SEAFOOD SAFETY
THE MICROBIAL ASPECT

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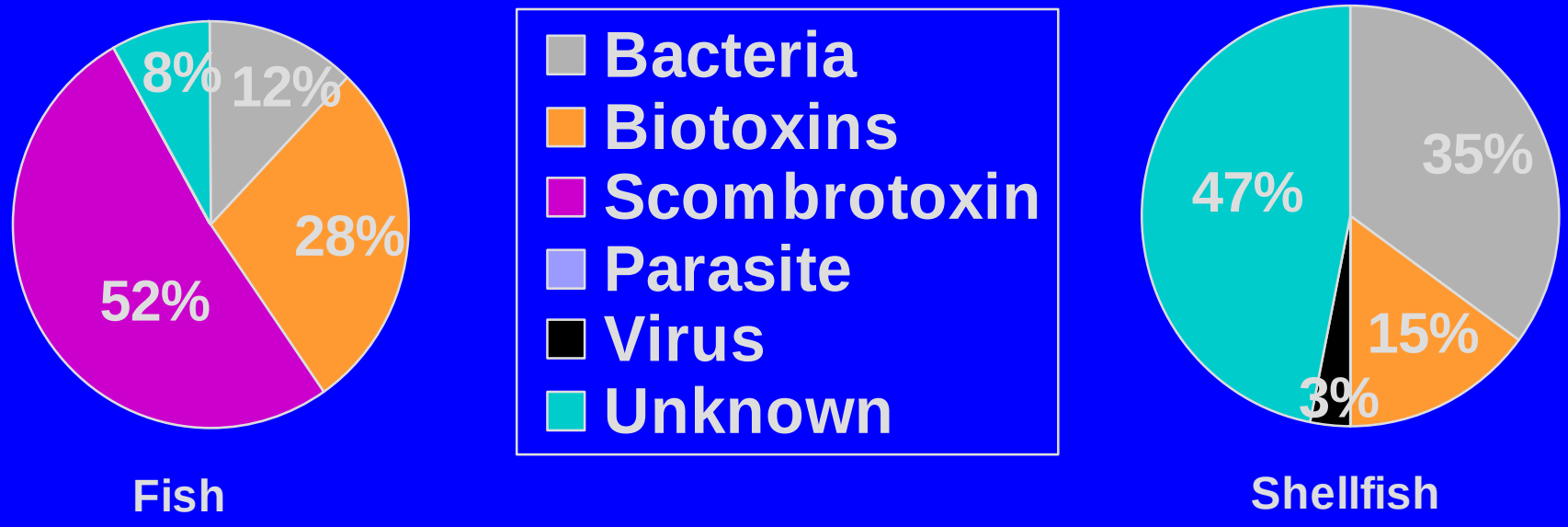
Food safety is becoming more important in food market due to several structural changes in the world food system

- Advancements in the science of public health, public awareness of risk
- Changes in how consumers obtain and prepare food
- Increased International and European trade

Statistics of seafood-borne disease

- 10 to 20% of all food-borne outbreaks are attributed to seafood

the largest food poisoning outbreaks have been associated with seafood



USA 1988-1992 (Bean et al. 1996)

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Microbial hazards in seafood

- Indigenous micro-organisms
  - *Clostridium botulimum* type E
  - *Vibrio* spp. (*parahaemolyticus, cholerae, vulnificus* …)
  - *Aeromonas hydrophila*
  - *Listeria monocytogenes*
  - *Salmonella* (some species) in tropical water
  - Micro-algae (paralytic, diarrheic, neurotoxic, amnesic, azaspiracid toxin)

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Microbial hazards in seafood

- Indigenous micro-organisms

  Normally not a safety concern (too low level to cause disease) and adequate cooking eliminate those bacteria

Hazard concerns :

✓ Products in which growth is possible and which are eaten raw (*Vibrio* in Ceviche or Suchi, *L. monocytogenes* in lightly preserved fish)

✓ Scombroid and Clupeid fish kept at abuse temperature (>5°C) : histamine production

✓Shellfish which concentrate bacteria, virus and micro-algae

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Microbial hazards in seafood

- Micro-organisms present as result of animal/human faecal contamination

Those micro-organisms can be introduced in the aquatic environment or during post harvest handling and processing

- *Salmonella* spp
- *Shigella,* spp
- *Echerichia coli* O157
- *Staphylococcus aureus*
- Enteric virus

Serious problem (low dose can cause illness) in products eaten raw or insufficiently cooked

Risk	Seafood product	Agent
High	Mollusc (fresh or frozen)	virus, bacteria, toxin from micro-algae (heatstable)
	Raw fish (Ceviche, Suchi)	Indigenous bacteria (*Vibrio* spp)
	Lightly preserved fish products (NaCl<6% WP, pH>5) : lightly salted, marinated, cold-smoked, gravads …	Growth of indigenous bacteria (*L. monocytogenes* in CSF, production of toxin from *C. botulimum* in insufficiently salted products
	Mildly heat processed : pasteurised, precooked, hot smoked …	Recontamination with enteric bacteria
	Scombroid fish	Histamine production
Low	Fish and crustacean after cooking	Ciguatera in tropical fish
	Semi preserved fish (NaCl>6% WP, pH<5, preservatives) : salted, dried, dried-salted marinated fish, caviar …	Recontamination with enteric bacteria
	Heat processed (sterilised, canned …)	*C. Botulinum* spores

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Approach to seafood safety management

- Controlling initial level of hazard
  - ✓ limitation of the faecal pollution in coastal area and in aquaculture ponds (development of « Good Aquaculture Practises »)
  - ✓ monitoring the harvesting area and seafood products (detection and typing methods for virus, toxic algae and bacteria should be improved)

Approach to seafood safety management

- Preventing an increase in the level of the hazard
  - Post-harvest contamination (GMP, GHP, HACCP)
  - Growth in the product
    - storage conditions and preservatives, predictive microbiology model
    - Growth of *L. monocytogenes* in lightly preserved fish is still a problem
- Reducing the level of a hazard
  - Removing or destroying pathogens (classical thermic process or alternative food preservation technologies)
- Consumer information

Some research priorities

- Detection and typing methods

Virus → Technique of detection and identification
Virus → Indicators (bacteria, bacteriophage … ?)

Micro-algae → Molecular technique of detection and identification of algae
Micro-algae → Routine technique of extraction and identification of toxin

Bacteria → Rapid methods of detection and identification
Bacteria → Indicators

- Limitation of growth of *L. monocytogenes* in lightly preserved fish
- Development of alternative food preservation technologies which preserve fish quality
- Rigorous validation of predictive microbiology model