

CLASS NOTES FOR SEMESTER –IV STUDENTS , Date- 3.3.2020

Dr. Harekrishna Jana

Assistant Professor

Dept. Of Microbiology

Raja N.L.Khan Women's College

B.Sc (HONOURS) MICROBIOLOGY (CBCS STRUCTURE)

C-10: FOOD AND DAIRY MICROBIOLOGY (THEORY)

SEMESTER –IV

TOTAL HOURS: 60

CREDITS: 4

Unit 1 Foods as a substrate for microorganisms

No. of Hours: 8

Intrinsic and extrinsic factors that affect growth and survival of microbes in foods, natural flora and source of contamination of foods in general.

Q. What is Food? Write the source of contamination of foods in general.

Food is an indispensable item for all living organisms. All food items are associated with microorganisms in one form or other. Even naturally occurring foods such as fruits and vegetables contain microorganisms.

Foods get contaminated with microorganisms in any one or more than one of the following ways:

1. Foods get contaminated during handling, harvest, transport and storage.
2. Due to methods of food collection
3. Due to methods of cooking and preparation
4. While eating and storing prepared foods.
5. Due to soil in which they occur.
6. Food forms an ideal culture medium for the growth of microorganisms.

Sources of Microorganisms Found in Foods

Foods acquire the population of microorganisms through the following ways:

1. From soil
2. From plants
3. From cooking vessels
4. From use of polluted and contaminated water for washing and cooking.
5. Unhygienic habits of food handlers.

Q. Write the normal microorganism presents in Common food items.

Normal Microbial Flora of Common Foods

The microbial flora commonly associated with foods is given in table -1. The microorganisms associated with different kinds of food are given in table -2. This list is not exhaustive but includes those commonly encountered in foods.

Table -1: List of commonly occurring microorganisms in foods.

<i>Bacteria (sp)</i>	<i>Mold (sp)</i>	<i>Yeasts (sp)</i>
<i>Acetobacter</i>	<i>Alternaria</i>	<i>Brettanomyces</i>
<i>Acinetobacter</i>	<i>Aspergillus</i>	<i>Candida</i>
<i>Acromonas</i>	<i>Botrytis</i>	<i>Debaryomyces</i>
<i>Alcaligenes, Bacillus</i>	<i>Byssochlamys</i>	<i>Endomycopsis</i>
<i>Campylobacter</i>	<i>Cephalosporium</i>	<i>Hansenula</i>
<i>Citrobacter</i>	<i>Cladosporium</i>	<i>Kluyveromyces</i>
<i>Clostridium</i>	<i>Colletotrichum</i>	<i>Mycoderma</i>
<i>Corynebacterium</i>	<i>Gloeosporium</i>	<i>Rhodotorula</i>
<i>Enterobacter, Erwinia</i>	<i>Helminthosporium</i>	<i>Saccharomyces</i>
<i>Escherichia</i>	<i>Monilia (Neurospora)</i>	<i>Saccharomycopsis</i>
<i>Flavobacterium</i>	<i>Mucor</i>	<i>Schizosaccharomyces</i>
<i>Lactobacillus</i>	<i>Penicillium</i>	<i>Torulopsis (torula)</i>
<i>Leuconostoc</i>	<i>Rhizopus</i>	<i>Trichosporon</i>
<i>Micrococcus</i>	<i>Sporotrichum</i>	
<i>Pediococcus, Proteus</i>	<i>Thamnidium</i>	
<i>Pseudomonas</i>	<i>Trichothecium</i>	
<i>Salmonella, Serratia</i>		
<i>Staphylococcus</i>		
<i>Streptococcus</i>		
<i>Vibrio, Yersinia</i>		

Table -2: Common foods and their microbial flora.

Types of food	Microbial flora
1. Milk	<p>Biochemical types <i>Streptococcus lactis, S. cremoris</i> Acid producers <i>Lactobacilli, Microbacteria, Coliforms, Micrococcus</i> Gas Producers <i>Coliforms, Clostridium, Torula cremoris</i> Ropy fermenters <i>Alcaligenes, Enterobacter, Streptococcus</i> Proteolytic <i>Bacillus, Pseudomonas, Proteus, Streptococcus</i> Lipolytic <i>Pseudomonas, Achromobacter, Candida, Penicillium</i> Psychrophils <i>Flavobacterium, Pseudomonas, Alcaligenes, Lactic streptococci, Coliforms</i> Mesophilic <i>Bacillus coagulans</i> Thermophile <i>Bacillus stearothermophilus</i></p>
2. Dairy Products	<p><i>Lactobacillus, Leuconostoc, Micrococcus Streptococcus, Geotrichum.</i></p>
3. Raw Milk	<p><i>Alcaligenes, Bacillus, E.coli, Lactobacillus, Leuconostoc and Streptococcus</i></p>

<p>4. <i>Fruits & Vegetables</i></p>	<p><i>Bacillus, Pseudomonas, Salmonella, Corynebacterium, Erwinia, E.coli, Aspergillus, Botrytis, Fusarium, Trichothecium, Saccharomyces, Monilia, Rhizopus.</i></p>
<p>5. <i>Egg and egg products</i></p>	<p><i>Pseudomonas fluorescens, P.ovalis, Salmonella, E.coli, Proteus thamnidium, molds and yeasts.</i></p>
<p>6. <i>Meat</i></p>	<p><i>Clostridium, Enterobacteria, Micrococcus, Streptococcus faecalis, Proteus, Pseudomonas, Staphylococcus, Aspergillus, Candida.</i></p>
<p>7. <i>Fish</i></p>	<p><i>Pseudomonas, Chromobacterium, Micrococcus, Flavobacterium, Corynebacterium, Sarcina, Serratia, Bacillus, E.coli, Clostridium, Bacillus.</i></p>
<p>8. <i>Bread</i></p>	<p><i>Polymyxa, B. Pumilis (ropiness) Serratia marcescens (red or bloody bread) Rhizopus nigricans, Penicillium, Aspergillus, Monilia, Mucor (Bread mold).</i></p>
<p>9. <i>Poultry</i></p>	<p><i>Pseudomonas, Proteus, Chromobacter, E.coli, Salmonella, Alcaligenes, Bacillus</i></p>
<p>10. <i>Shell fish</i></p>	<p><i>Bacillus, Alcaligenes, Proteus, Coliforms</i></p>

11. Fermented foods	<i>Streptococcus lactis, Lactobacillus, Clostridium butyricum, C. Botulinum, Leuconostoc, Acetobacter, Saccharomyces, Pediococcus</i>
12. Beef	<i>Cladosporium, Sporotrichum</i>

13. Sea Food	<i>Pseudomonas, Vibrio</i>
14. Pickles	<i>Brettanomyces, Debaryomyces, Leuconostoc mesenteroides</i>
15. Grams	<i>Enterobacter, E. Coli.</i>

The inner tissues of healthy plants and animals are free of microorganisms. However, the surfaces of raw vegetables, fruits and meats are contaminated with a variety of microorganisms. The magnitude of this microbial population reflects one or more of the following :

1. Microbial population of the environment from which the food was taken.
2. The condition of the raw product.
3. The method of handling.
4. The time and conditions of storage.

Q. Write the several factors that Influence the microbial growth in food

Many factors seem to affect the growth of microorganisms in food. Some of them are intrinsic and some others are extrinsic.

a) Intrinsic Factors

These are factors that are inherent part of plant and animal tissues from which we obtain foods. This includes P^H , moisture content, redox potential, nutrient content, antimicrobial constituents and biological structures.

b) Extrinsic Factors

This includes those properties of the storage environment that affect both the foods and their microorganisms. The following extrinsic factors affect growth of microorganisms: storage temperature, P^H , presence and concentration of gases in the environment.