

## GIT infections

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Ingestion of pathogens can cause many different infections. These may be confined to the gastrointestinal tract or initiated in the gut before spreading to other parts of the body.

Most infections of the GIT are acquired through contaminated food – food poisoning

- Food infection –
  - Bacteria like - *Cholera*, *E. coli*, *Salmonella*, *shigella*,
  - viruses like enterovirus, rotavirus, hepatitis A and E
  - Parasites like *G. lamblia*
- Food intoxication – *S. aureus*, *B. cereus*, *Cl. Perfringens*, *Cl. Botulinum*

The clinical manifestation of infections affecting the gastrointestinal tract are Abdominal pain, Diarrhoea , Vomitting, Fever

The occurrence of diarrhea is a central feature, and its presence and nature form the basis for classification of gastrointestinal infections into three major syndromes:

watery diarrhea, dysentery, and enteric fever.

**Diarrheal pathogens have two basic mechanisms** by which they produce diarrhea. One is by the production of toxins called **enterotoxins**. Enterotoxins cause physiologic changes in the intestinal epithelium resulting in fluid and electrolyte secretion. *Vibrio cholerae*, and ETEC which cause fluid loss without cellular injury. Most cases of watery diarrhea run an acute but brief (1 to 3 days) self-limiting course. Exceptions are those caused by *V. cholerae*, which usually produces a more severe illness. Microscopically, the intestinal epithelium appears normal in patients with enterotoxin induced diarrhea.

The other major mechanism of diarrheal disease is by **damage to the intestinal epithelium**. Organisms may also produce toxins that directly damage the intestinal epithelium (cytotoxin).

Damage to intestinal epithelium can also occur as a result of direct invasion of the intestinal epithelium. A number of gastrointestinal pathogens,

including *Salmonella* spp., *Shigella* spp., *Campylobacter* spp., and *Yersinia enterocolitica*, are capable of invading the intestinal epithelium. Inflammation frequently occurs in response to these pathogens. Patients with diarrhea due to organisms that damage the epithelium frequently will have white blood cells visible in their feces. However, these cells may also be present in feces of patients with noninfectious inflammatory bowel disease, so results of examination of feces for white blood cells should be interpreted cautiously.

Dysenteric infections generally last longer than the common watery diarrheas, but most cases still resolve spontaneously in 2 to 7 days.

### **Enteric Fever**

Enteric fever is a systemic infection, the origin and focus of which are the gastrointestinal tract. The most prominent features are fever and abdominal pain, which develop gradually over a few days in contrast to the abrupt onset of the other syndromes. Diarrhea is usually present but may be mild and not appear until later in the course of the illness. The pathogenesis of enteric fever is more complex than that of watery diarrhea or dysentery. It generally involves penetration by the organism of the cells of the distal small bowel with subsequent spread outside the bowel to the biliary tract, liver, mesentery, or reticuloendothelial organs. Bacteremia is common, occasionally causing metastatic infection in other organs. Typhoid fever caused by *Salmonella enterica* serotype Typhi is the only infection for which these events have been well studied. Although it is usually self-limiting, enteric fever carries a significant risk of serious disease and significant mortality.

Bacterial Etiology:

Features of Infectious Gastrointestinal Syndromes				LABORATORY DIAGNOSIS <sup>b</sup>					
ORGANISM	COMMON DISTRIBUTION	CLINICAL SYNDROME	PATHOGENIC MECHANISM	STOOL MICROSCOPY	CULTURE			SEROLOGY	
					STOOL <sup>a</sup>	BLOOD	TOXIN IN STOOLS	ANTIBODY DETECTION	ANTIGEN DETECTION
<i>Salmonella</i> serotypes	Worldwide	Dysentery	Mucosal invasion	PMNs	+	-	-	-	-
<i>Salmonella</i> serotype typhi	Tropical, developing countries	Enteric fever	Penetration, spread	Monocytes	+	+	-	+	-
<i>Shigella</i> spp.	Worldwide	Dysentery	Mucosal invasion, cytotoxin	PMNs, RBCs	+	-	-	-	-
<i>Shigella dysenteriae</i> (Shiga)	Tropical, developing countries	Dysentery	Mucosal invasion, cytotoxin	PMNs, RBCs	+	+	-	-	-
<i>Campylobacter jejuni</i>	Worldwide	Dysentery	Unknown	PMNs, RBCs	+	-	-	-	-
<i>Escherichia coli</i> (EIEC)	Worldwide	Dysentery	Mucosal invasion	PMNs, RBCs	+ <sup>e</sup>	-	-	-	-
<i>E. coli</i> (ETEC)	Worldwide <sup>d</sup>	Watery diarrhea	Enterotoxin(s)	-	+ <sup>e</sup>	-	-	-	-
<i>E. coli</i> (EHEC)	Worldwide	Dysentery	Cytotoxin	RBCs	+ <sup>e</sup>	-	-	-	-
<i>E. coli</i> (EPEC)	Worldwide <sup>d</sup>	Watery diarrhea	Adherence	-	+ <sup>e</sup>	-	-	-	-
<i>Vibrio cholerae</i>	Asia, Africa, Middle East, Central and South America, Louisiana, Texas	Watery diarrhea	Enterotoxin	-	+	-	-	-	-
<i>Vibrio parahaemolyticus</i>	Seacoast	Watery diarrhea	Unknown	-	+	-	-	-	-
<i>Yersinia enterocolitica</i>	Worldwide	Enteric fever <sup>f</sup>	Penetration, spread	-	+	+	-	-	-
<i>Clostridium difficile</i>	Worldwide	Dysentery	Cytotoxin, enterotoxin	-	+	-	+	-	-
<i>Clostridium perfringens</i>	Worldwide	Watery diarrhea	Enterotoxin	-	+	-	-	-	-
<i>Bacillus cereus</i>	Worldwide	Watery diarrhea	Enterotoxin	-	+	-	-	-	-

### Abbreviations:

a Positive sign indicates procedure is useful and usually available in clinical laboratories.

b Which cultures are done routinely depends on the laboratory and/or physician's request.

c Organism may be isolated in culture, but demonstration of pathogenic potential (toxin production, etc.) is limited to specialized laboratories.

d Organism is more common in developing countries.

e Infection may also manifest watery diarrhea or dysentery.

f Appropriate methods may be available in only a limited number of laboratories.

## EPIDEMIOLOGIC SETTING

The epidemiologic setting of the infection is of great importance in assessing the relative probability of the infectious agents. When combined with clinical findings, the differential diagnosis can often be limited to two or three organisms. The major epidemiologic settings are (1) endemic infection, (2) epidemic infection, (3) traveler's diarrhea, (4) food poisoning, and (5) hospital-associated diarrhea.

### Endemic Infections

Are those that occur sporadically in the usual living circumstances of the patient. Some organisms are endemic worldwide, whereas others are geographically limited. In developed countries the most common bacterial causes of endemic gastrointestinal infections are *Campylobacter*,

Salmonella, and Shigella. All are more common in infants and children because they are more prone to fecal–oral spread and because development of immunity is related to age.

### Epidemic Infections

Under certain epidemiologic conditions some of the organisms responsible for endemic infections can spread beyond the family unit to cause epidemics involving regional, national, and even international populations. The diarrheal diseases most frequently associated with epidemics are typhoid fever, cholera, and shigellosis.

### Travelers diarrhea

From 20% to 50% of travelers from developed countries who go to less developed countries experience a diarrheal illness in the first week that is usually brief but can be serious. In nearly 50% of these cases, the diarrhea is caused by enterotoxigenic strains of *E. coli* acquired during travel. *Shigella* infections account for another 10 to 20%, and the remaining cases are attributable to various pathogens or unknown causes.

### Food Poisoning

caused by ingestion of a toxin produced by bacteria in the food before it was eaten. Intoxications have shorter incubation periods than infections and may involve extraintestinal symptoms (eg, the neurologic damage in botulism).

ETIOLOGY	PERCENTAGE OF CASES <sup>d</sup>	TYPICAL INCUBATION PERIOD	PRIMARY CLINICAL FINDINGS	CHARACTERISTIC FOODS
<b>INTOXICATION<sup>b</sup></b>				
<i>Bacillus cereus</i> (vomiting toxin)	1–2	1–6 h	Vomiting, diarrhea	Rice, meat, vegetables
<i>Clostridium botulinum</i>	5–15	12–72 h	Neuromuscular paralysis	Improperly preserved vegetables, meat, fish
<i>Staphylococcus aureus</i>	5–25	2–4 h	Vomiting	Meats, custards, salads
Chemical <sup>c</sup>	20–25	0.1–48 h	Variable	Variable
<b>INFECTIONS<sup>d</sup></b>				
<i>Clostridium perfringens</i>	5–15	9–15 h	Watery diarrhea	Meat, poultry
<i>Salmonella</i>	10–30	6–48 h	Dysentery	Poultry, eggs, meat
<i>Shigella</i>	2–5	12–48 h	Dysentery	Variable
<i>Vibrio parahaemolyticus</i>	1–2	10–24 h	Watery diarrhea	Shellfish
<i>Trichinella spiralis</i>	5–10	3–30 days	Fever, myalgia	Meat, especially pork
Hepatitis A	1–3	10–45 days	Hepatitis	Shellfish

### **Hospital-associated Diarrhea**

The hospital environment should not allow spread of the usual causes of endemic intestinal infection. When such infection occurs, it can usually be traced to an employee who continues working while ill or to contaminate food prepared outside the hospital that is “smuggled” in by the patient’s friends. Two special causes of hospital-associated diarrhea are caused by *E. coli* in infants and *Clostridium difficile* in patients treated with antimicrobial agents. Fortunately, *E. coli* outbreaks have become rare. *C. difficile* accounts for more than 90% of cases of a syndrome that ranges from mild diarrhea to fulminant pseudomembranous colitis during or after treatment with antibiotics.

### **GENERAL DIAGNOSTIC APPROACHES**

Laboratory diagnostic procedures include microscopic examination, culture, toxin detection, and serologic procedures.