Bacterial Infections

The most important bacterial infections that gain entry through the gastro-intestinal tract are:

- the enteric fevers;
- the bacillary dysenteries;
- cholera;
- brucellosis;
- food-poisoning bacteria

Typhoid fever

S. *typhi* is a Gram-negative, aerobic, non-sporing, rod-like organism. It can survive in water for 7 days, in sewage for 14 days and in ice-cream for 1 month. In warm dry conditions most of the bacilli die in a few days. Boiling of water or milk destroys the organism.

There are many phage types of S. *typhi* and these have proved of great value in tracing the source of an epidemic. Outbreaks of chloramphenicol resistant S. *typhi* Vi-Phage Type E1 have occurred in Mexico, South East Asia, Pakistan and India. Molecular methods may be used to supplement phage typing. Multidrug resistance is causing increasing.

Transmission

Food handlers, especially if they are intermittent carriers, are particularly dangerous and have been responsible for many outbreaks of the disease. Close contact with a patient whether family or otherwise (e.g. nurse) may result in infection being transmitted by soiled hands or through fomites such as towels.

Contamination of water - the cause of major outbreaks - can occur through cross-connection of a main with a polluted water supply, faecal spread, by shellfish, particularly oysters which mature in tidal estuaries and are thus exposed to contaminated waters. Milk-borne outbreaks occur either by direct contamination from a carrier or indirectly from utensils. Ice-cream, other milk

products, ice, fruit, vegetables and salads may be infected directly from a carrier or indirectly. Flies or infected dust may be sources of infection. Food (e.g. tinned meat, vegetables infected from human faeces used as manure) can also cause epidemics.

LABORATORY DIAGNOSIS

A leucopenia with a relative lymphocytosis is often seen. S. *typhi* is isolated from blood or 'clot' culture in the first week of disease, from faeces in the second and following weeks and from urine in the 3rd and 4th weeks. It can also be found in bile by duodenal aspirate culture and marrow cultures. A probe technique as well as the polymerase chain reaction (PCR) has been used. After about the 10th day the Widal test (0 and H agglutinations) becomes positive and rises progressively, a rising titre rather than absolute values is necessary for diagnosis. The diazo test is a red coloration given by the froth of the urine of typhoid patients when mixed with the diazo reagents. Despite its definite limitations it is a simple and useful diagnostic test in areas where laboratory facilities are minimal. It becomes positive during the 2nd and 3rd weeks.

Reservoir

Humans are the only reservoir of infection. This may be an overt case of the disease, an ambulatory 'missed' case or a symptomless carrier. About 2--4% of typhoid patients become chronic carriers of the infection. The majority are faecal carriers. Urinary carriers also occur and seem more common in association with some abnormality of the urinary tract and in patients with *Schistosoma haematobium* infection. Although in most patients

TREATMENT

All typhoid patients should be barrier nursed in a general hospital or removed to an infectious diseases hospital. Cases should be immediately notified and, if possible, the room from where they came should be cleansed and disinfected. All fomites should be likewise disinfected. The treatment of choice is still chloramphenicol 2 g daily for 14 days, while trimethoprim-

sulphamethoxazole is a valuable substitute. Other effective drugs are amoxycillin, the cephilasporisis and the fluoroquinolones. The patient should remain in hospital until, following treatment; stools and urine are bacteriologically negative on three occasions at intervals of not less than 48 hours.

Campylobacter

Two species of campylobacter, C. *jejani* and *C.coli, are* the causative agent of Compylobacter enteritis. The average incubation period is 3 days. Abdominal pain and diarrhoea are the common presenting symptoms.

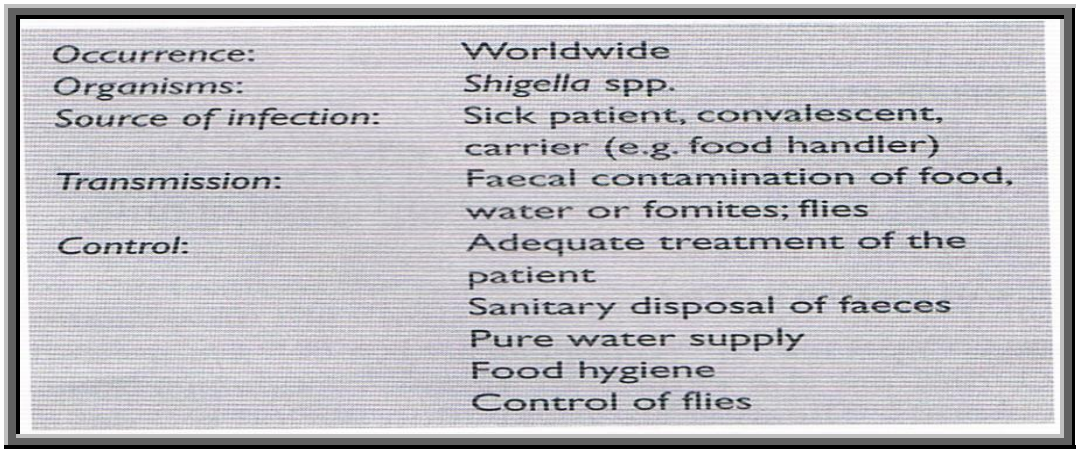
Poor-quality drinking water, poor sanitation and intimate contact with animals are responsible for the hyperendemicity of this infection in developing countries. Several episodes of diarrhoea occur in the first 3 years of life. C. jejani and C. coli are widely distributed in the intestines of a wide variety of birds and animals it is a zoonotic infection.

Indirect transmission occurs through raw milk, raw meats (especially poultry) and contaminated water, direct transmission occurs among occupational groups such as farmers, veterinarians and butchers, and in the home through contact with infected pets. Person to person infection is common.

DIAGNOSIS

Direct microscopy shows the characteristic rapid jerking movements in wet preparations or spiral morphology in stained smears. Culture, membrane filtration methods and serology can also be used.

BACILLARY DYSENTERY (SHIGELLOSIS)



Occurrence:	Worldwide
Organisms:	*Shigella* spp.
Source of infection:	Sick patient, convalescent, carrier (e.g. food handler)
Transmission:	Faecal contamination of food, water or fomites; flies
Control:	Adequate treatment of the patient Sanitary disposal of faeces Pure water supply Food hygiene Control of flies

Bacillary dysentery is characterized by diarrhoea (containing blood, mucus and pus), fever and a sudden onset of abdominal pain. The incubation period is 1-7 days. Shigellosis is a notifiable disease in some countries. Species and varieties of the genus Shigella (nonmotile, Gram-negative bacilli) are numerous and they can be conveniently classified into four main subgroups:

• Sh. dysenteriae (10 serotypes);

• Sh. flexneri (8 serotypes);

• Sh. boydii (15 serotypes);

• Sh. sonnei (15 colicen types).

Multiresistance (i.e. sulphonamides, tetracycline, ampicillin and chloramphenicol) is prevalent in many developing countries.

SOURCE OF INFECTION

Infection is derived from cases of the disease, from healthy convalescents (who can excrete organisms for up to 2 months or more), and from symptomless carriers who keep up infection in the community.

TRANSMISSION

The organisms, which are excreted in the faeces, may gain access to food through the soiled fingers of patients or carriers. Owing to the low infectious dose of shigella, they may also pass from person to person by contact with inanimate articles or fomites (e.g. lavatory seats, door handles, crockery, bedding and clothes). Fly-borne infection is an important. Young children are more liable than older persons to acquire shigella infections,

Diagnosis can be confirmed by the presence of faecalleucocytes, cultures, DNA-DNA hybridization and PCR.

Severe forms of shigellosis require appropriate antibiotic therapy with ampicillin, trimethoprimsulphamethozale, nalidixic acid or ciprofloxacin, depending on the resistance position.

CHOLERA (Vibrio cholerae)

Occurrence:	India/ Pakistan subcontinent, South East Asia, the Near East, Africa, Southern and Central Europe
Organisms:	*Vibrio cholerae* (classical, El Tor biotypes, 0139 Bengal)
Reservoir:	Humans
Transmission:	Water, food, flies
Control:	Diagnosis, isolation, notification and antibiotics Search for source of infection Concurrent and terminal disinfection Environmental sanitation Health education; personal hygiene International co-operation

This is a disease of rapid onset characterized by vomiting; profuse dehydrating diarrhoea with 'rice water stools' and marked toxaemia. Muscular

cramps, suppression of urine and shock occur later. The incubation period is 1-7 days. Cholera is a notifiable disease.

Vibrio cholerae 01 is a delicate Gram-negative organism. There are two biotypes, classical and El Tor. Each biotype contains three serotypes - Inaba, Ogawa and Hikojima. The El Tor biotype is named after the El Tor quarantine station in Egypt where it was first isolated in 1920 and has been responsible for most epidemics in recent years

RESERVOIR

The reservoir of infection is a sick person, a convalescent patient or a carrier (through the faeces or vomit). For every typical case of the disease

TRANSMISSION

Cholera may begin suddenly as a water-borne disease. The supply of filtered water falls short in summer and the people are found to use both unfiltered and tank water. Cholera also spreads by contaminated food (e.g. dates or shellfish), infected inanimate objects and by flies

*continuous transrrussion by asymptomanc carriers or persons with mild disease

*an aquatic reservoir, e.g. seafood, plankton or water plants.

Cholera control programme Within a national Control of Diarrhoeal Diseases programme the following activities are considered important for cholera control:

..**The formation of a national epidemic control committee;**

..Collection of stool specimens or rectal swabs

..From suspected cases;

..Provision of local, regional and reference laboratory services for the rapid identification of V cholerae 01;

..Training in clinical management of acute

..Diarrhoea;

..Continuing surveillance activities and main- tenance of a diarrhoea case's record;

..Early notification of changes in the pattern of diarrhoea;

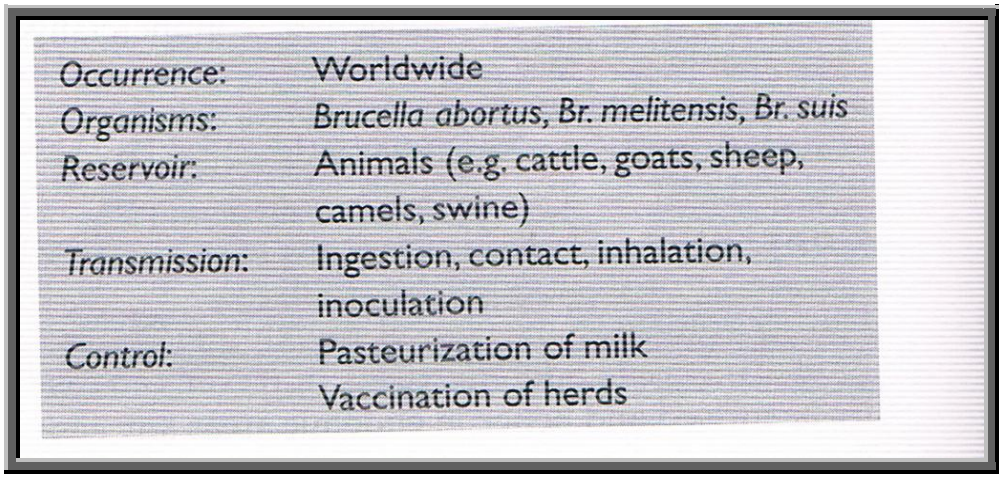
..Enforcement of basic principles of sanitation;

..Continuing health education;

..Establishment of mobile control teams in certain special circumstances;

• Management logistics for supply and distribution requirements

BRUCELLOSIS



Brucellosis is one of the most important zoonoses infections of animals which can affect man. The human disease is characterized by fever, heavy night sweats, splenomegaly and weakness. The incubation period varies from 6 days to as long as 3 months.

Human disease is attributed to Brucella abortus, Br. suis and Br. melitensis from cattle, swine and goat exposure respectively. Brucella are small, nonmotile, non-sporing, Gram-negative coccobacilli.

RESERVOIR many animals can serve as sources of infection for man, among which the most important are cattle, swine, goats and sheep.

TRANSMISSION

The modes of transmission from animals which are discharging brucella are ingestion, contact, inhalation and inoculation. Infection by ingestion may occur by the gastro-intestinal route and also by penetration of the mucous membrane of the oral cavity and throat. The transmission of brucella by ingestion of contaminated milk, milk products (soft cheeses), meat and meat products is well recorded. Viable brucella may be present in the viscera and muscles of infected carcasses for periods of over 1 month. Camel meat and milk and water are also vehicles of infection. Contact with infected material (e.g. placentae, urine, carcasses, etc.), is a common mode of infection and brucellosis is an occupational disease of veterinarians,

Laboratory diagnosis

The laboratory diagnosis of brucellosis includes bacteriological and serological methods as well as allergic tests. Brucella organisms can be cultured from the blood, bone marrow, synovial fluid, lymph nodes and other sources.

Numerous serological tests are available: standard tube-agglutination test (SAT); the rose bengal test; ELISA; 2-mercaptoethanol agglutination test; complement fixation test; Coombs antiglobulin test; radioimmunoassay; Western blotting and PCR. More than one of these tests should be used to confirm a diagnosis. Rising titres or titres that decline after appropriate antibiotic treatment indicate recent active infection. Titres of 640 or more are usually indicative of acute bucellosis. The main control of human brucellosis rests in the pasteurization of milk and environmental sanitation of farms.

BACTERIAL FOOD POISONING Food

Poisoning in the tropics is commonly due to three species of bacteria: Salmonella spp. (the most important), Staphylococcus aureus and Clostridium perfringens. Food-borne bacterial gastro-enteritis may be of three types: (i) infectious type (e.g. salmonella or Vibrio parahaemolyticus), when bacteria infected with food multiply in the individual; (ii) toxin type (e.g. Staphylococcus aureus) when food is ingested that already contains a toxin;

and (iii) intermediate type (e.g. Clostridium perfringens, which releases a toxin in the bowel).

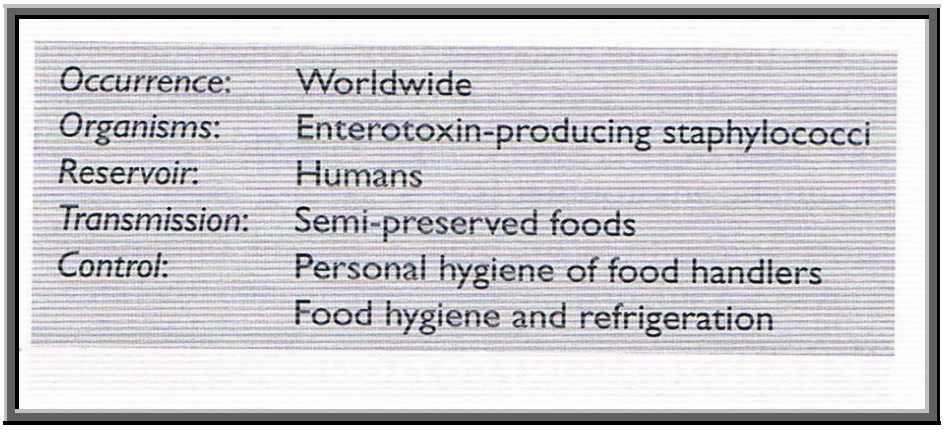
Salmonella food poisoning

Salmonella food poisoning typically presents with diarrhoea, vomiting and fever. The incubation period is usually 12-24 hours. Epidemiological... This is worldwide, but infection is commoner in tropical communities with low hygiene standards. The source of infection is usually salmonellainfected animals, for example cattle, poultry, pigs, dogs, cats, rats and mice. Transmition of this disease by meat, meat products and eggs.

LABORATORY DIAGNOSIS

Serological agglutination methods are needed to identify the type of salmonella, but the genus is readily recognized by standard bacteriological techniques.

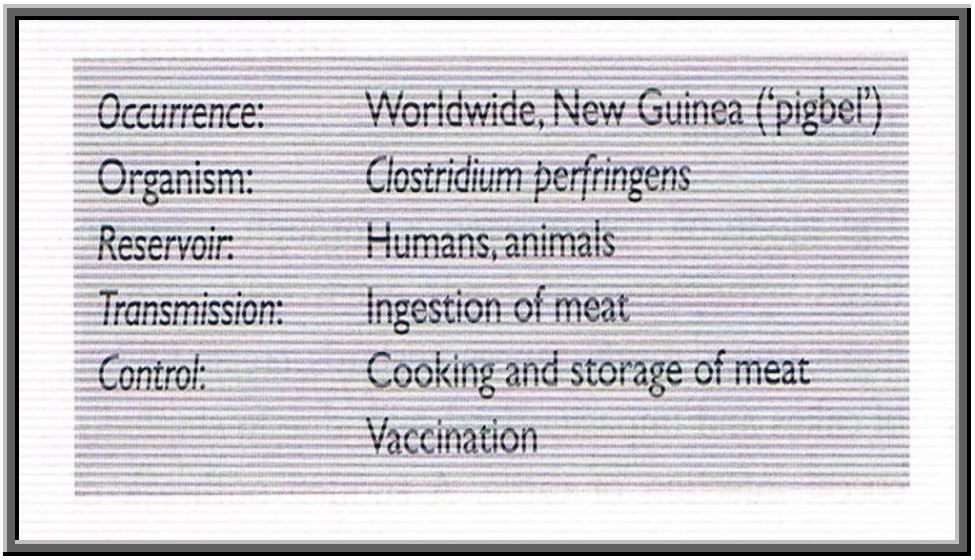
Staphylococcus food poisoning



Staphylococcus food poisoning is characterized by an abrupt onset with nausea and vomiting sometimes accompanied by diarrhoea and shock. The incubation period is from 1 to 6 hours (i.e. very short) which a differential point from salmonella food poisoning is. Seven serologically distinct enterotoxins A, B, C, D, E, G and H are recognized. Enterotoxin A is most often responsible in outbreaks of food poisoning.

LABORATORY DIAGNOSIS If an unconsumed portion of the suspected food is still available this should be sent to the laboratory for examination of enterotoxin-producing staphylococci. ELISA and reversed passive late agglutination (RPLA) are used for the detection of staphylococcal enterotoxins in food.

Clostridium perfringens food poisoning



Clostridium perfringens food poisoning presents with diarrhoea and abdominal pain; vomiting is not very common. The incubation period is 12-24 hours. There are many serotypes of Cl. perfringens. The rod-like organisms require anaerobic conditions in which to grow. They are Gram-positive and produce endospores.

Reservoir and transmission

The source of infection can be human, animal or fly faeces, and the spores of Cl. perfringens survive for iong periods in soil, dust, clothes and in the environment generally. The carrier rate in human populations varies from 2-30%. The mode of transmission is by ingestion of meat which has been precooked and eaten cold, or reheated the next day prior to consumption.

- LABORATORY DIAGNOSIS

perfringens can be isolated from the stools of individuals suffering from the disease and from food remnants. The detection of enterotoxin is done by

ELISA, vero-cell assay, reserve passive late agglutination and DNA hybridization.

Vibrio parahaemolyticus food poisoning

Vibrio parahaemolyticus food poisoning is characterized by acute diarrhoea, abdominal pain and nausea. The incubation period is 4-96 hours (usu- ,ally 12-24 hours). Outbreaks are associated with contamination of fish or shellfish. Incidence is highest in the warmer months when V parahaemolyticus is most prevalent in aquatic environments.