Preventing person-to-person spread following gastrointestinal infections: guidelines for public health physicians and environmental health officers

Prepared by a Working Group of the former PHLS Advisory Committee on Gastrointestinal Infections

Summary: This guidance updates advice on preventing person-to-person spread of gastrointestinal infections in the general population, first published in 1983 by the Public Health Laboratory Service and last updated in 1995. It represents a consensus of informed opinion and is particularly aimed at those public health physicians and environmental health officers who do not specialise in communicable disease control. It addresses predominantly the organisms that more commonly present them with problems. The guidance considers general measures, enteric precautions, exclusion from work, school and other settings and groups that pose an increased risk of spreading infection.

Key words:
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guidance
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Introduction – status and scope

As long ago as 1983, the then Public Health Laboratory Service (PHLS) produced, under the aegis of the Salmonella Subcommittee, its first guidance on preventing person-to-person spread of gastrointestinal infection. Published as a supplement to the *Communicable Disease Report*, it acquired the colloquial name of 'Supplement 1'. In three editions, the latest in 1995, it achieved popularity as a source of practical and authoritative advice.

The present document, like its predecessors, aims to provide concise, accessible, and sound advice to public health professional about how to prevent the person-to-person spread of diseases resulting from infection acquired via the gastrointestinal tract. It has been deliberately kept brief to be put easily into a briefcase or on-call pack. It is particularly aimed at those public health physicians and environmental health officers who do not specialise in communicable disease control and it will also be relevant to others who, from time to time, find themselves involved in the investigation and control of infection. It addresses predominantly the organisms that commonly present those professionals with problems. Purists may question the use of the term 'gastrointestinal infection' to describe some of the diseases mentioned, but all are acquired via the gastrointestinal tract. Rather than cover topics in exhaustive detail, the guidelines try to convey perspective acquired through experience to those who may not be so experienced. In places the style is didactic. This is for clarity and ease of use. Guidance should help inform professional judgement and the assessment of risk locally. It should not deter the reader from seeking expert assistance if required.

These notes are primarily concerned with control in the general population rather than the special circumstances of the hospital or other healthcare settings such as residential homes, for which existing specific guidance is likely to be more appropriate. No details of investigative procedures, including investigation of outbreaks, are given. The possibility of an outbreak should usually prompt the calling together of an outbreak control team. A noticeable change is that we have preferred the categorisation of 'Groups that pose an increased risk of spreading infection' previously used in Scotland (see below) so the groups are now A to D, rather than 1 to 4 and in a slightly different order with slightly different (and we think, on balance, better) descriptions. Another important change is explicit acknowledgement of the widespread practice of advising all persons with diarrhoea to remain off work or school for 48 hours after clinical recovery and passing the first normal stool. This is similar to current Scottish advice and the 48-hours interval has the merit of making sure that the person is indeed recovered and not infectious to others. The final key change is to align the recommendations for contacts of typhoid and paratyphoid more closely with the guidance of the American Public Health Association and so recommend only two negative faecal specimens obtained 48 hours apart once the case has commenced treatment.

Further advice and assistance may be obtained locally from consultants in communicable disease control (CCDCs), consultants in public health medicine (CPHMs) (Communicable Disease and Environmental Health) (Scotland) and consultant microbiologists and more widely from regional epidemiologists, the Communicable Disease Surveillance Centre, Health Protection Scotland (HPS) and reference laboratories.

Some definitions

- **Foodborne disease**: any disease of an infectious or toxic nature caused by or thought to be caused by the consumption of food or water. (**Food** comprises all foodstuffs and drinks). Foodborne disease is synonymous with **Food Poisoning**.
- **Gastrointestinal infection**: any infection, from whatever source, of the gastrointestinal (digestive) tract.
- **Case**: a person with symptoms.
- **Excreter**: a person without symptoms but excreting pathogenic organisms in their faeces or urine for fewer than 12 months. Such a person may be a case who had recovered or someone who has had an asymptomatic infection.
- **Carrier**: a person without symptoms who has excreted pathogenic organisms in faeces or urine, either continuously or intermittently, for more than 12 months. The carrier state is rare except after typhoid or paratyphoid fever. It is occasionally found after other salmonella infections.
- **Contact**: a person who is likely to have been exposed to the excreta of an infectious person (case, excreter, or carrier). Other forms of contact, where relevant, are described below under individual diseases.
- **Sporadic case**: a single case which has not apparently been associated with other cases, excreters, or carriers in the same period of time.
- **Family outbreak**: two or more cases within the same household.
- **General outbreak**: two or more cases associated in place and/or time but not within the same household.
- **Clinical surveillance**: observation of or by the patient for the development of relevant symptoms.
- **Microbiological clearance**: the reduction of the number of pathogenic organisms in a specimen below that detectable by conventional means.

Statutory notification and other procedures

Section 11 of the *Public Health (Control of Disease) Act 1984* in England and Wales requires a registered medical practitioner attending anyone who he has reason to suspect may be suffering from one of a list of notifiable diseases or from food poisoning to notify 'forthwith' the 'Proper Officer' for the Local Authority (local council) of that district. Regulation 3 of the *Public Health (Notification of Infectious Diseases) (Scotland) Regulations 1988* puts a similar duty on medical practitioners to notify the Chief Administrative Medical Officer of the Health Board (now called NHS Board). For Northern Ireland notification is covered by the *Public Health Act (Northern Ireland) 1967*.

'Forthwith' is not defined in law but is taken to mean as soon as is reasonably possible taking into account the circumstances. To be valid each notification strictly should be signed by the notifying medical practitioner. However, in practice, telephoned or telefaxed notifications are to be preferred and most CCDCs/CPHMs will regard telephoned reports as 'duly made' and hence eligible for payment. Undue delay is to be avoided and may mean that the legal requirement to notify has not been discharged.

'Attending'means that there must be a doctor/patient relationship between the person notifying and the individual with the notifiable condition.

The law does not place the responsibility for notification on any particular medical practitioner. It is simply the first one to suspect that a person is suffering from a notifiable condition. Absolute confirmation of the diagnosis **is not required**.

Section 11(4) of the above Act states that 'A person who fails to comply with an obligation...(to notify) shall be liable on summary conviction to a fine not exceeding level 1 on the standard scale'.

Food Poisoning

The most common causes of food poisoning are bacteria such as *Campylobacter*, *Salmonella*, *Clostridium perfringens* and *Staphylococcus aureus*. Norovirus (previously termed small round structured virus) can also be foodborne. All these agents generally result in an illness characterised by gastro-intestinal upset ie diarrhoea and/or vomiting. Other illnesses may occur. For example *Clostridium botulinum* affects the central nervous system rather than the gastrointestinal tract.

Conversely, by no means all cases presenting with diarrhoea and vomiting will have food poisoning. Most of the organisms that cause food poisoning can also be passed from person-to-person by direct contact. Other causes of diarrhoea and vomiting, for example *Shigella sonnei* and rotavirus are nearly always acquired directly from another, usually symptomatic, person.

In the absence of positive laboratory findings, deciding whether an individual with diarrhoea and vomiting is suffering from food poisoning is difficult. Certain foods, eg chicken, are acknowledged as at higher risk of carrying bacterial food poisoning organisms such as *Salmonella* or *Campylobacter*. When a group of people are ill after eating the same meal it is very likely to be food poisoning. It is also tempting to assume that a gastrointestinal illness occurring very soon, or often just after, a 'suspect' meal must be food poisoning from that meal but, although some causes of food poisoning have incubation periods measured in a few hours (*Staphylococcus aureus*, *Bacillus cereus*), most take days to become apparent (eg *Salmonella*, 6 hours to 3 days and *Campylobacter*, 1 to 10 days).

Even a positive laboratory culture does not prove that the infection was acquired from food. For practical purposes, however, it is reasonable to assume that most *Campylobacter* and *Salmonella* infections will be acquired from food and may be notified accordingly as 'food poisoning (*Salmonella* [or whatever])'.

General advice

Diarrhoea and vomiting can be caused by infections or non-infectious agents. All cases of gastroenteritis should, however, be regarded as infectious unless good evidence suggests otherwise.

A liquid stool is more likely than a formed stool to contaminate hands and the environment, and is consequently at greater risk of spreading faecal pathogens. Formed stools voided by asymptomatically infected people, or people who have recovered from illness, may contain pathogens, but are unlikely to transmit infection if good personal hygiene can be achieved. Vomit, like liquid stool, may be highly infectious.

The CCDC/CPHM, or someone on their behalf such as a health protection nurse, should consider every case or outbreak reported and if necessary discuss the incident with the local or regional microbiologist and if appropriate the regional or national epidemiological centre. General practitioners take primary clinical responsibility for cases nursed at home.

It should be borne in mind that treatment mainly consists of general supportive measures such as maintaining hydration. With certain exceptions, specific treatment directed against the infective organism is usually not appropriate.

The CCDC/CPHM, or someone on their behalf, should provide clear medical advice to assist environmental health officers (EHOs) involved in control measures directed towards sporadic cases and outbreaks outside the home, and provide practical advice on the day-to-day management of cases and outbreaks in residential homes and other institutions. In this context the assistance of hospital infection control staff is an invaluable resource.

Cases at home should be nursed with enteric precautions (see below). Cases and excreters should always be advised on personal hygiene. It is important to ensure that schools and institutions have adequate hand-washing facilities (see below) and that the toilet hygiene of young children, people with learning disabilities and the elderly mentally infirm is supervised. Cruise ships may have persistent and recurrent problems with gastrointestinal infections.

During the investigation of outbreaks faecal specimens should be obtained from a number of cases for epidemiological purposes. It may also be necessary to obtain faecal or serological specimens from asymptomatic contacts and people exposed to the same risk who have remained well. This is best carried out as soon as is practicable and ideally needs to be done within 48 hours for outbreaks of viral gastrointestinal infection.

Enteric precautions

Hand washing

Thorough hand washing with soap (preferably liquid) in warm running water, and drying, is the most important factor in preventing the spread of gastro-

intestinal infections. Doctors, nurses, relatives, and other carers must wash their hands after dealing with sick people, handling their clothes or bedding, having contacts with sick room equipment, and after removing disposable gloves. Everyone (carers and sick people) should always wash their hands after going to the toilet or changing babies' nappies and before preparing or serving food or eating meals. Towels should not be shared and, particularly, staff in residential institutions must not use residents' towels. All institutions and schools should be encouraged to use liquid soap and disposable hand towels or air dryers. Alcohol hand gel may have a role in certain circumstances, particularly during outbreaks in institutional settings.

Disposal of excretions and soiled materials

At home, sick people should normally use a flush toilet. If a urinal, commode pan or bedpan has to be used, carers should wear disposable plastic or rubber gloves and wash their hands thoroughly after attending the patient, after removing the gloves. Bedpans, commode pans and urinals should be emptied into the toilet bowl and then washed with hot water and detergent, rinsed and allowed to dry. Ideally, disposable plastic aprons will also be used when dealing with excretions and soiled materials or during cleaning. Aprons and gloves may be disposed of by placing them in a plastic bag, sealing the neck and placing with solid waste.

Soiled clothing and bed linen should be washed separately from other clothes in a domestic washing machine at the highest temperature that they will tolerate (eg 60°C plus for linen). If the amount of soiling makes it impractical to put the soiled items straight in, as much faecal material as possible should be scraped off into the toilet bowl (before the laundry is placed in the washing machine). A pre-wash cycle of the washing machine may then be used. Soaking in disinfectant before washing to reduce contamination is not necessary and may bleach coloured fabrics. The outside of the washing machine should be wiped down with hot water and detergent after soiled linen is loaded. Thorough hand washing is required after handling soiled linen or clothing.

Spillages

Any spillage or contamination with faeces, vomit, or urine should be dealt with immediately. Absorbent material such as paper towels, tissues, or sawdust may be used to limit the spread of liquid soiling. The material may then be more easily scraped into a toilet or a plastic bag for disposal. Cleaning the soiled area with hot water and detergent is usually adequate. Again, disposable plastic or rubber gloves and a disposable apron should be worn if available. Hands should be washed thoroughly after cleaning is completed. After clearing vomit or diarrhoea from carpets it is best to clean the area with a proprietary carpet shampoo or steam cleaner, if available. In the absence of this type of equipment a thorough cleaning with hot water and detergent will have to suffice. Always rinse with clean water and allow to dry before using the area again. Carpets may be damaged by disinfectants and the use of these products is not usually necessary.

Decontamination

Toilet seats, flush handles, wash-hand basin taps, surfaces and toilet door handles should be cleaned at least daily or more often, depending on use. Hot water and detergent should be used for this purpose. Commercial sanitising sprays and cleaners or alcohol-based wipes may be used on toilet seats and other surfaces after visible soiling has been removed by thorough cleaning. Household bleach (diluted 1:10 for soiled surfaces and 1:100 for other hard surfaces) is highly effective and retains an important role although concerns about user safety limit its routine use. All these precautions are especially important in schools, nursery schools and residential institutions.

Ideally, disposable gloves and cloths will be used for cleaning. These may be disposed of by placing them in a plastic bag, sealing the neck and placing with solid waste. If household rubber gloves and non-disposable cloths are used by carers, these should be thoroughly washed in hot water and detergent after use, rinsed and allowed to dry. Ideally mops with disposable heads should be used and mop heads should be disposed of at the end of the episode of illness. No cleaning of soiled items should take place in food preparation areas (eg in sinks in domestic kitchens).

Education

Everyone should be instructed in personal hygiene and in the hygienic preparation and serving of food. This teaching should be reinforced in those suffering from, or who are contacts of sick people with, intestinal infections. As well as verbal instruction, written material should be available for professional carers (eg managers of nurseries, residential homes etc). Suitable written material should also be available for teachers, parents and carers in the home environment. The importance of thorough hand washing and thorough cleaning (and the limitations of disinfectants/sanitisers) should be stressed.

Exclusions from work, school and other institutional settings

The guidance given here is somewhat categorical although it is recognised that, in practice, this may require the exercise of discretion. The circumstances of each case, excreter, carrier, or contact should be considered individually and factors such as type of employment, provision of sanitation, facilities at work school or other institution, and standards of personal hygiene should be taken into account. In some situations it will be necessary to recommend temporary exclusion from work or school (see note under each disease) or transfer a worker temporarily to duties in which he/she does not pose a special risk, or to make special sanitary arrangements in schools and institutions to reduce the risk. Once an individual fulfils the criteria for clearance he/she should no longer be considered a risk and should be allowed to return to normal working. All such decisions need to be justified, however, and particularly if they differ from the advice here, should be made only after a careful assessment of the risk of further spread.

ALL cases of gastroenteritis should be regarded as potentially infectious and should normally be excluded, from work, school or other institutional settings, at least until 48 hours after the person is free from diarrhoea and/or vomiting.

Groups that pose an increased risk of spreading infection

It is particularly important to assess infected people who belong to one of the four groups for whom special action should be considered.

Group A: Any person of doubtful personal hygiene or with unsatisfactory toilet, hand-washing or hand drying facilities at home, work or school.

Group B: Children who attend pre-school groups or nursery.

Group C: People whose work involves preparing or serving unwrapped foods not subjected to further heating.

Group D: Clinical and social care staff who have direct contact with highly susceptible patients or persons in whom a gastrointestinal infection would have particularly serious consequences.

People who do NOT pose an increased risk

People not in the above risk groups present a minimal risk of spreading gastrointestinal illness and may return to any form of work from 48 hours after they have recovered clinically and their stools have returned to normal consistency.

With certain exceptions, detailed below, most notably infections with Vero cytotoxin-producing *Escherichia coli* and typhoid/paratyphoid, microbiological clearance is unnecessary.

Note on individual organisms and conditions

The following section provides guidance where a microbiological diagnosis has been established. It should be remembered, that particularly in sporadic cases and small clusters such a diagnosis may not be available, especially when investigation has been delayed. Where there are insanitary conditions it should also be considered whether mixed gastrointestinal infections have occurred.

Amoebic dysentery

Control of human source

Dysentery is statutorily notifiable.

Cases
Enteric precautions until treatment is complete.

Contacts
Screen household contacts. microbiologically to detect cyst excreters.

Exclusions
48 hours after first normal stool. C and D require microbiological clearance.

Microbiological clearance
Cases in risk groups C and D: One stool, obtained at least one week after the END of treatment, should be examined for *E. histolytica* cysts.

Careful assessment of excreters is needed to evaluate significance because pathogenic *E. histolytica* cysts are morphologically indistinguishable from those of the non-pathogenic *E. dispar*. Referral of specimens for cyst typing can be undertaken.

Cause
Entamoeba histolytica.

Reservoir
Human gastrointestinal tract.

Transmission
Waterborne or via contaminated raw or undercooked foods. Transmission is usually through faecal oral spread from a chronically ill or asymptomatic cyst shedder.

Other relevant features
Cysts resist standard chlorination but are destroyed by hyperchlorination or iodination.

Bacillus species food poisoning

Control of human source

Statutorily notifiable as food poisoning. Person-to-person spread does not occur.

Cases
Enteric precautions.

Contacts
No action necessary.

Exclusions
48 hours after first normal stool.

Microbiological clearance
None required.

Cause
1. *Bacillus cereus.*
2. *Bacillus subtilis* group, including *B. licheniformis*.

Reservoir
No human or animal sources.
Environment, soil, sediments, dust, vegetation. Food: cereal products herbs and spices, dried foods, milk and dairy products, meat and meat products.

Transmission
Contaminated cooked foods subjected to inadequate post-cooking temperature control during cooling and storage.

B. cereus: mainly rice dishes; occasionally pasta, meat or vegetable dishes, dairy products, soups, sauces, sweet pastries.

B. subtilis group: mainly meat or vegetable with pastry products, cooked meat or poultry products, occasionally bakery products, including bread, crumpets, sandwiches, and ethnic meat or seafood dishes.

Other relevant features
B. cereus causes two distinct clinical presentations – the emetic and diarrhoeal syndromes – which are associated with different toxins.

Campylobacter

Control of human source

Statutorily notifiable as food poisoning if thought to be foodborne or waterborne.

Cases
Enteric precautions.

Contacts
Clinical surveillance.

Exclusions
48 hours after first normal stool.

Microbiological clearance
None required.

Cause

Predominantly *Campylobacter jejuni*.
C. coli and other *Campylobacter* species (eg *C. lari* and *C. fetus*) are much less frequently implicated. *C. jejuni* predominantly causes enteric illness (acute gastroenteritis, colitis), while *C. fetus* is the major pathogen in extraintestinal illness (systemic illness with bacteraemia, meningitis, vascular infection, abscesses, occasionally gastroenteritis).

Reservoir

Campylobacter infection is a zoonosis. The reservoir for *C. jejuni* is very varied and includes the gastrointestinal tract of birds (particularly poultry) and mammales (ie cattle and domestic pets). *C. coli* is most commonly isolated from pigs, and *C. fetus* from cattle and sheep.

Transmission

Transmission is predominantly via contaminated food or water. Person-to-person transmission can occur if hygiene is poor and/or if the case is faecally incontinent.

Other relevant features

Not all *Campylobacter* infections result in illness. The infective dose is considered to be low. In one volunteer study illness followed the ingestion of as few as 500 organisms, although illness occurrence was infrequent with a dose of $<10^4$ organisms. Person-to-person transmission can occur and school age children can rarely transmit campylobacter infection. Occupational exposure has been implicated in some illness. *Campylobacter* is a fairly frequent cause of travellers' diarrhoea. *Campylobacter* does not multiply on food and foodborne disease outbreaks are rarely recognised. In a recent review of outbreaks the most frequently identified food handling fault was cross-contamination. Transmission from ill food handlers is extremely rare.

Cholera

Control of human source

Statutorily notifiable.

Cases
Enteric precautions. Cases should normally be admitted to an Infectious Diseases Unit.

Contacts
Clinical surveillance of people who shared food and drink with case for 5 days from shared exposure.

If secondary transmission is likely, chemoprophylaxis with tetracycline, doxycycline or erythromycin.

Exclusions
48 hours after first normal stool.

Microbiological clearance
Where indicated, two consecutive negative stools taken at intervals of at least 24 hours apart.

Cause

Vibrio cholerae O1 (biotypes classical and El Tor) and *V. cholerae* O139. Clinical disease is mediated by the production of an enterotoxin.

Reservoir

The natural reservoir is aquatic environments. *Vibrio cholerae* lives attached to a special sort of algae or to crustacean shells and zooplankton. In favourable environmental conditions *V. cholerae* survives for years in a free-living cycle without human intervention. When growth and survival conditions are sub-optimal, *V. cholerae* switches to a viable, non-culturable state. Although humans infected with *V. cholerae* may shed organisms for prolonged periods, their importance as a reservoir is trivial compared with the aquatic environment.

Transmission

Transmission is predominantly through consumption of polluted untreated water, contaminated shellfish and raw food or food washed in contaminated waters. *V. cholerae* has been shown to survive for up to 14 days in some foods, particularly when the food was contaminated post preparation. Symptomatic and asymptomatic food handlers have been implicated in foodborne outbreaks. Although there are reports of person-to-person transmission in the literature, it has been suggested that other potential risk factors might have been overlooked in disease transmission in some of these outbreaks. Hospital outbreaks have occurred following contamination of enteric foods.

Other relevant features

Cholera is rare in the United Kingdom (UK) and only occurs in imported cases. For person-to-person transmission to occur a large inoculum is required. Vaccination plays no part in the management of contacts or the control of outbreaks.

Clostridium botulinum – botulism

Cause
Clostridium botulinum neurotoxin.

Reservoir
Soil and aquatic sediments.

Transmission
Foodborne botulism in adults is generally caused by ingestion of food contaminated with toxin. Underprocessed non-acid foods or foods contaminated after canning or bottling (eg canned fish) may provide anaerobic conditions and suitable pH for the organism to multiply during prolonged storage at room temperature. Infant botulism is caused by ingestion of spores. Wound botulism can also occur when spores get into the body via a contaminated wound.

Other relevant features
Foodborne botulism is rare in the UK, but it is a severe disease with a high mortality rate. A single case, especially if caused by eating a commercially produced food, may signal a national emergency and prompt action is essential at any time of the day or night. The local microbiologist and CCDC/CPHM should be contacted as a matter of urgency, as should HPA Centre for Infections (telephone 020 8200 4400) or HPS (0141 300 1100). Suspect foods and clinical specimens (serum, vomit, faeces) (including from Scotland) should be sent immediately by courier to the HPA Centre for Infections, Food Safety Microbiology Laboratory, 61 Colindale Avenue, London NW9 5HT (telephone 020 8200 4400) for testing. Botulism is ultimately a clinical diagnosis which laboratory tests can confirm but not refute. Once a clinical diagnosis is made botulinum antitoxin must be given as soon as possible. Details of holding centres nationwide are available from the HPA duty doctor.
Enforcement officers should refer to the *Food Safety Act 1990 – Code of Practice No. 16: enforcement of the Food Safety Act 1990 in relation to the food hazard warning system.*

Control of human source

Statutorily notifiable as food poisoning. Person-to-person spread does not occur.

Cases
Hospital admission imperative. Immediate investigation with associated laboratory studies to identify the source. No other control measures are required for the case.

Others exposed to the same source
Immediate identification and treatment of others at risk is mandatory. Examination of faecal and serum specimens of people exposed may be indicated.

Contacts
Only important as potential cases if they have been exposed to the same risk of infection.

Exclusions
None.

Microbiological clearance
None required.

Clostridium difficile antibiotic-associated diarrhoea (AAD)

Cause
Clostridium difficile which produces toxins damaging to the colonic mucosa.

Reservoir
Human gastrointestinal tract. Spores survive in the environment around symptomatic cases.

Transmission
Person-to-person by the faecal-oral route and by environmental contamination. Antibiotic use (especially broad-spectrum agents) disrupts the normal bacterial flora and induces susceptibility to *C. difficile* colonisation and overgrowth.

Other relevant factors
AAD ranges in severity from mild diarrhoea to severe pseudomembranous colitis. Outbreaks occur in hospitals and nursing homes. The elderly are particularly susceptible. Young children (aged less than 2 years) can carry *C. difficile* as part of the normal bowel flora and asymptomatic carriage occurs in a small proportion of adults.

Control of human source

Cases
Enteric precautions. Stop predisposing antibiotic therapy. Initiate appropriate treatment.

Contacts
Monitor susceptible individuals (elderly, all those receiving antibiotics) for diarrhoeal illness.

Exclusions
48 hours after first normal stool.

Asymptomatic carriers should **not** be excluded from nursing homes/ hospitals.

Microbiological clearance.
None required.

Control of human source

Statutorily notifiable as food poisoning. Person-to-person spread does not occur.

Cases
Enteric precautions.

Contacts
No action necessary.

Exclusions
48 hours after first normal stool.

Microbiological clearance
none required.

Clostridium perfringens food poisoning

Cause
Clostridium perfringens enterotoxin.

Reservoir
Gastrointestinal tract of food animals, soil and dust.

Transmission
Contaminated cooked meat and poultry dishes subjected to inadequate temperature control after cooking or cooling, inadequate reheating before consumption.

Other relevant features
C. *perfringens* enterotoxin is produced in the intestine after ingestion of large numbers (usually $>10^5$) of organisms. The toxin is produced when the ingested organisms transform into spores in the intestine.

Control of human source

Statutorily notifiable as food poisoning if thought to be food or waterborne.

Cases
Enteric precautions.

Contacts
Clinical surveillance.

Exclusions
48 hours after first normal stool.
Cases should also avoid using swimming pools for two weeks after the first normal stool.

Microbiological clearance
None required.

Cryptosporidiosis

Cause
Cryptosporidium spp.

Reservoir
Gastrointestinal tracts of humans and animals.

Transmission
Direct or indirect contact with infected animals. Person-to-person spread, particularly in households, healthcare and nurseries. Water contaminated directly or indirectly with faeces. Outbreaks have been associated with public and private water supplies, swimming pools and, more rarely, contaminated food. Seasonal outbreaks are associated with farm visits to feed and handle lambs and calves.

Other relevant features
Oocysts resist standard chlorination.
Large numbers of organisms are excreted during acute infection. The infectious dose is low. Since oocysts can continue to be shed following cessation of diarrhoea, it is recommended that cases avoid using swimming pools for two weeks after the first normal stool.
Immunocompromised individuals are particularly susceptible and may be unable to clear the parasite. Anyone whose T cell function is compromised should be advised to boil and cool their drinking water, and water for making ice, from whatever source.

Control of human source

Statutorily notifiable as food poisoning. Direct person-to-person transmission is unlikely.

Cases
Enteric precautions.
Treatment with trimethoprim sulphamethoxazole is rapidly effective.

Contacts
No action necessary.

Exclusions
48 hours after first normal stool.

Microbiological clearance
None required.

Cyclosporiasis

Cause
Cyclospora cayetanensis.

Reservoir
Human gastrointestinal tract.

Transmission
Routes of transmission are poorly understood. Outbreaks have been associated with the consumption of soft fruit and vegetables (foods that are difficult to wash and are eaten raw) and drinking water.

Other relevant features
Direct person-to-person transmission is unlikely since oocysts require a maturation period after shedding and are only infectious once spores are produced. Food handlers could contaminate food for later consumption. Diarrhoea may follow a relapsing and remitting course.
Immunocompromised people may be infected for some months but treatment will clear the infection.

Control of human source

Some syndromes such as meningitis may be notifiable on clinical grounds.

Cases
Enteric precautions and prompt washing of articles soiled with nose and throat discharges.

Contacts
No action necessary.

Exclusions
None.

Microbiological clearance
None required.

Enteroviruses

Cause
Group of viruses including coxsackie A and B, echovirus and enteroviruses (more than 70 serotypes). This group includes poliovirus, now eradicated from the UK and not considered further.

Reservoir
Human gastrointestinal tract. Environmental and shellfish samples contain virus.

Transmission
Faecal-oral, close contact. Virus found in upper respiratory tract.

Other relevant features
Variable incubation, 2 to 30 days. Wide range of syndromes associated such as meningitis, hand foot and mouth disease, conjunctivitis and rarely cardiomyopathy. Diarrhoea and vomiting are **not** characteristically caused by these viruses.

Escherichia coli – Vero cytotoxin-producing (VTEC)

Cause
Vero cytotoxin-producing *Escherichia coli*. The commonest serotype in the United Kingdom is *E. coli* O157:H7.

Reservoir
The gastrointestinal tract of cattle, sheep, goats and other, particularly domesticated, animals. The disease is a zoonosis.

Transmission
Person-to-person spread can occur by direct contact (faecal-oral), particularly in households, nurseries and infant schools. (In confirmed cases of VTEC infection, younger primary school children, whose ability to practice personal hygiene may be limited, should be managed as risk group B). Evidence for spread from asymptomatic healthcare staff and foodhandlers remains elusive.

Primary infections are acquired by:
Contact with infected animals or their faeces, particularly on farms, including 'open' farms.
Contaminated foodstuffs – beef and other meat products (for example, undercooked beef burgers and contaminated cooked meats) and raw dairy products have been associated with cases or outbreaks. Extensive waterborne outbreaks have occurred.

Other relevant features
VTEC may give rise to a haemorrhagic colitis and about 5% of cases progress to the haemolytic uraemic syndrome, of which the case fatality rate is about 2%. Antibiotic treatment may be harmful.
Diagnosis may be made by a serum sample even after microbiological clearance and a salivary sample may be a possible alternative, particularly for younger children.

Control of human source

Statutorily notifiable if thought to be food poisoning. The informal reporting of haemolytic uraemic syndrome (HUS), particularly with a diarrhoeal prodrome, is to be encouraged.

Cases
Enteric precautions. Hospital admission if haemorrhagic complications occur. Isolation only during acute diarrhoeal phase.

Contacts
Contacts in risk groups A to D should be screened microbiologically, initially to identify excreters and subsequently for microbiological clearance (below). Authorities must satisfy themselves of the adequacy of hygiene and toilet facility arrangements. Hand washing by children must be supervised in nurseries and infant schools.

Exclusions
48 hours after the first normal stool for cases not in risk groups.
Cases and contacts in risk groups A to D until microbiological clearance is obtained.

Microbiological clearance
Risk groups A to D only – two negative faecal specimens taken at intervals of not less than 48 hours. The ease of spread means that it may be wise to ensure that all cases and contacts in high-risk groups in a given household or similar setting are no longer excreting before being allowed to return to work, school, etc. Such risks depend in part on the risk of transmission in the household and can ultimately only be assessed locally.

Escherichia coli other than VTEC

Control of human source

Cases
Enteric precautions for EPEC, EAggEC and ETEC. Cases of EPEC admitted to hospital should be isolated if possible.

Contacts
Clinical surveillance.

Exclusions
48 hours after first normal stool.

Microbiological clearance
None required.

Cause
Some classical enteropathogenic *E.coli* (EPEC) belonging to a small number of serotypes cause sporadic cases and outbreaks of diarrhoea in children, usually under the age of 2 years. A wider range of EPEC strains have caused sporadic cases and outbreaks affecting adults.
Enterotoxigenic *E..coli* (ETEC) are a major cause of travellers' diarrhoea.
Enteroaggregative *E..coli* (EAggEC) cause sporadic cases and outbreaks affecting all ages. Associated with travel abroad. Other types such as enteroinvasive *E..coli* (EIEC) rarely occur in the UK.

Reservoir
Human gastrointestinal tract, including 'classical' EPEC. Infection with some EPEC strains may be zoonotic.

Transmission
EPEC in day care units and nurseries transmitted from person-to-person by the faecal oral route.
Sporadic cases and outbreaks of non-classical EPEC infection may be caused by contaminated food.
ETEC in contaminated food and water. Person-to-person spread is unusual.
EAggEC in contaminated food.

Giardiasis

Control of human source

Statutorily notifiable as food poisoning when believed to be foodborne.

Antimicrobial treatment of individual cases forms the basis of control.

Cases
Enteric precautions.

Contacts
Screening household contacts may identify excreters who need treatment.

Exclusions
48 hours after first normal stool.

Microbiological clearance
None required.

Cause
Giardia duodenalis (syn. Giardia lamblia, syn. Giardia intestinalis).

Reservoir
Human gastrointestinal tracts. Animal hosts have been described but this is seldom the source of disease in humans.

Transmission
Person-to-person. Faecal-oral route is important in young children. Spread within families is common. Foodborne outbreaks have occurred, particularly linked to infected food handlers or contacts. Water contaminated with faeces. Outbreaks have been associated with drinking and recreational waters.

Other relevant features
Cysts resist the levels of chlorine normally used in drinking water treatment.

Control of human source

Statutorily notifiable as viral hepatitis.

Cases
Enteric precautions.

Contacts
Vaccination of household contacts should be considered if the index case was identified within one week of onset of illness (usually defined by jaundice) or if at continuing risk. Alternatively, passive immunisation with human normal immune globulin to family, sexual, household, and other close contacts should be considered. Hand washing by children must be supervised in nurseries and infant schools. Authorities must satisfy themselves that hygiene and toilet facilities are adequate. Consider active immunisation in selected outbreaks and seek advice.

Others exposed
People who have recently been exposed to food prepared by a case may benefit from active or passive immunisation.

Exclusions
All cases including those in risk groups A to D should be excluded for 7 days after onset of jaundice and/or other symptoms.

Microbiological clearance
None required.

Hepatitis A

Cause
Hepatitis A virus (HAV).

Reservoir
Human gastrointestinal tract.

Transmission
Person-to-person spread is common by faecal-oral route, including through sexual intercourse and probably through urine. Food contaminated by an infected person. Consumption of contaminated untreated water, contaminated shellfish, and foods eaten raw or washed in these waters. Other vehicles have been fresh picked fruits and products such as ice cream made from them.

Other relevant features
Young children are commonly asymptomatic. Older children and adults usually have symptoms. The period of infectivity starts 10 to 14 days after exposure and a similar interval before the onset of jaundice but is maximal just before jaundice develops. Specific HAV IgM is diagnostic but not detected until 5 days after onset of symptoms. Susceptibility may be determined by the examination of a blood or saliva specimen for anti-HAV IgG. Bloodborne transmission is described but rare, associated with injecting drug use or blood products.

Control of human source

Treatment of individual cases and removal of contaminated foods.

Statutorily notifiable as food poisoning. Person-to-person spread does not occur except during the neonatal period.

Cases
Admission to hospital and treatment with antimicrobial agents.

Contacts
Clinical surveillance only.

Exclusions
None required.

Microbiological clearance
None required.

Listeriosis

Cause
Listeria monocytogenes.

Reservoir
Environment: soil, water, drains, food production areas.
Consumption of heavily contaminated ready-to-eat food products, usually with a high degree of processing, of neutral pH, and with an extended refrigerated shelf life.
Gastrointestinal tract of animals and birds.

Transmission
Foods associated with transmission have involved dairy products, meat-based products, seafood and vegetable-based products.

Other relevant features
Most cases present as septicaemia and/or meningitis in the immunocompromised, or as an infection of pregnant women and fetus/neonate. Pregnant women present with a series of pyrexial influenza-like illnesses. Some strains of *L. monocytogenes* also cause a diarrhoeal illness plus fever.

Control of human source

Statutorily notifiable as food poisoning.

Person-to-person spread does not occur.

Cases
Enteric precautions only.

Contacts
Clinical surveillance only.

Exclusions
None required.

Microbiological clearance
None required.

Marine biotoxins – marine algal shellfish poisoning syndromes and ciguatera poisoning

Cause
Ingestion of toxic algae and retention of the toxins by filter-feeding bivalves and some fish. Concentration of toxins up the food chain by some carnivorous gastropods, crustacea, and fish.

Reservoir
Toxic seafood.

Transmission
Consumption of toxic seafood.

Other relevant features
The main syndromes are amnesic shellfish poisoning, diarrhetic shellfish poisoning, neurotoxic shellfish poisoning (NSP), paralytic shellfish poisoning (PSP) and ciguatera poisoning. A wide range of gastrointestinal and neurological symptoms is often manifest, for example, respiratory paralysis in PSP, a reversal of hot-cold temperature sensation in NSP and ciguatera poisoning. Symptoms are dose related and mild cases of all these syndromes may only suffer gastrointestinal effects. All the toxins are heat stable and not removed by cooking and processing. There are no known antidotes.

Control of human source

Statutorily notifiable as food poisoning.

Person-to-person spread does not occur.

Cases
None required.

Contacts
Clinical surveillance only.

Exclusions
None required.

Microbiological clearance
None required.

Marine biotoxins – scombrotoxic poisoning

Cause
Conversion of histidine to histamine by growth of some bacteria. Histidine is naturally present at high levels in the flesh of some fish such as tuna, mackerel and sardines.

Reservoir
Natural flora of fish and environmental contamination.

Transmission
Inadequate temperature control of fish at any stage after catching. Histamine is heat stable and not reduced by cooking or processing.

Other relevant features
The symptoms of some patients are sufficiently severe that they visit accident and emergency departments.

Control of human source

Statutorily notifiable as food poisoning.

Cases
None required.

Contacts
Clinical surveillance.

Exclusions
48 hours after first normal stool.

Microbiological clearance
None required.

Non-cholera vibrios

Cause
Halophilic vibrios (*Vibrio parahaemolyticus, V. vulnificus, V. fluvialis, V. hollisae*); non-halophilic vibrios (non-O1 and non-O139 *Vibrio cholerae*, *V. mimicus*). *V. vulnificus* is the most virulent of the non-cholera vibrios and is primarily associated with severe, soft tissue infections or septicaemia, or both, rather than diarrhoea.

Reservoir
These organisms are part of normal marine flora and proliferate during the summer months.

Transmission
Transmission of halophilic vibrios is foodborne via consumption of raw or undercooked contaminated shellfish Transmission of non-halophilic vibrios is via consumption of very large inocula from contaminated water and, occasionally, food. Person-to-person transmission has not been demonstrated. Secondary spread is rare, even where sanitation is sub-optimal, suggesting that the infective dose for normal, healthy individuals is relatively high.

Other relevant features
Non-cholera *Vibrio* infections in the UK tend to be imported in travellers returning from warmer climates. Non-O1 *V. cholerae* does not seem to cause sweeping epidemics, unlike *V.cholerae* O1 and *V. cholerae* O139, but explosive outbreaks have been caused by a few non-O1 strains. Genetic differences mediate these differences in epidemiological behaviour.

Control of human source

Statutorily notifiable if thought to be food poisoning.

Cases
Enteric precautions with particular attention to environmental contamination, relating to vomit, especially of toilets and wash handbasins, as well as soft furnishings. Cases occurring in institutions should be isolated where practicable.

Contacts
Clinical surveillance.
Do not transfer patients during incubation period.
Authorities must satisfy themselves of the adequacy of hygiene and toilet facilities and arrangements.

Exclusions
48 hours after first normal stool.

Microbiological clearance
None required.

Noroviruses (Norwalk-like viruses [NLV], small round structured viruses [SRSV])

Cause
Norovirus genogroup 1 or 2.

Reservoir
Human gastrointestinal tract.

Transmission
Person-to-person by the faecal-oral route; risk of infection from aerosols or environmental contamination due to projectile vomiting. Water and foods contaminated by a case/excreter. Particular problems arise with ready-to-eat foods which are extensively handled by a case or excreter during preparation (eg salads and sandwiches).

Other relevant features
Infectivity lasts for 48 hours after resolution of symptoms. Person-to-person spread is very common and may be difficult to contain.
Soft furnishings may need to be steam cleaned. Soiling with vomit should ideally be cleaned to a radius of two metres and people taken out of the area until it is done.

Rotavirus

Control of human source

Cases
Enteric precautions.

Contacts
Clinical surveillance only.
Authorities must satisfy themselves of the adequacy of hygiene and toilet facilities and arrangements.

Exclusions
48 hours after first normal stool.

Microbiological clearance
None required.

Cause
Rotavirus groups A, B, and C (mainly group A in the UK).

Reservoir
Human gastrointestinal tract.

Transmission
Person-to-person by faecal-oral route and by environmental contamination. Children and the elderly are at particular risk.

Other relevant features
Person-to-person spread is very common.

Salmonellosis (excluding typhoid and paratyphoid)

Control of human source

Statutorily notifiable as food poisoning if thought to be foodborne or waterborne.

Cases
Enteric precautions.

Contacts
Clinical surveillance.

Exclusions
48 hours after first normal stool.

Microbiological clearance
None required.

Cause
Salmonella spp. There are some 2,500 serotypes of *Salmonella,* of which the two most commonly identified in the UK, the rest of Europe and the United States are *Salmonella enterica* serovar Enteritidis and *S.* Typhimurium.

Reservoir
Salmonellosis is a zoonosis. *Salmonella* spp. are found in the gastrointestinal tract of a wide variety of wild and domestic animals, birds, reptiles and amphibians. In humans chronic carriage is rare, but organisms are excreted by convalescent carriers, mild and unrecognised cases. Children aged less than 5 years may shed organisms for up to a year (median 10 weeks). Over the age of 5 years the maximum duration of shedding appears to be up to 12 weeks (median 4 weeks).

Transmission
Transmission is predominantly via contaminated food, where very many food vehicles have been implicated, although waterborne outbreaks have been documented. Exotic salmonella infections are documented following exposure to exotic pets, especially reptiles (up to 90% of reptiles are *Salmonella* carriers). Person-to-person transmission is important, especially where cases have diarrhoea. Infants and faecally-incontinent adults pose a greater risk of transmission than do asymptomatic carriers. Hospital transmission from patients to staff has been associated with handling of soiled linen, failing to comply with barrier nursing and faecally incontinent patients. On the other hand hospital transmission from healthcare workers to patients appears to be low if infection control measures are strictly adhered to. The risk of transmission to neonates and infants from family members, who are chronic carriers or who have been recently infected, is high. Infected (but not necessarily symptomatic) food handlers have been implicated in outbreaks of salmonellosis.

Other relevant features
Although volunteer studies suggest that the infective dose may be fairly high, data from outbreaks suggest that low doses ($<10^3$) may produce illness and that the ingested dose is an important determinant of incubation period, symptoms, and disease severity.

Control of human source

Clinical dysentery is notifiable. Person-to-person spread is common.

Cases
Enteric precautions.

Contacts
Contacts in risk groups A to D of cases of *S. dysenteriae, S. flexneri, S. boydii* should be screened microbiologically. Otherwise clinical surveillance only.
Authorities must satisfy themselves of the adequacy of hygiene and toilet facility arrangements. Hand washing by children must be supervised in nurseries and infant schools.

Exclusions
S. sonnei: 48 hours after first normal stool. *S. dysenteriae*, *S. flexneri, S. boydii* (microbiological clearance).

Microbiological clearance
Cases and contacts of *S. dysenteriae, S. flexneri, S. boydii* in risk groups A to D – two negative faecal specimens taken at intervals of not less than 48 hours.

Shigellosis

Cause
Organisms of the genus *Shigella* which comprises four species: *S. sonnei, S. boydii, S. dysenteriae* and *S. flexneri*.

Reservoir
Human gastrointestinal tract.

Transmission
Faecal-oral from cases with diarrhoea, particularly in households, children's nurseries and infant schools. Occasionally spread by food and water, contaminated by cases.

Other relevant features
S. sonnei is endemic in the UK and usually only causes a mild illness. *S. boydii, S. dysenteriae* and most *S. flexneri* infections, originate outside the UK and frequently present clinically as dysentery (diarrhoea with blood, mucous and pus). *S. dysenteriae* 1 may be associated with serious disease including toxic megacolon and the haemolytic uraemic syndrome.

Control of human source

Statutorily notifiable as food poisoning. Person-to-person spread does not occur.

Cases
Enteric precautions.

Contacts
Clinical surveillance.

Exclusions
48 hours after first normal stool.

Risk group C – exclude food handlers with septic lesions on exposed skin from work until successfully treated.

Nasal carriers do not usually need to be excluded.

Microbiological clearance
None required after lesions are healed.

Staphylococcus aureus food poisoning

Cause:
Staphylococcus aureus enterotoxins.

Reservoir:
Infected exposed skin lesions, nostrils, or fingers of food handlers. Rarely, infected animals.

Transmission
From skin flora or infections in food handlers of cooked foods such as ham, meat, poultry, fish, prawns, and cream cakes which are then stored at room temperature for more than two hours and eaten cold. Some outbreaks are associated with canned foods contaminated after processing. Since the toxins are heat stable, outbreaks have been associated with heat treated or dried foods.

Other relevant factors
Some 25% people may carry *S. aureus* in their nose.

Typhoid and paratyphoid infections (enteric fever)

Cause
Salmonella Typhi, *S.* Paratyphi A, B and C.

Reservoir
Gastrointestinal tract of humans – cases and carriers. *S.* Paratyphi B infections have occasionally been associated with cattle. Ninety per cent of enteric fever cases are acquired abroad, mainly in Asia.

Transmission
Predominantly foodborne from the consumption of foods contaminated with faeces by a human case or occasionally by an asymptomatic carrier. Fruit and vegetables washed in water contaminated with sewage. Waterborne outbreaks recorded. Milkborne paratyphoid has occurred. Person-to-person spread is possible in poor hygiene conditions.

Other relevant factors
Incubation period may be up to one month. Enteric fever should be borne in mind when persons returning from an endemic or epidemic area develop a febrile illness.
Prolonged asymptomatic carriage with intermittent detection in stool specimens may occur.
Antibiotic therapy may suppress *Salmonella* below detection levels for several weeks after completion of a course of antibiotics.

Control of human source

Statutorily notifiable as 'Typhoid Fever', 'Paratyphoid Fever'.

Cases
Enteric precautions. Isolation in hospital is advisable. Follow-up examinations of faecal specimens is required to identify potential carriers.

Contacts
Faecal specimens should be obtained from all contacts and from any others, assessed to have had similar exposure to the case, in the month prior to the case's disease onset.

Excreters/Carriers
They should be advised on good personal hygiene.

It is recommended that stool samples be checked at monthly intervals. Chronic urinary typhoid carriage may occur but is rare. Antibiotic treatment for clearance of carriage should be undertaken under the guidance of an appropriate specialist.

Exclusions
Cases, excreters, carriers and contacts in risk groups A to D until microbiological clearance.

Microbiological clearance
Six (Group C) or three (Groups A, B & D) consecutive negative faecal specimens, each obtained 1 week apart, commencing 3 weeks after completion of treatment (***cases, excreters, carriers***). Two negative faecal specimens obtained 48 hours apart and after case has commenced treatment (***contacts***).

Control of human source

Cases
Enteric precautions.
Early treatment.

Threadworm: keep fingernails short and hands well washed. Regular change of underwear, nightclothes and bedclothes.

Contacts
Threadworm: Treat all household contacts – screening not necessary.

Strongyloides: Healthcare workers should take particular care with the stools, urine, and other body fluids of patients with hyperinfestation as larvae are infective via skin penetration.

Taenia solium: Screen serologically household contacts of pork tapeworm for evidence of cysticercosis.

Exclusions
Threadworm: exclude cases in risk groups A to D until treated.

Taenia solium: Exclude cases in risk groups A to D until two negative stools commencing 1 and 2 weeks post treatment.

Microbiological clearance
Taenia solium: two negative stools at 1 and 2 weeks post treatment for cases in groups A to D.

Worms (helminths)

Cause, Reservoir, Transmission

Worms are classified into three groups:
Nematodes (roundworms), cestodes (tapeworms), and trematodes (flukes).

1. Nematodes (roundworms)

i) **Threadworm *Enterobius vermicularis***
Eggs present in faeces and on perianal region.
Transmission – faecal-oral, on hands and under nails as a result of scratching the itchy perianal region. Clothing, particularly nightwear, and bedclothes may be contaminated.

ii) **Whipworm (*Trichuris trichiura)***
Heavy infection may present as a diarrhoeal illness. Eggs must mature for 3 to 5 weeks in soil outside the host before becoming infective.

iii) **Roundworm (*Ascaris lumbricoides*)**
Eggs must mature in the environment for 1 to 2 weeks before they become infective. They may remain alive outside the human host from months to years.

iv) **Hookworm (*Necator americanus, Ancylostoma duodenale*)**
Infection of humans is via skin penetration by larvae, as the eggs passed in faeces have to mature in soil for seven to eight days to form infective larvae.

v) Strongyloides stercoralis
Larvae passed in the stool are usually not infective until they mature. However, patients with severe immunodeficiency and the *Strongyloides* hyperinfestation syndrome pass infective larvae in stool and sometimes urine which are infective to humans by skin contact.

2. Cestodes (tapeworms)

i) Eggs of the **fish tapeworm *Diphyllobothrium latum*** and the **beef tapeworm *Taenia saginata*** are not infective to humans as the lifecycle involves an intermediate host.

ii) Eggs of ***Taenia solium*, the pork tapeworm** can produce cysticercosis in humans, *a potentially dangerous condition*. **NB** The eggs of ***Taenia solium*** and ***Taenia saginata*** are morphologically identical. Speciation can be made only by examining segments of the worm itself. ***Taenia saginata*** is seen much more commonly than ***Taenia solium*** in the UK.

iii) Eggs of the dwarf tapeworm ***Hymenolepis nana*** are infective to humans.

3. Trematodes (flukes)

i) Trematode eggs are not directly infective to humans as the lifecycle involves one or more intermediate hosts.

Other relevant features

Apart from the threadworm *Enterobius vermicularis*, intestinal helminth infections in the UK are usually seen as imported cases

Control of human source

Statutorily notifiable if thought to be the cause of food poisioning.

Cases
Enteric precautions.

Contacts
Clinical surveilliance.

Exclusion
48 hours after first normal stool.

Microbiological clearance
None required.

Yersiniosis

Cause
Yersinia enterocolitica; occasionally *Y. pseudotuberculosis.*

Reservoir
Gastrointestinal tract of many species of wild and domestic animals and birds, usually asymptomatic.

Transmission
Contaminated food and water (organisms can multiply in food at 4°C). Direct contact with infected animals. Person-to-person spread may occur. Particular association with raw pork and pork products.

Other relevant features
Many cases in children present as abdominal pain that mimics appendicitis.
Not all strains are pathogenic and *Y. enterocolitica* can be isolated from asymptomatic individuals.

Clinical features (including commonly observed incubation periods and routes of transmission)

Disease/Organism	Incubation period	Common clinical features	Usual modes of transmission
Amoebic dysentery	Usually 2 to 4 weeks	Bloody diarrhoea	Faecal oral spread
Bacillus spp	1 to 6 hours (emetic syndrome) 6 to 24 hours (diarrhoeal syndrome)	Nausea and vomiting Diarrhoea and abdominal pain	Ingestion of contaminated food
Campylobacter spp	1to10 days (usually 2 to 5 days)	Abdominal pain. Profuse diarrhoea (may be bloodstained). Vomiting is uncommon	Ingestion or handling of contaminated food or water
Cholera	few hours to 5 days (usually 2 to 3 days)	Profuse watery diarrhoea leading to rapid dehydration	Ingestion of contaminated food or water. Faecal oral spread
Clostridium botulinum	2 hours to 8 days (usually 12 to 36 hours)	Slurred speech, double vision, difficulty in swallowing. Ptosis. Respiratory paralysis	Ingestion of contaminated food
Clostridium difficile	Not relevant	Antibiotic associated diarrhoea.	Antibiotics alter gut flora leading to susceptibility to infection
Clostridium perfringens	4 to 24 hours (usually 8 to 12 hours)	Diarrhoea and abdominal pain.	Ingestion of contaminated food
Cryptosporidium spp	1 to 14 days (mean 7 days)	Watery or mucoid diarrhoea.	Ingestion of contaminated food or water. Faecal oral spread from cases and animals
Cyclosporiasis	7 to 11 days 1 week (median)	Watery or mucoid diarrhoea.	Ingestion of contaminated food or water, particularly soft fruits and leafy vegatables
Enteroviruses	12 hours to 10 days (commonly 3 to 5 days)	Wide range (see text). NOT diarrhoea and vomiting.	Direct contact with nose and throat droplets and faeces
Escherichia coli (VTEC)	1 to 8 days (usually 3 to 4 days)	Diarrhoea, abdominal pain and blood. Haemolytic uraemic syndrome (2 -7%)	Ingestion of contaminated food and water. Faecal oral spread
Escherichia coli (EAggEC) other than VTEC (EPEC) (ETEC)	20 to 48 hours 9 to 12 hours 10 to 72 hours	Diarrhoea, blood in stool Diarrhoea Diarrhoea	Ingestion of contaminated food Faecal oral spread (EPEC) Ingestion of contaminated food and water
Giardia duodenalis	3 to 25 days (median 7 to 10 days)	Diarrhoea and abdominal pain.	Faecal-oral spread. Ingestion of contaminated water
Hepatitis A	15 to 50 days	Malaise, fever followed by jaundice.	Ingestion of contaminated food or water Faecal oral spread.

Clinical features (continued)

Disease/Organism	Incubation period	Common clinical features	Usual modes of transmission
Listeriosis	1 day to >3 months	Septicaemia, meningitis, influenza-like illness	Contaminated food
Marine Biotoxins			
Ciguatera poisoning (Ciguatera toxins)	Few minutes to 6 hours	Numbness, muscular pain, blurred vision, paralysis	Ingestion of contaminated food
Scombrotoxic poisoning	<10 minutes to 2 hours	Rash, flushing, diarrhoea, dizziness, swelling in mouth, palpitations	Ingestion of histamine contaminated food
Marine algal fish and shellfish poisoning (exact symptoms depend on toxin ingested)	15 minutes to 48 hours	Nausea, vomiting, diarrhoea, chills loss of short term memory, paraesthesia, ataxia, paralysis	Ingestion of contaminated seafood
Non-cholera vibrios	4 to 30 hours	Diarrhoea, abdominal pain	Ingestion of contaminated food particularly shellfish
Noroviruses	10 to 50 hours (usually 24 to 48 hours)	Vomiting predominates, diarrhoea	From cases (including first 48 hours post recovery). Faecally-orally, by ingestion Inhalation of vomit and fomites (particularly toilets and wash hand basins).
Rotavirus	24 to 72 hours	Diarrhoea, vomiting	Faecal-oral spread
Salmonellosis	6 to 72 hours (usually 12 to 36 hours)	Diarrhoea, vomiting and fever	Ingestion of food contaminated from its animal source
Shigellosis	12 hours to 7 days (usually 1 to 3 days)	Diarrhoea (usually mild) *S. sonnei*, others`more severe, including dysentery	Faecal-oral
Staphylococcus aureus	Usually 2 to 4 hours	Vomiting, abdominal pain	Ingestion of food contaminated from skin sepsis or skin/nasal flora in handler
Typhoid/Paratyphoid	3 days to 1month (usually 8 to14 days)	Enteric fever	Ingestion of food contaminated by excreter/carrier
Worms	Life-cycle dependent (measured in weeks-months)	Wide range (see text)	Usually ingestion except hookworms and *Strongyloides* (skin penetration)
Yersinia spp	3 to 7 days	Diarrhoea, abdominal pain and fever	Ingestion of contaminated food

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Further Reading

This document represents a consensus of informed opinion rather than a systematic review. Other sources of information, in some of which the evidence base is laid out, are listed here.

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