BACTERIAL FOOD INTOXICATION

- Bacteria are minute unicellular organisms which can only be observed with the aid of microscope.
- They belong to class of microorganisms called Schizomycetes.
- They are ubiquitous creatures and widely distributed in nature.
- The various groups of bacteria show marked differences in their growth requirements: some grow at low temperature (psychrophilic), most at moderate temperature (mesophiles), while a few like a high temperature (thermophiles) for their activities.
- Some are anaerobic and some are aerobic.
- Bacteria prefer a pH range near the neutral (7.0) most will not grow below a pH 3.5
- Bacteria are of great economic significance to man. In the food and pharmaceutical industries their activities have been harnessed in the production of several vital products like vitamins, organic acids, enzymes, antibodies and amino acids.
- They have been used as agents for preservation of several vital products and production of new food products.
- They are also responsible for many diseases in man, animals, plants.
- Bacteria are very closely associated to our foods. When they contaminate the foods, they produce such products which often render them unfit for human consumption.
- Some bacteria are capable of producing different types of endotoxins and exotoxins.
- The **endotoxins** are produced within the bacterial cell and are only released in the environment when the organism is dead. These toxins are heat stable and are produced by Gram-negative bacteria such as salmonella, shigellae, coliforms.
- The **exotoxins** are proteinaceous compounds which are heat liable, highly specific for certain tissues and released in environment by living bacteria. They are produced by Gram-positive bacteria like bacilli, streptococci, and staphylococci
- Bacterial food intoxication is caused by ingestion of food containing the exotoxins. When such foods are consumed, the exotoxins act on the specific tissues and result in an illness, commonly known as **food intoxication**

Bacillus cereus

- It is commonly found in soil dust, water on green vegetables, potatoes and cereals.
- Emetic strains of *Bacillus cereus* produce an emetic toxin (ETE) known as cereulide. This emetic toxin is highly resistant to heat, to proteolytic cleavage and to pH between 2 to 11.
- Other food poisoning strains produce three different enterotoxins Hbl (haemolysin BL), Nhe (nonhaemolysin) and cytotoxin K (Entk).
- All three enterotoxins are cytotoxic and cell membrane active toxins that will make holes or channels in membranes.
- A number of food like meat loaf, cornflour sauces and rice dishes (boiled and fried rice) have been implicated with outbreak of *Bacillus cereus* intoxication.
- *Bacillus cereus* is responsible for causing two types of food borne illnesses. One type, the short incubation, this disease is characterized by nausea, vomiting and abdominal cramps.
- The second type long incubation, this disease is manifested primarily by abdominal cramps and diarrhea.
- Thorough cleaning of the kitchen surfaces, equipment and removal of cereal dust from storage and preparation areas can reduce the chances of food contamination by this organism.

Clostridium botulinum

- The natural habitat of *clostridium botulinum* are surface layers of soil, marine muds and decaying vegetables from where it contaminates fish, vegetables and other foodstuffs.
- *Clostridium botulinum* species when growing in food produce very powerful proteinaceous crystalline exotoxins, botulinum neurotoxins (BoNts), which act specifically on the central nervous system causing the disease known as botulism. This toxin is so powerful that even a taste of it could be fatal.
- Seven types of toxins are found and designated as A to G. Only types A, B, E, and rarely F cause diseases in humans while C and D cause diseases in cows, birds and other animals but not in humans. Type G is not known to cause toxicity in human or animals.

- *Clostridium botulinum* is more often associated with low and medium acid canned and bottled foods because of its anaerobic nature. Honey has been identified as probable causes of infant botulism.
- The first symptoms of vague discomfort and muscular weakness, followed by sign of paralysis, blurring of vision, drooping of eyelids, slurred speech, difficulty in swallowing and speaking.
- All suspected food must be boiled for at least 15 minutes prior to consumption.

Staphylococcus aureus

- Staphylococcal intoxication is caused by certain strains of *staphylococcus aureus* which are found in the mucous membranes of nose and throat and occasionally on the skin of man and animals.
- The organisms prefer moist surfaces and hence are present in cuts and abrasions on the skin. It infects wound and produce pus. Cows, buffaloes and goats suffering from mastitis secrete the organisms in milk.
- Some *staphylococcus aureus* strains are able to produce staphylococcal enterotoxins (SEs) that are the causative agents of staphylococcal food poisonings. There are about 14 different SE types which share structure and sequence similarities. They resist many proteolytic enzymes such as pepsin and trypsin and thus kept their activity in the digestive tract after ingestion. They also resist chymotrypsin, rennin, and papain. They also highly heat resistant (withstand boiling for 30 minutes).
- Foods commonly associated with staphylococcal food intoxication are cooked meats (usually barbecued meat), poultry, meat pies, cakes milk, cheese, desserts (especially custards and cream filled or topped desserts), and salad containing mayonnaise and egg products.
- Contamination of foods usually occurs by food handlers who may spread the organisms through sneezing, coughing and open wounds on hands.
- Symptoms of this food intoxication include nausea, vomiting and abdominal cramps followed by diarrhea, salivation and prostration (incapability to make efforts).

- Staphylococcal food intoxication may be prevented through proper sanitation and personal hygiene.