

# Infectious diarrhoea

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## Abstract

Infectious diarrhoea remains a major cause of morbidity and mortality world wide. Viruses, bacteria and protozoa are responsible for the majority of infections, which are transmitted most commonly by the faecal–oral route through water, food and person-to-person transmission. Clinical presentation of infectious diarrhoea conforms to three patterns: acute watery diarrhoea; dysentery; and persistent diarrhoea, which can include steatorrhoea. Diagnosis still rests heavily on stool microscopy and culture, although faecal antigen tests and molecular assays are increasingly used. Oral rehydration therapy continues to be the most important supportive intervention, particularly in acute watery diarrhoea, when death from dehydration and acidosis can be prevented in the vast majority of sufferers. There have been some important advances in the development of new approaches to antibiotic therapy. The non-absorbable antibiotic, rifaximin, is highly effective in the treatment of traveller's diarrhoea and is free from the majority of adverse effects associated with systemically absorbed antibiotics. The broad-spectrum antimicrobial, nitazoxanide, is often effective in the treatment of cryptosporidiosis but is also effective in giardiasis, amoebiasis and *Clostridium difficile* infection. Recent meta-analyses suggest that probiotics are probably not effective in the prevention or treatment of antibiotic-associated diarrhoea but they do shorten attacks of acute diarrhoea in children.

**Keywords** antibiotics; antidiarrhoeal agents; bacteria; diarrhoea; enteropathogens; probiotics; protozoa; viruses

## Introduction

Infections of the gastrointestinal tract are the most common intestinal disorders. They have their major impact in the developing world and are still responsible for the deaths of up to 2–3 million pre-school children each year.<sup>1</sup> Despite industrialization, wealth and public health interventions to ensure water quality and sewage disposal, intestinal infections have a major impact in the Western world, including both food-borne (*Salmonella* sp. and *Campylobacter* sp.) and water-borne (*Cryptosporidium parvum* and *Giardia intestinalis*) infections.<sup>2</sup> Infectious colitis is an increasingly important condition resulting from *Salmonella* sp., *Campylobacter jejuni* or enterohaemorrhagic *Escherichia coli* (EHEC) infection, which has a mortality of 1–2% and a relatively high incidence of serious complications, such as the haemolytic–uraemic syndrome.<sup>3</sup> The increase in foreign travel has further contributed to the importance of infectious diarrhoea in the industrialized world, as has the increasing use of broad-

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## What's new?

- Our understanding of pathogens and their effects is evolving rapidly
- While the principles of treatment remain unchanged, refinements in antimicrobial therapy and in formulations of oral rehydration solution represent important advances
- Appreciation of the deleterious impact of subclinical infections is beginning to emerge

spectrum antibiotics and associated antibiotic-related diarrhoea caused by *Clostridium difficile*. Opportunistic infections are increasingly recognized in various immunodeficiency states (such as AIDS, transplants, ulcerative colitis).

## Epidemiology

The key reservoirs of human enteropathogens are food, water and other humans. Certain human infective agents are carried by animals, giving rise to conditions known as zoonoses (such as salmonellosis, campylobacteriosis, giardiasis and cryptosporidiosis). Domestic water supplies, swimming pools, sea water and inland freshwater lakes and rivers also harbour enteropathogens.

Faecal–oral transmission, the main route by which these infections are spread, may occur either through ingestion of contaminated food or fluids or by direct person-to-person contact. The latter is particularly important when only small infective doses are required to initiate infection, as in shigellosis. *Vibrio cholerae* and non-cholera vibrios are transmitted by contaminated water, shellfish and other seafood and by person-to-person contact. Food-borne infection – so-called ‘food poisoning’ – may be caused by true infection of the intestine or related to the ingestion of a pre-formed toxin (Table 1).

Intimate sexual contact, notably oro–anal sex, is commonly associated with transmission of enteropathogens. Viruses, such as the norovirus (previously known as small, round, structured viruses (SRSVs) of the Norwalk family), can be spread by aerosol, especially as vomiting is an important early symptom of the illness. This probably explains why this infection spreads so rapidly through cruise ships, hotels and hospital wards. Immunodeficiency and reduced gastric acid secretion are well-recognized risk factors for intestinal infections.

## Causes

Infective diarrhoea presents in a variety of ways, the recognition of which may assist clinical diagnosis and early management. The three major patterns are: (i) acute watery diarrhoea; (ii) bloody diarrhoea (dysentery), usually due to an infective enterocolitis; and (iii) persistent diarrhoea, sometimes with steatorrhoea and evidence of an enteropathy. The major organisms responsible for these clinical syndromes are summarized in Table 2. However, there is considerable overlap between these clinical patterns; infection with some organisms, such as *Shigella* sp. and *C. jejuni*, presents initially as acute watery diarrhoea but then progresses to a dysenteric illness with fever and bloody diarrhoea. Similarly, giardiasis may start as acute watery diarrhoea but eventually become persistent with features of malabsorption.

### Microbial pathogens responsible for food-borne diarrhoeal disease

Organism	Incubation period (h)	Recovery
<b>Gut colonization</b>		
<i>Salmonella</i> spp.	12–48	2–14 days
<i>Campylobacter jejuni</i>	48–168	7–21 days
EHEC	24–168	7–21 days
<i>V. parahaemolyticus</i>	2–48	2–30 days
<i>Y. enterocolitica</i>	2–144	1–3 days
<i>Clostridium perfringens</i>	8–22	1–3 days
<b>Pre-formed toxins</b>		
<i>Staphylococcus aureus</i>	2–6	Few hours
<i>Bacillus cereus</i>	1–2	Few hours
<i>Clostridium botulinum</i>	18–36	10–14 days

EHEC, enterohaemorrhagic *E. coli*.

Table 1

### Clinical presentation

#### Acute watery diarrhoea

Rotavirus infection, the most common cause of acute diarrhoea in infants and young children, often takes the form of a brief prodromal illness with fever and mild respiratory symptoms that is followed by vomiting and diarrhoea. If fluid and electrolyte losses are not replaced promptly, dehydration and metabolic acidosis soon follow. The degree of dehydration can be assessed clinically by noting skin tone and tissue turgor, dryness of mucous membranes, intra-ocular tension and, in young infants, depression of the anterior fontanelle. As the degree of dehydration increases, there is impairment of consciousness, ultimately leading to stupor and coma. Typically, the illness lasts about 7 days. Adenovirus infection is a more prolonged illness with pronounced respiratory symptoms.

Acute watery diarrhoea in adults is usually caused by bacteria, most commonly enterotoxigenic *E. coli* (ETEC) in travellers or one of the food-borne pathogens in the indigenous population of industrialized countries. ETEC usually begins after a short incubation period and lasts 3–5 days on average. Watery

### Causes of infectious diarrhoea by clinical pattern

Enteropathogen	Acute watery diarrhoea	Dysentery	Persistent diarrhoea
<b>Viruses</b>			
Rotavirus	+	–	–
Enteric adenovirus (types 40, 41)	+	–	–
Norovirus and other SRSVs	+	–	–
Calicivirus	+	–	–
Astrovirus	+	–	–
<b>Cytomegalovirus</b>			
	+	+	+
<b>Bacteria</b>			
<i>Vibrio cholerae</i> and other vibrios	+	–	–
Enterotoxigenic <i>E. coli</i> (ETEC)	+	–	–
Enteropathogenic <i>E. coli</i> (EPEC)	+	–	+
Enteraggregative <i>E. coli</i> (EAEC)	+	–	+
Enteroinvasive <i>E. coli</i> (EIEC)	+	+	–
Enterohaemorrhagic <i>E. coli</i> (EHEC)	+	+	–
<i>Shigella</i> spp.	+	+	+
<i>Salmonella</i> spp.	+	+	+
<i>Campylobacter</i> spp.	+	+	+
<i>Yersinia</i> spp.	+	+	+
<i>Clostridium difficile</i>	+	+	+
<b>Mycobacterium tuberculosis</b>			
	–	+	+
<b>Protozoa</b>			
<i>Giardia intestinalis</i>	+	–	+
<i>Cryptosporidium parvum</i>	+	–	+
Microsporidia	+	–	+
<i>Isospora belli</i>	+	–	+
<i>Cyclospora cayetanensis</i>	+	–	+
<i>Entamoeba histolytica</i>	+	+	+
<b>Balantidium coli</b>			
	+	+	+
<b>Helminths</b>			
<i>Strongyloides stercoralis</i>	–	–	+
<i>Schistosoma</i> spp.	–	+	+

Table 2

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