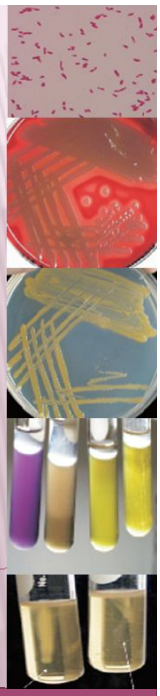
FISH AND FISHERY PRODUCTS MICROBIOLOGY– 3 (2 – 1)



BACTERIA ON FISH: part I

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SOURCES OF MICROORGANISMS

INTRODUCTION

- The microbial of food consist of MO associated with RM.
- Most foods are subjected to many potential sources of MO.
- The potential sources of contamination are soil, water, palnts, animals, human beings, sewage, processing equipments, ingredients, products & packaging material.
- MO can be exchanged between other sources
- Why should we be concerned with sources of contamination?

SOURCES OF MO CAUSING FISH SPOILAGE

- WATER
  - + Tropical and sub tropical water
  - + Marine water
  - + Brackish water
  - + Fresh water
- SOIL
- AIR
- ANIMALS
- HUMAN
- SEWAGE

WATER

INTRODUCTION

- Water is potential source of MO contamination
- Water lands may contaminated by soil Mos.
- Sewage & feces → contaminate soil & water lands.
- Microflora of temperate water fish is dominated by psycotropic Gram (-), gram + also be found in small proportion.

SEVERAL BACTERIA FROM WATER

Marine bacteria	Brackish bacteria	Fresh water bacteria
Vibrio sp	*Vibrio* sp	*E. coli*
Aeromonas	*Salmonella*	*C. botulinum*
Plesiomonas	*Aeromonas*	*Aeromonas*
Streptococcus sp	*Mycobacterium*	*Plesiomonas*
Mycobacterium	*Flavobacterium sp*	*Salmonella*
Pseudomonas sp		*Staphylococcus* sp
Lactococcus sp		*Citrobacter*
Pseudoalteromonas		*Flavobacterum*
Eubacterium sp		*Yersinia*
Clostridium sp		*E. Vulneris*
Listonella sp		*Edwardsiella* sp
Tenacibaculum sp		*Bacillus* sp
Brucella		*Mycobacteria*
Helicobacter		*Lactococcus sp*
Photobacterium		*Streptococcus sp*
Etc.		*Pseudomonas sp*
		Etc.

FOOD CONTAMINATION

- Water contact during harvesting, handling, & processing .
- Water is a direct suorce of contamination
- MO in water contaminate the surface, gills, & intestinal tract in fish & shellfish.
- Preedominant genera*: Cytophaga, Flavobacterium, Moraxella, & Pseudomonas*.
- Other organism: *Acinetobacter, Bacilus, Aeromonas, Vibrio*, coryneform.
- Water stored in tank → pseudomonas 10^5 to 10^6 / ml.
- Water (53^o – 61^oC) can kill many pathogenic bacteria.

SOIL

INTRODUCTION

- Most of sewage, human corpse, plant tissue, etc buried in soil.
- After several years they changes into organic and anorganic compound -- > MO
- 5 main components of soil: mineral particle, organic material, water, gas, & microorganism.
- Fertile soil has rich MO
- MO changes soil chemical substances through several biochemistry process.
- Soil contains fertlizer MO and pathogen MO

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- Soil is natural habitat of some Mos
- Types & numbers of MO vary with types of soil
- MO growth is limited to areas of organic material
- Factors affecting MO growth : chemical composition, rate of decomp., & envi condition.

NUMBER & TYPES OF MO

- MO quite prevalent → Bacillus & Clostridium
- MO common in food & soil → Acinetobacter, Alcaligenes, Arthrobacter, Bacillus, Clostridium, Corynebacterium, Flavobacterium, Micrococcus, Pseudomonas, & Streptomyces.
- C. botulinum A & C are found in soil.
- MO in soil become inactivated by predators, bacteriolytic enzymes, & toxin.

CONTAMINATION OF FOODS

- MO contaminate to RM & product by direct contact.
- MO numbers are influenced by degree of contamanition of soil.
- Marine sediments -→ MO range $10^4 – 10^9$/g
- These bacteria are *Aeromonas, Bacillus, Chromobacterum, Citrobacter, Escherichia, Pseudomonas, & Vibrio*.

AIR

INTRODUCTION

- Main concern on air pollution is chemical rather than biolgical
- Microorganism on air are temporarily & variably.
- Amount & size of MO in the air depend on polution sources on environment
- Factors causing MO in the air : athmosphere, humidity, sunray, size particle in the air, and Characteristic of MO.
- Food is subjected to airborne contamination until it is seled.

TYPES OF BACTERIA AND MOLDS WHICH ARE ISOLATE FROM ATHMOSPHERE

Height (m)	Bacteria (genus)	Molds (genus)
1500 – 4500	*Alcaligenes* *Bacillus*	*Aspergilus* *Macrosporium* *Penicilium*
4500 – 7500	*Bacillus*	*Aspergillus* *Clasdosporium*
7500 – 10500	*Sarcina* *Bacillus*	*Aspergillus* *Hormodedrum*
10500 – 13500	*Bacillus* *Kurthia*	*Aspergillus* *Hormodenrum*
13500 – 16500	*Micrococcus* *Bacillus*	*Penicillium*

Source: Irianto, 2006

TYPES & NUMBERS OF MO

- There is no natural / normal MO of air.
- Molds spores > prevalent than other MO
- Contamination of the air is caused by gusts.
- Sources MO 4 air contamination : spraying, splashing, vibration, bursting, etc.
- Types of MO: *Klebsiella, Bacillus, Flavobacterium, Strepticoccus, & Micrococcus*.
- Microflora air in food procesing reflects sanitary condition.
- Types yeast in air: *Aspergillus, Penicillium, Cladosporium, Alternaria, Helminthosporium*

SURVIVAL & FOOD-PROCESSING OPERATION

- Stability of Mos in air is affected by Rh, temperature, O2, solar factors, & chemical components.
- Contamination on products from air MOs depends upon to the level of contamination on air & time contact air with foods.

ANIMAL AND PLANT FOOD

- Animal & plant → source of chemical & biological contamination on foods.
- Microorganisms in animal feed can contaminate the feet, hide, hair, & feathers of animals.
- Plant of food may contain organism that can contaminate he palnt & associate human foods.

PLANTS

- Plants are contaminated by MO from several sources (dirt, water, air, fertilizer, animals, & human).
- Pseudomnas are quite prevalent on vegetables.
- Several flowers of fruit are inhabited by several yeast such as *Saccharomyces, Hansenula, Torulopsis, Candida, Rhodotorula, & Kloeckera.*
- Decaying plant is impottant source of MO.

ANIMALS

- MOs in animals are founds in gastrointestinal, nasal pasage, cutneous lesions, & skin, feet, hair / feather.
- Animals able to tranfered pathogen bacteria to foods.
- Flies have a part in spreading of *Salmonella, Shigella, Vibrio, Eschericia coli,* & other MO causing food spoilage.
- Predominant organisms in the intestinal flora of both animal & human ar obligates anaerobe such as *Bacteriodes & Peptostreptococcus.*
- The surface of fish may contain 10^2 to 10^5 square / cm & in the intestinal vary from 10^4 to 10^7 / g.

HUMAN

- Staphylococci are predominant on normal infant skin.
- The colonization of MO is abundant in nose, oral cavity, throat, respiraory, digestive, & urogenital tracts.
- The predominant MO on the skin are *staphylococci, corynebacteria, & propionibacteria*.
- *Micrococcus, Bacillus, Alcaligenes, Pseudomonas, Enterobacter, Klebsiella, Proteus, Escherichia, & Citrobacter* are quite prevalent on human skin.
- S. aureus is associated with infection such as acne, pimples, & boils.

- Fecal flora of infants is composed primarily species of Bifidobacterium.
- Fecal adult
- Diet influences the fecal microflora
- Most bacteria in rest room is *Salmonella / Shigella*
- In fish processing, process that contact with human may provide contamination of food with human pathogens.

SEWAGE

- Animal manure may produce substrate may contain microorganism, including human pathogen.
- Inproper septic tank may contaminate soil/environment.
- Salmonella are quite prevalent in raw sewage.
- Sewage sludge → agricultural land ------ > enteric virus

THANK YOU FOR ATTENTION