

## **Applied and Industrial Microbiology**

### **Food Microbiology**

I. The earliest methods of preserving foods were drying. the addition of salt or sugar, and fermentation.

### **Foods and Disease**

2. Food safety is monitored by the FDA and USDA and also by use of the HACCP system.

### **Industrial Food Canning**

3. Commercial sterilization of food is accomplished by steam under pressure in a retort.
  4. Commercial sterilization heats canned foods to the minimum temperature necessary to destroy *Clostridium botulinum* endospores while minimizing alteration of the food.
  5. The commercial sterilization process uses sufficient heat to reduce a population of *C. botulinum* by 12 logarithmic cycles (J 2D t reat - ment).
  6. Endospores of thermophiles can survive commercial sterilization.
  7. Canned foods stored above 45°C can be spoiled by thermophilic anaerobes.
  8. Thermophilic anaerobic spoilage is sometimes accompanied by gas production; if no gas is formed, the spoilage is called flat sour spoilage.
  9. Spoilage by mesophilic bacteria is usually from improper heating procedures or leakage.
  10. Acidic foods can be preserved by heat of 100°C because microorganisms that survive are not capable of growth in a low pH.
- II. *Byssochlamys*, *Aspergillus*, and *Bacillus coagulans* are acid-tolerant and heat -resistant microbes that can spoil acidic foods.

### **Aseptic Packaging**

12. Presterilized materials are assembled into packages and aseptically filled with heat-sterilized liquid foods.

### **Radiation and Industrial Food Preservation**

13. Gamma and X-ray radiation can be used to sterilize food, kill insects and parasitic worms, and prevent the sprouting of fruits and vegetables.

### **High-Pressure Food Preservation**

14. Pressurized water is used to kill bacteria in fruit and meat.

### **The Role of Microorganisms in Food Production**

#### **Cheese**

15. The milk protein casein curdles because of the action by lactic acid bacteria or the enzyme rennin.

16. Cheese is the curd separated from the liquid portion of milk, called whey.

17. Hard cheeses are produced by lactic acid bacteria growing in the interior of the curd.

18. The growth of microbes in cheese is called ripening.

19. Semisoft cheeses are ripened by bacteria growing on the surface; soft cheeses are ripened by *Penicillium* growing on the surface.

#### **Other Dairy Products**

20. Old-fashioned buttermilk was produced by lactic acid bacteria growing during the butter-making process.

21. Commercial buttermilk is made by letting lactic acid bacteria grow in skim milk for 12 hours.

22. Sour cream, yogurt, kefir, and kumiss are produced by lactobacilli, streptococci, or yeasts growing in low-fat milk.

#### **Nondairy Fermentations**

23. Sugars in bread dough are fermented by yeast to ethanol and CO<sub>2</sub>; the CO<sub>2</sub> causes the bread to rise.

24. Sauerkraut, pickles, olives, soy sauce, and even cocoa and coffee, are products of microbial fermentations.

#### **Alcoholic Beverages and Vinegar**

25. Carbohydrates obtained from grains, potatoes, or molasses are

fermented by yeasts to produce ethanol in the production of beer, ale, sake, and distilled spirits.

26. The sugars in fruits such as grapes are fermented by yeasts to produce wines.
27. In winemaking, lactic acid bacteria convert malic acid into lactic acid in malolactic fermentation.
28. *Acetobacter* and *Gluconobacter* oxidize ethanol in wine to acetic acid (vinegar).

References':1- Microbiology an introduction TWELFTH EDITION. Gerard. Tortora.2016.

2- Microbiology an introduction TENTH EDITION. Gerard. Tortora.2010.