

## ***E. coli* and *Enterococcus spp.* as related to Sewage Contamination**

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Contamination with sewage or wastewater can originate from a variety of sources, including leaking and overflowing sanitary sewer systems, wastewater treatment facilities, leakage from septic tanks, and fecal matter associated with storm runoff from areas with high densities of wildlife, pets, or livestock. Exposure to this contamination elevates the risk of contracting gastrointestinal and other related diseases, which makes the need of testing for indications of sewage contamination very important.

The USEPA has published the following list of common pathogens that might be spread by sewage contamination. Some of these conditions are rare in the USA, but common in other countries.

### **Bacteria**

Vibrio cholera  
Salmonella typhi  
Salmonella other species  
Shigella species  
Campylobacter  
Proteus species  
Coliform species  
E. coli 0157  
Clostridium species  
Pseudomonas species  
Tuberclebacilli  
Leptospira  
Yersinia enterocolitica

### **Diseases**

Cholera (not applicable in the UK)  
Typhoid and other enteric fevers  
Food poisoning  
Bacterial dysentery  
Gastro-enteritis  
Diarrhea  
Diarrhea  
Gastro-enteritis, renal failure  
Botulism  
Local infection  
Tuberculosis  
Leptospirosis (Weil's disease)  
Gastro-enteritis

### **Viruses**

Infectious Hepatitis  
ECHO viruses  
Coxsackie virus  
Polio virus  
Epidemic gastroenteritis virus  
Small round viruses(SRV's)

### **Diseases**

Inflammation of the liver  
Enteric diseases and the causative  
Agents of aseptic Meningitis  
Poliomyelitis  
Gastro-enteritis  
Gastro-enteritis

### **Parasites**

Entamoeba histolytica  
Balantidium coli  
Isospora hominis & others  
Giardia lamblia  
Cryptosporidium  
Pinworms (eggs)  
Tapeworms  
Liver & intestinal flukes

### **Diseases**

Amoebic dysentery  
Balantidial dysentery  
Coccidiosis  
Diarrhea  
Epidemic diarrhea  
Ascariasis  
Tapeworm infestation  
Liver & intestinal infection

Historically, a variety of organisms have been used as indicators of fecal contamination but many of them have been questionable because they can be found naturally in environmental samples, even in the absence of fecal contamination. Example of this is the bacteria included in categories such as fecal Streptococci, total coliforms, and fecal coliforms. *Escherichia coli* and *Enterococcus spp.* are bacteria that occupy the gut of warm blooded animals, including humans, thus their presence can be considered an indication of some kind of fecal contamination.

*E. coli* is a member of the family *Enterobacteriaceae*, which includes many genera, including known pathogens such as *Salmonella*, *Shigella*, and *Yersinia*. Microscopically the cells of these organisms generally appear as Gram-negative coccobacilli; or straight rods with rounded ends. *Enterobacteriaceae* ferment glucose, grows on MacConkey agar, is oxidase-negative, and, with rare exceptions, reduces nitrates. Although most strains of *E. coli* are not regarded as pathogens, they can be opportunistic pathogens that cause infection in immunocompromised hosts. There are also pathogenic strains that when ingested, can cause gastrointestinal illness in healthy humans.

The *Enterococci* are catalase-negative Gram-positive cocci that occur singly, in pairs, or in short chains. They are normal residents of the gastrointestinal and biliary tract and, in lower numbers, of the vagina and male urethra. They can be found in soil, vegetation, and surface water, probably due to contamination by animal excrement. *Enterococci* are capable of growing at a range of temperatures from 10°C to 45°C, and can live in a variety of environments that would be adverse to other bacteria. A wide variety of enterococcal species have been isolated from human infection, but *E. faecalis* and *E. faecium* predominate as the two species that are most commonly encountered.