptosporidium*



What is it?

- *Cryptosporidium* is a protozoan (unicellular) parasite.
- It affects humans and many other animals and may be anthroponotic (human to human) or zoonotic (transmitted between animals and humans).
- The oocysts are very hardy and survive in the environment for up to 6 months, and survive chlorination, hence its ability to cause swimming pool outbreaks.

Epidemiology

- Common worldwide and the commonest reported parasite causing diarrhoea in the UK, with 4000 – 6000 cases per year reported in England and Wales. It is also one of the commonest causes of diarrhoea in young children in the developing world.
- Commonest in young children but anyone can be affected.

Clinical Presentation

- Symptoms of gastroenteritis, which can be prolonged, going on for up to 2 weeks or longer, with diarrhoea, vomiting, fever and abdominal pain.
- In healthy patients, it is self-limiting.
- In the immunocompromised, eg HIV with low CD4 counts, bone marrow transplant patients or leukaemia, it can cause severe disease which may be fatal. In these patients it can also go on to infect the biliary tree leading to sclerosing cholangitis and/or liver cirrhosis.
- Asymptomatic carriage can also occur.

Risk factors for *Cryptosporidium* acquisition in high income countries

- *Cryptosporidium* can be transmitted in contaminated water, either through leisure activities in lakes/rivers, swimming pools (as resists chlorination) or sometimes in drinking water, resulting in a 'boil-water notice' for an area. Its control is a major concern for water supply companies.
- It may be transmitted on food, eg contaminated salad leaves

- It can be acquired from animals especially young animals like kid goats or lambs – so petting zoos/farms are a risk factor.
- Like *Giardia*, it can also be associated with day care nurseries/changing nappies.

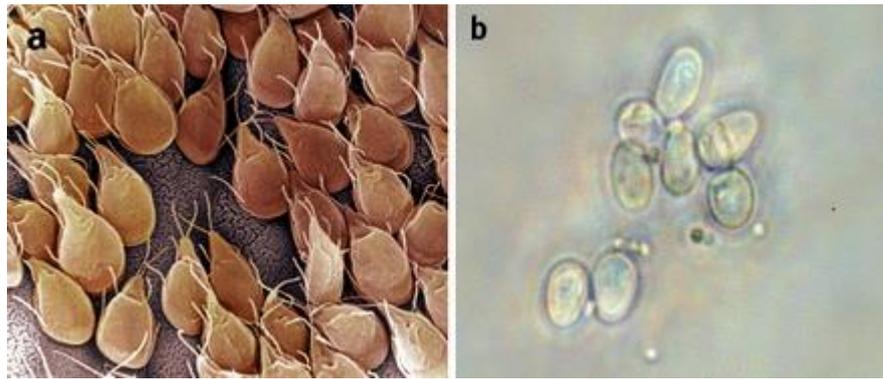
Diagnosis

- The parasites can be seen under the microscope in stool samples, which have been stained with the appropriate stains (Ziehl-Neelson, as above, or auramine-phenol).
- Stool ELISA tests now also exist.
- If suspected, it is important to specifically request a stool sample for *Cryptosporidium*, as it will not be looked for routinely in the lab. This means many diagnoses are delayed or missed.

Treatment

- There is no licensed treatment in the UK and treatment is symptomatic.
- Nitazoxanide (not available in UK) is effective in immunocompetent patients and is licensed in the US.
- In immunocompromised patients, where disease can be severe/life-threatening, reducing the level of immunosuppression wherever possible can be very effective.

Giardia



a) Trophozoites under electron microscopy. (b) Giardia cysts on microscopy

What is it?

- *Giardia* is a flagellated protozoan parasite.
- The parasite induces intestinal villous flattening, and diarrhoea due to malabsorption. Cysts present in faeces can remain viable for up to three months in lake or river water.

Epidemiology

- *Giardia* is a leading cause of infectious gastroenteritis worldwide.
- Between 3000 and 4000 cases are reported annually in England and Wales but its UK incidence is underestimated because of the lack of diagnostic sensitivity of traditional faecal microscopy and the mistaken belief that it is mostly acquired abroad. In fact about 75% of UK cases are believed to be acquired in the UK.
- The number of patients diagnosed with *Giardia* will increase as routine testing of stool samples using highly sensitive diagnostic tests (such as EIA) instead of microscopy becomes more widespread.
- The highest incidence of giardiasis is in under 5s and adults aged 25-44. The source of most infection is person-to-person transmission through faeco-oral spread, including also during sexual activity.

Clinical Presentation

- Can be asymptomatic (estimated in 5-15% of infected people).
- Typical symptoms include diarrhoea, flatulence, abdominal pain, and bloating.
- The stools are characteristically pale, greasy and difficult to flush away (a feature of malabsorption).
- Blood in the stool is unusual and suggests the presence of another pathogen.
- Untreated, symptoms can continue for 2-6 weeks or more.
- Weight loss due to malabsorption occurs in more than 80% of patients; chronic infection in children might result in failure to thrive.

- Intestinal lactase deficiency occurs in up to 40% of patients with giardiasis and might persist for several weeks after parasite eradication. This manifests as diarrhoea that is worse after consumption of food containing lactose.
- Diagnosis is often delayed, sometimes for months, owing to the insidious onset and relapsing clinical course.

Risk factors for *Giardia* acquisition in high income countries

- Foreign travel, particularly in low income settings
- Toileting young children and changing nappies/attending childcare settings
- drinking water from sources where *Giardia* may live (for example, hikers drinking from streams or wells - 'beaver fever')
- Drinking contaminated water or swallowing contaminated water while using swimming pools or other recreational fresh waters
- Sexual transmission especially between men who have sex with men
- Dog ownership for some genotypes
- Some immunodeficiency disorders: X linked agammaglobulinaemia, common variable immunodeficiency

Diagnosis

By laboratory analysis of stool samples, either by:

- traditional microscopy (ova, cysts, and parasites (OCP) examination) for visualisation of cysts (or more rarely, trophozoites) . Owing to variable shedding, three stool specimens (ideally taken two or three days apart) need to be examined
- or, by stool antigen detection assays (EIA). The sensitivity of antigen detection assays is superior to microscopy for the diagnosis of giardiasis.

Not all laboratories routinely test stool samples for the microorganism, so specifically request examination of samples for *Giardia* and document travel or other risk factor history.

When giardiasis is highly suspected but stool results are negative, diagnosis can be made through duodenal aspiration and biopsy. Less likely to be necessary nowadays with advent of more sensitive stool EIA tests.

Treatment

- Unlike many causes of infectious gastroenteritis, giardiasis is treatable.
- Metronidazole and tinidazole have similar efficacies, with parasitological cure rates and symptom relief in more than 90% of patients.
- The British National Formulary currently recommends a five day course of metronidazole as preferred treatment in the UK.
- Tinidazole is also licensed for this indication, has similar efficacy to a multiple dose metronidazole regimen, and is better tolerated.

Entamoeba histolytica



What is it?

- *Entamoeba histolytica* is a pathogenic amoeba causing amoebiasis.
- Several species of *Entamoeba* colonize humans, but do not cause disease. They are important in that they may be confused with *E. histolytica* in diagnostic tests.
- Because of the protection conferred by their walls, the cysts can survive days to weeks in the external environment and are responsible for transmission.

Epidemiology

- Occurs worldwide but higher incidence in tropical areas with poor sanitation.
- A significant cause of morbidity and mortality in the developing world.
- Humans are the only reservoir, and infection occurs by ingestion of mature cysts in food or water, or on hands contaminated by faeces.

Clinical presentation

- About 90% of infections are asymptomatic. The remaining 10% produce a spectrum of disease ranging from dysentery to amoebic liver abscess.
- The cysts release active amoebae (trophozoites), which invade the epithelial cells of the large intestines, causing 'flask-shaped' ulcers. Infection can spread to other organs - eg, the liver, lungs and brain, via the bloodstream.

Intestinal amoebiasis

- *Amoebic colitis with dysentery*: loose stools with fresh blood. The patient is usually generally well with mild/moderate abdominal pain. Amoebic colitis may lead to fulminant or necrotising colitis, toxic megacolon, amoeboma or a rectovaginal fistula. Localised perforation and appendicitis can also occur.
- *Amoeboma*: An abdominal mass, usually in right iliac fossa. May be painful and tender, with fever, altered bowel habit, and partial/intermittent bowel obstruction.
- *Fulminant colitis*: high-grade fever, severe abdominal pain, increasing abdominal distension with vomiting plus watery diarrhoea. Absent bowel sounds. X-ray may show free peritoneal gas with acute gaseous dilatation of the colon.

Invasive amoebiasis most often causes an amoebic liver abscess but may affect other organs including the brain, causing a brain abscess.

Amoebic liver abscess

- There is usually no current, and often no history of, dysentery.
- It presents with sweating and pyrexia, pain in the right hypochondrium and weight loss, often appearing insidiously.
- There is liver enlargement with localised tenderness.
- Upward enlargement may cause raised upper level of liver dullness on percussion. There may be reduced breath sounds/crepitations at right lung base.
- May extend and/or rupture into the abdomen or chest, or disseminate and cause a brain abscess. If it extends into the lung, it produces a hepatobronchial fistula with expectoration of brownish, necrotic liver tissue.
- The pus is classically described in old textbooks as like 'anchovy paste' (not a reliable diagnostic indicator!).

Risk factors

In industrialized countries, risk groups include male homosexuals, travellers and recent immigrants, and institutionalized populations.

Diagnosis

- Stool examination:
 - *E. histolytica* should be differentiated from other *Entamoeba* spp. For this reason the World Health Organization now recommends that intestinal amoebiasis should be diagnosed with specific stool *E. histolytica* testing (eg EIA or PCR) rather than examining stool for ova and parasites.
- Serology: serum antibody testing is positive in nearly all cases of liver abscess and amoeboma, and most cases of invasive intestinal disease.
- Abdominal ultrasound or CT/MRI scans are useful in hepatic amoebiasis.

Treatment

- Diloxanide furoate is the drug of choice for asymptomatic patients with *E. histolytica* cysts in the faeces (metronidazole and tinidazole are relatively ineffective for amoebae in gut).
- Metronidazole is the first choice for treatment of acute invasive amoebic dysentery/liver abscess. Tinidazole is also effective.
- Treatment with metronidazole or tinidazole is followed by a 10-day course of diloxanide furoate to destroy any amoebae in the gut. Recurrence is common if amoebae are not completely eradicated.
- Surgical drainage of an uncomplicated amoebic liver abscess is unnecessary and should be avoided unless there is a risk that it may rupture.