Food Microbiology

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Primary sources of MO in Foods

(1) soil

- usually high in numbers
- greater near the soil surface than at deeper levels
- microbial growth is limited to areas of organic material
- generally not a good medium for microbial growth
- sporeforming bacteria quite common
- ***Acinetobacter, Alcalegenes, Arthrobacter, Corynebacterium, Flavobacterium, Micrococcus, Pesudomonas***

Soil (continued)

- Mold spores can be found (***Aspergillus, Rhizopus, Penicillium, Fusarium*** *etc.)*
- Yeasts (***Saccharomyces, Hanseniaspores***) prevalent in soil of orchards and vineyards
- 10^4 to 10^9 /g in marine sediments
- ***Aeromonas, Bacillus, Chromobacterium, Citrobacter, Escherichia, Pseudomonas, Vibrio*** included

(2) Water

- Rain from air, run off from soil, sewages in water
- *Pseudomonas, Micrococcus, Bacillus, Flavobacterium, Streptococcus, Escherichia etc.*
- *Altermonas* specific in marine

(3) plant and plant products

- contaminated by air, water, sewage, animals, soil, human
- *Corynebacterium, Pseudomonas, Xanthomonas*, Lactic acid bacteria & yeast

(4) Animals

- Surface flora, respiratory, intestinal, etc.
- Carry potential human pathogens such as *Salmonella*, *Shigella*, *Vibrio*, *Escherichia* by fly
- Dominant MO in intestinal flora are obligate anaerobes, such as *Bacteriodes*, *Peptostreptococcus*, which may rich to 10^{10} to 10^{11}/g
- Facultative anaerobe (food related)may reach levels of 10^{7} to 10^{9} including coliforms, enterococci and lactobacilli

(5)Human

- Skin, respiratory, intestinal
- Skin is never free of MO and contains normal microflora (*S. aureus* on head and face, arms and hands had *Sarcina, Bacillus* etc.)
- Carelessness of human hygiene and sanitation can results in contaminated food

(6) air

- contaminated by respiratory MO, MO in dust
- not contain a normal flora
- mold spores normally the most prevalent
- MO in air depend on several factors (a) sunshine; (b) humidity; (c) location; (d) air movement
- MO can not multiply in air

(7) equipment

- many parts and surfaces
- types of surfaces (wood vs. stainless steel)
- clean and sanitation
- type & amount of food processed, care of equipment, storage of equipment, air flow, dust
- MO adhere to surfaces (sanitation concern)

(8) sewage

- use of animal wastes to fertilize crops (organic), contaminated water, inadequate sewage disposal system
- *Salmonella* are quite prevalent in raw sewage
- Enteric virus survive sewage treatment process and may remain infective

(9) Animal feeds and hides

- *Salmonella* to poultry and other farm animals (How to prepare Salmonella-free egg?)
- *Lister monocytogenes* to dairy and meat products
- MOs from udder and hide can contaminate the environment, milk containers, and hands of handlers