FAQ's

1. **What is the inter-relationship of microbiology food fermentation and probiotics?**
    a. Development of strains with desirable metabolic activities by genetic transfer among strains
    b. Development of bacteriophage-resistant lactic acid bacteria
    c. Metabolic engineering of strains for overproduction of desirable metabolites
    d. Development of methods to use lactic acid bacteria to deliver immunity proteins
    e. Sequencing genomes of important lactic acid bacteria and bacteriophages for better understanding of their characteristics
    f. Food bio-preservation with desirable bacteria and their antimicrobial metabolites
    g. Understanding of important characteristics of probiotic bacteria and development of desirable strains
    h. Effective methods to produce starter cultures for direct use in food processing

2. **What are the relation of food microbiology with spoilage?**
    a. Identification and control of new spoilage bacteria associated with the current changes in food processing and preservation methods
    b. Spoilage due to bacterial enzymes of frozen and refrigerated foods with extended shelf life
    c. Development of molecular methods (nanotechnology) to identify metabolites of spoilage bacteria and predict potential shelf life of foods
    d. Importance of environmental stress on the resistance of spoilage bacteria to antimicrobial preservatives

3. **What are the relation of microbiology with foodborne diseases**

a. Methods to detect emerging foodborne pathogenic bacteria from contaminated foods
b. Application of molecular biology techniques and nanotechnology for rapid detection of pathogenic bacteria in food and environment
c. Effective detection and control methods of foodborne pathogenic viruses
d. Transmission potentials of prions from food animals to humans
e. Importance of environmental stress on the detection and destruction of pathogens
f. Factors associated with the increase in antibiotic-resistant pathogens in food
g. Adherence of foodborne pathogens on food and equipment surfaces
h. Mechanisms of pathogenicity of foodborne pathogens
i. Effective methods for epidemiology study of foodborne diseases
j. Control of pathogenic parasites in food

4. Contribution of Louis Pasture

Louis Pasteur was the first person to prove the relationship between microorganisms in infusions and the chemical changes that took place in those infusions. Pasteur concluded that all fermentative processes were caused by microorganisms. Fermentation (e.g. alcoholic, lactic or butyric) were the result of specific types of microorganisms. He demonstrated the role of microorganisms in the spoilage of French wines, which resulted in the rediscovery of bacteria.

In 1857, he showed that souring milk was caused by microbes and in 1860, he demonstrated that heat destroyed undesirable microbes in wine and beer. The latter process is now called as pasteurization. Pasteur is known as the founder of food microbiology.

He demonstrated that air needs heating to remain sterile. He finally disproved spontaneous generation. His experiment to disprove the old theory of spontaneous generation "micro-organisms are the result of decaying matter" led to the new germ theory. It says microorganisms cause decay of matter and the microorganisms can be killed by applying heat, today known as pasteurization**.**

5. **Contribution od Anton Van Leeuwenhoek**

   Anton van Leeuwenhoek, a tailor, used lenses to examine cloth. He discovered: micro" organisms – organisms so tiny that they were invisible to the naked eye. He called these tiny living organism "animalcules" he first described bacteria and the protozoans

6. **Give a note prescientific era of food microbiology**

   The era before the establishment of bacteriology as a science may be designated as a prescientific era. The prescientific era is divided into the food-gathering period and the food producing period.

   Spoilage of prepared foods apparently dates from around 6000 BC. Western Europe started making pottery by about 5000 BC. The art of cereal cooking, brewing, and food storage were either started at about this time or stimulated by this new development.

   a. Babylonian civilization (7000 BC) were the first evidence of beer manufacture
   b. Sumerians of about 3000 BC are believed to have been the first great livestock breeders and dairymen. They were first to make butter, salted meats, fish, fat, hide, wheat, and barley.
   c. Egyptians (3000 BC) civilization shows the use of Milk, butter, and cheese.
   d. The Jews were the first to use salt from the Dead Sea in the preservation of various foods, between 3000 BC and 1200 BC
   e. The Chinese and Greeks used salted fish in their diet, and the Greeks are credited with passing this practice to the Romans. Their diet included pickled meats. Mummification and preservation of foods were related technologies which have influenced both Chinese and Greek development.
   f. Fermented sausages were prepared and consumed by the ancient Babylonians and the people of ancient China way back 1500 BC.

7. **Give a note on spontaneous generation of life debate**

   The spontaneous generation of life debate: The belief in the spontaneous generation of life from nonliving matter was introduced by Aristotle, who lived around 350 BC. He

concluded that aphid arises from the rainfall which falls on plants and mice originates from dirty food storage structures.

8. **What is the contribution of Nicholas Appe**rt?

   In 1795, a French confectioner named Nicholas Appert was granted a patent for meat preservation, when it was placed in glass bottles and boiled. This was the beginning of food preservation by canning.

9. **List out some examples for food poisoning and food spoilage before the 13th century.**

   The case for food poisoning and food spoilage were documented between the birth of Christ, AD 1100. And few advances were made towards understanding the nature of food poisoning and food spoilage. *Ergot* poisoning (caused by *Claviceps purpurea*, a fungus that grows on rye and other grains) caused many deaths during the Middle Ages. During AD 943- over 40,000 deaths occurred due to ergot poisoning in France, but it was not known that the toxin of this disease was produced by a fungus. During AD 1156 - meat butchers came into existence. During1248- Swiss were concerned with marketable and nonmarketable meats. In 1276, a compulsory slaughter and inspection order was issued for public abattoirs in Augsburg.

10. **Who disprove the doctrine of the spontaneous generation of life? Give a note on it.**

    Spallanzani disprove the doctrine of the spontaneous generation of life. In 1765, Spallanzani showed that boiled beef broth when sealed remained sterile and did not spoil. Spallanzani performed this experiment to disprove the doctrine of the spontaneous generation of life. However, his work was criticized because they believed Oxygen (O2) was excluded and O2, which they thought was vital to spontaneous generation.

11. **Who is the father of food microbiology? What is his contribution on spontaneous generation?**

Louis Pasteur is the father of food microbiology. He demonstrated that air needs heating to remain sterile. He finally disproved spontaneous generation. His experiment to disprove the old theory of spontaneous generation "micro-organisms are the result of decaying matter" led to the new germ theory. It says microorganisms cause decay of matter and the microorganisms can be killed by applying heat.

12. List out history of food preservation.

The history of food preservation from 1700 to 1929 are.

1782-1840

- Development and use of canning process for preservation of food.

1813

- Use of So2 as a meat preservative

1841-1878

- Developemnt and use of freezing for storing foods for long periods of time.
- Food sterilization, development of condensed and dried milk.

1890-1900

- Development and use of milk pasteurization

1907-1930

- Use of chemicals for food preservation
- Use of modified and controlled atmospheres for preservation of fruits and vegetables

1929

- High energy radiation for food processing

13. List the history for food spoilage

1659-1780

- Studies on milk souring
- Association between lactic acid and milk souring

1866

- Development of pasteurization

1839-1902

- Studies on sugar slimes

1887-1902

- Studies that demonstrated bacterial growth at low temperatures
- Use of the term psychrophile

1888-1917

- Studies on thermophilic bacteriology

1933-1964

- Studies of Byssochlamis fulva

14. What are the four basic criteria for Koch's Postulates.

1. A specific microorganism is always associated with a given disease
2. The microorganism can be isolated from the diseased animal and grown in pure culture in the laboratory
3. The cultured microbe will cause disease when transferred to a healthy animal.
4. The same type of microorganism can be isolated from the newly infected animal

15. Briefly, list out the contribution made my Robert Koch.

Robert Koch was born in Germany. Robert Koch isolated pure cultures of bacteria responsible for anthrax, cholera, and tuberculosis. He became the first physician to use an oil immersion lens, the first to use a condenser, and the first to publish photographs of bacteria. He worked to develop his plate technique for generating 'pure' cultures of bacteria. Along with his associates, he also developed techniques of agar plating methods to isolate bacteria in pure cultures and to determine microbial numbers in a sample. With the development of Petri plates by his assistant Julius Perti. Koch now had all the tools for his 'plate technique' and Koch's paper became the 'Bible of Bacteriology'. He also developed the famous Koch's postulates. Koch's discovered Tubercle bacillus which cause tuberculous. He need to prove that these bacilli caused tuberculosis so he formalized a set of 'postulates'