

## Importance of Micro-Organism in Foods

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Microorganisms play an important role in food industry. As already discussed in the earlier article Contributions of Microbiology in Food Industry, they are used in production of various food products, and are also responsible for food spoilage thereby causing intoxication and diseases. Microbial contamination of food products takes place usually on the way from the field to the processing plant, or during processing, storage, transport and distribution or before consumption. The microorganisms that cause food spoilage and also find the maximum exploitation in production of food and food products are mainly bacteria, molds and yeasts.

### Bacteria

Bacteria are the largest group of unicellular microorganisms. The shapes of medically important bacteria are classified into-cocci, or spherical cells; bacilli, or cylindrical or rod shaped cells; and spiral or curved forms. The pathogenic or disease causing bacteria are usually gram negative, however, three gram-positive rods are known to cause food intoxications: *Clostridium botulinum*, *C. perfringens* and *Bacillus cereus*. Some of the other most common bacteria causing food spoilage, infections and disease are *Acinetobacter*, *Aeromonas*, *Escherichia*, *Proteus*, *Flavobacterium*, *Pseudomonas*, *Arcobacter*, *Salmonella*, *Lactococcus*, *Serratia*, *Shigella*, *Citrobacter*, *Staphylococcus*, *Micrococcus*, *Corynebacterium*, *Vibrio*, *Enterobacter*, *Paenibacillus*, *Enterococcus*, *Yersinia*. Different strains of bacteria are also used in production of various food and dairy products. Strains of *Streptococcus*, *Lactobacillus*, *Bifidobacterium*, *Erwinia* etc are used in the production of fermented food and dairy products. *Streptococcus*, *thermophilus* and *Lactobacillus bulgaricus* are used to produce yogurt.

### Molds

Molds are multicellular filamentous fungi whose growth on foods is usually readily recognized by their fuzzy or cottony appearance. They are mainly responsible for food spoilage at room temperature 25- 30°C and low pH, and have minimum moisture requirement. Molds can rapidly grow on grains and corns when these products are stored under moist conditions. Molds require free oxygen for growth and hence grow on the surface of contaminated food. Molds also find their use in manufacturing of different foods and food products. They are used in ripening of various types of food products as cheese. Molds are also grown as feed and food and are employed to produce ingredients such as enzymes like amylase used in making bread or citric acid used in soft drinks. Molds are major contributors in the ripening of many oriental foods. A species of *Bothrytis cinerea*, is used in rotting of grape for production of wine. Lactic fermentations using molds results in a unique Finnish fermented milk called viili.

### Yeasts

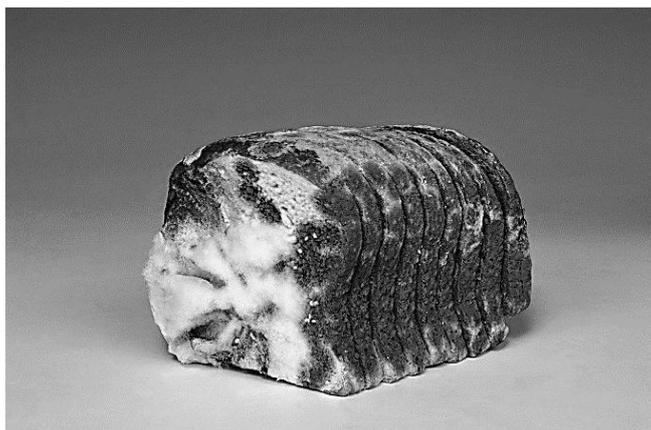
Yeasts have the ability to ferment sugars to ethanol and carbon-dioxide and hence they are extensively in food industry. The most commonly used yeast, the baker's yeast is grown industrially. *Saccharomyces carlsbergensis* is most commonly used in fermentation of most beers. The other yeast strains of importance are *Brettanomyces*, *Schizosaccharomyces*, *Candida*, *Cryptococcus*, *Debaryomyces*, *Zygosaccharomyces*, *Hanseniaspora*, *Saccharomyces*.

Since 1900 A.D. our understanding of the importance of micro-organisms in food has increased greatly. Their role in food can be either desirable (food bio-processing) or undesirable (food borne disease and food spoilage),

**Food borne diseases**

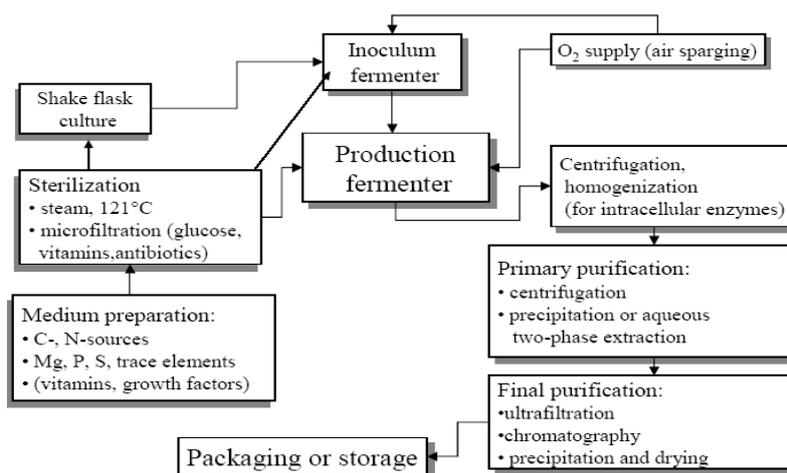
Many pathogenic micro-organisms (bacteria, molds and viruses) can contaminate foods during various stages of their handling, between production and consumption. Consumption of these foods can cause food borne diseases. Food borne diseases can be fatal and may also cause large economic losses. Foods of animal origin are associated, more with food borne diseases than foods of plant origin. Mass production of food, introduction of new technologies in the processing and storage of food, changes in food consumption patterns and increased import of food from other countries have increased the chance of large outbreaks as well as the introduction of new pathogens. Effective intervention technologies are being developed and implemented to ensure the safety of consumers against food borne diseases. New methods are also being developed to effectively and rapidly the pathogens in contaminated foods.

**Food spoilage**



Expect for sterile foods, all foods harbor micro-organisms. Food spoilage stems from the growth of these micro-organisms in food or is due to the action of microbial enzymes. New marketing trends, consumers' desire for foods that are not overly processed and preserved, extended shelf life and chances of temperature abuse between production and consumption of foods have greatly increased the chance of food spoilage and, in some instances, with new type of micro-organisms. The major concerns are the economic loss and wastage of food. New concepts are being studied to reduce contamination as well as control the growth of spoilage microbes in foods.

**Food Bio-processing**

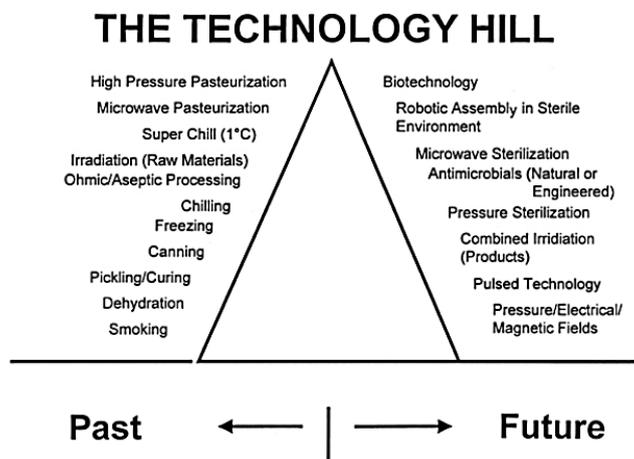


Many food grade micro-organisms are used to produce different types of fermented foods using raw materials from animal and plant sources. Consumption of these foods has increased greatly over the last 15 to 20 years and is expected to increase further in the future. There have been great changes in the production and availability of these micro-organisms (starter cultures) to meet the large demand. In addition, novel and better strains are being developed by using genetic engineering techniques.

### Food Additives

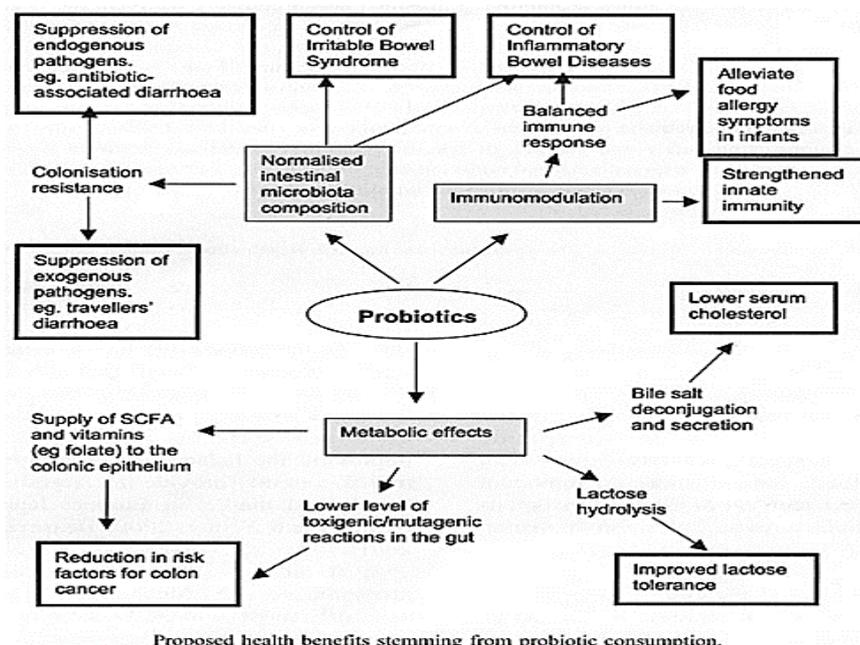
Microbial enzymes are also being used to produce food and food additives. By employing genetic recombination techniques, and using diverse microbial sources enzymes of higher purity & activity are obtained. Many types of additives from microbial sources are being developed and used in food. Some of these include single cell proteins, essential amino acids, color compounds, flavor compounds, stabilizers and organic acids.

### Food Bio-preservation



Antimicrobial metabolites (e.g. bacteriocins and organic acids like acetic, propionic and lactic acids) of desirable micro-organisms are being developed and used in foods in place of preservatives of non-food (chemical) origin to control pathogenic and spoilage micro-organisms in food. Economic productions of these antimicrobial compounds and their effectiveness in food systems have generated wide interest.

### Probiotics



Consumption of foods containing live cells of bacteria and that have apparent a health benefit has generated interest among consumers. The role of these bacteria for health and bacterial efficacy benefits is being critically investigated.

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