HACCP WORKSHOP

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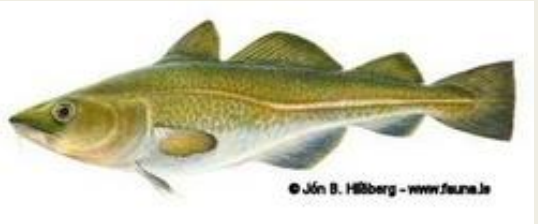
Co-funded by the Erasmus+ Programme of the European Union

What is HACCP?



- Stands for "Hazard Analysis Critical Control Point“
  - Designed to ensure food safety
- The idea is to prevent components that can threaten the safety of food during production rather than to conduct tests of manufactured goods afterwards
  - Was developed in the second half of the sixties and early seventh
- Designed as a method for ensuring a safe food space flights which were under preparation

What is HACCP?

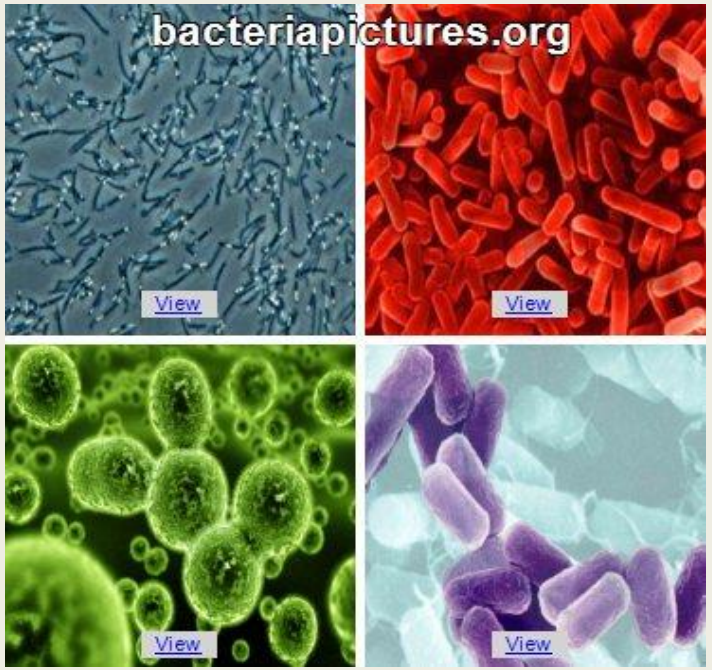
- NASA looked to a large producer Pillsbury to produce food for space flights
  - Important to develop a preventive methods exploring
    - Ingredients
    - Process
    - Environment
    - Storages
    - Distribution

What is HACCP?

- Registration system designed with data that can be tracked to ensure food safety
  - Less waste of food products
    - *Traceability of all the data necessary*
  - Necessary to keep the record of the fish from the beginning
  - Where was the fish caught
    - Name of the boat etc.

What is HACCP?

- Preventive quality control
  - If correctly done and the system properly designed then you can have control over all parts of the food that could somehow cause hazards
    - Denaturing agents
    - Pathogenic microorganisms
    - Dangerous foreign objects
    - Production methods
    - Instructions for consumers
    - Misleading instructions for storage



What is HACCP?

- Systematic approach for monitoring food
  - Conditions during production
  - Treatment
  - Storage
  - Packaging
  - Distribution
  - Operating instructions for consumers
  - **Analysis of this nature allows us to determine the "critical control points" (CCP) during the entire process**

What is HACCP?

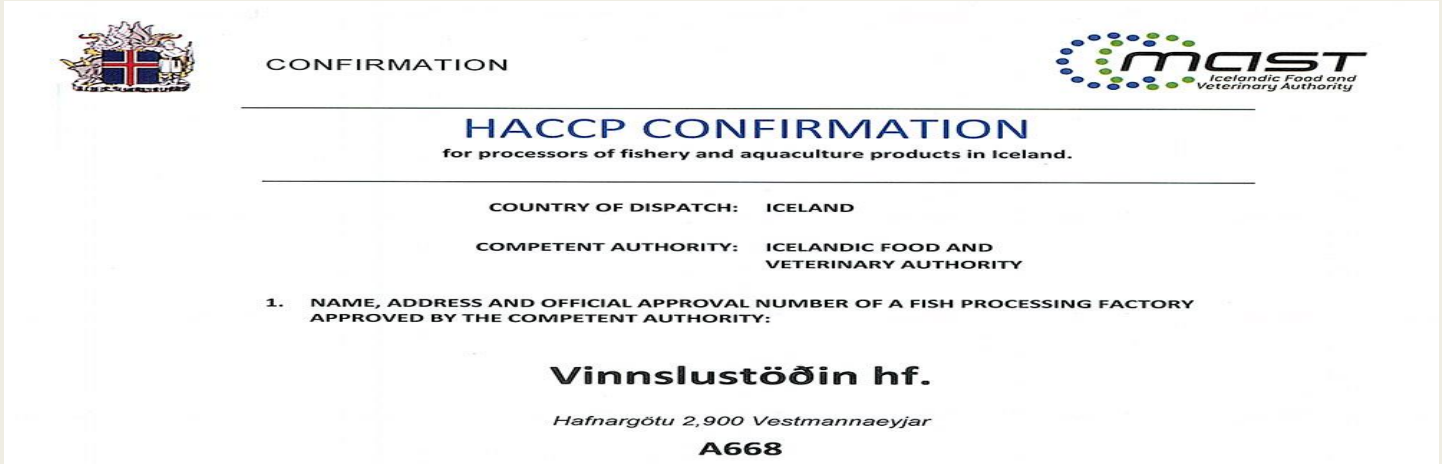
- Analysis is needed to check out each step of the process what could go wrong to locate critical control points
- Important to identify what hazards may be present and how to respond to them
  - The presence of micro-organisms
  - Parasite
  - Heavy metals
  - Toxic
  - Dangerous foreign objects
  - Chemical risk
  - Production processes such as heating, pasteurisation etc.

What is HACCP?

- Important to evaluate the entire production cycle with factors that could affect food safety
  - It is necessary to think about all aspects of food production that might somehow compromise the safety and health of the consumer
    - Housing
    - Environment
    - Staff
    - Storages
    - Transport
    - Distribution
    - How does the consumer use the product

What is HACCP?

- Was first presented to the public in 1971
  - Pillsbury was given the task to educate FDA (Food and Drug Administration) staff of this new method for ensuring food safety
  - Did not properly start until after 1985
  - In 1987 this procedure was the basis of restructuring the internal control of the fishery products
  - Preparation began in Iceland in 1992
  - Regulation 522/1994 on food hygiene assumed that all companies would have HACCP before the end of 1995



CONFIRMATION

MAST Icelandic Food and Veterinary Authority

HACCP CONFIRMATION

for processors of fishery and aquaculture products in Iceland.

COUNTRY OF DISPATCH: ICELAND

COMPETENT AUTHORITY: ICELANDIC FOOD AND VETERINARY AUTHORITY

1. NAME, ADDRESS AND OFFICIAL APPROVAL NUMBER OF A FISH PROCESSING FACTORY APPROVED BY THE COMPETENT AUTHORITY:

Vinnslustöðin hf.

Hafnargötu 2,900 Vestmannaeyjar

A668

What is HACCP?

- Best Practices (good manufacturing practice)
  - Housing, the environment around the factory, floors, ceilings, windows, maintenance, walls, equipment, hygiene, storage, ventilation, materials, lighting, doors, recall of materials, design, hand washing, drains, the withdrawal of equipment, water and ice, toilet, contacts food, staff facilities, training, cleaning and disinfection, pestcontrol, cooling, waste, traceability, raw materials
    - It is necessary to go over all these terms, among others
      - It is important to write down all these concepts and even more
        - And it is important to work with each one of them

Food organizaton of Iceland (Matvælastofnun)

- Á heimasíðu Matvælastofnunar er að finna fyrirtaks samantekt um „Góða starfshætti fyrir matvælafyrirtæki“

- Mast.is ⟹ Matvælastofnun ⟹ Innra eftirlit ⟹ Góðir starfshættir

What we need to do before the actual HACCP system is established

- Boats
  - *Need to be properly designed and cleaned to be able to handle delicate foods*
    - Need to be designed so it is easy to clean and hygiene the boat
    - Enough clean water available
    - Containers, tables and other surfaces in contact with the raw material should be easy to clean and sanitize
      - *Avoid dirt that can cause microbial contamination*

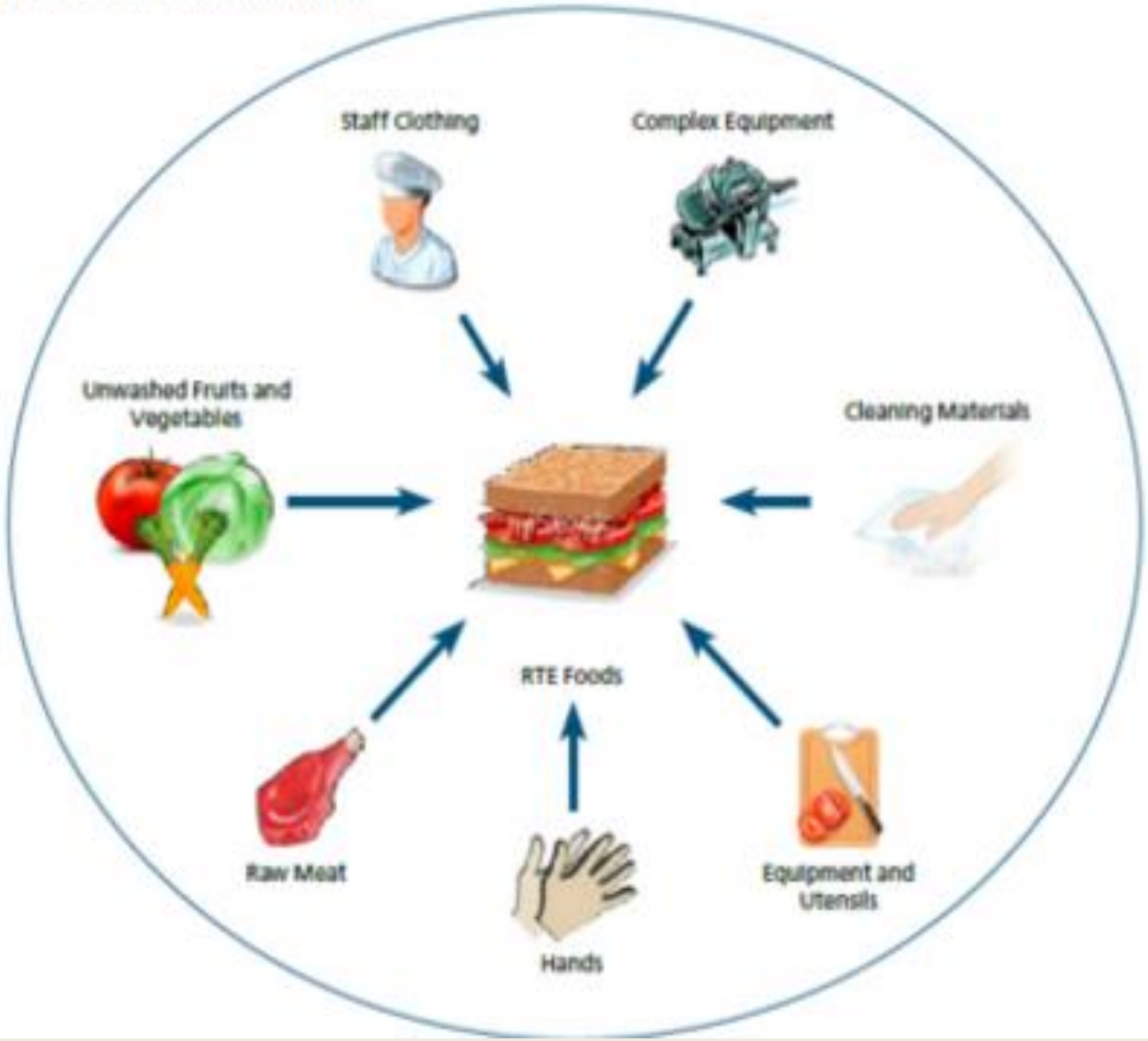
What we need to do before the actual HACCP system is established

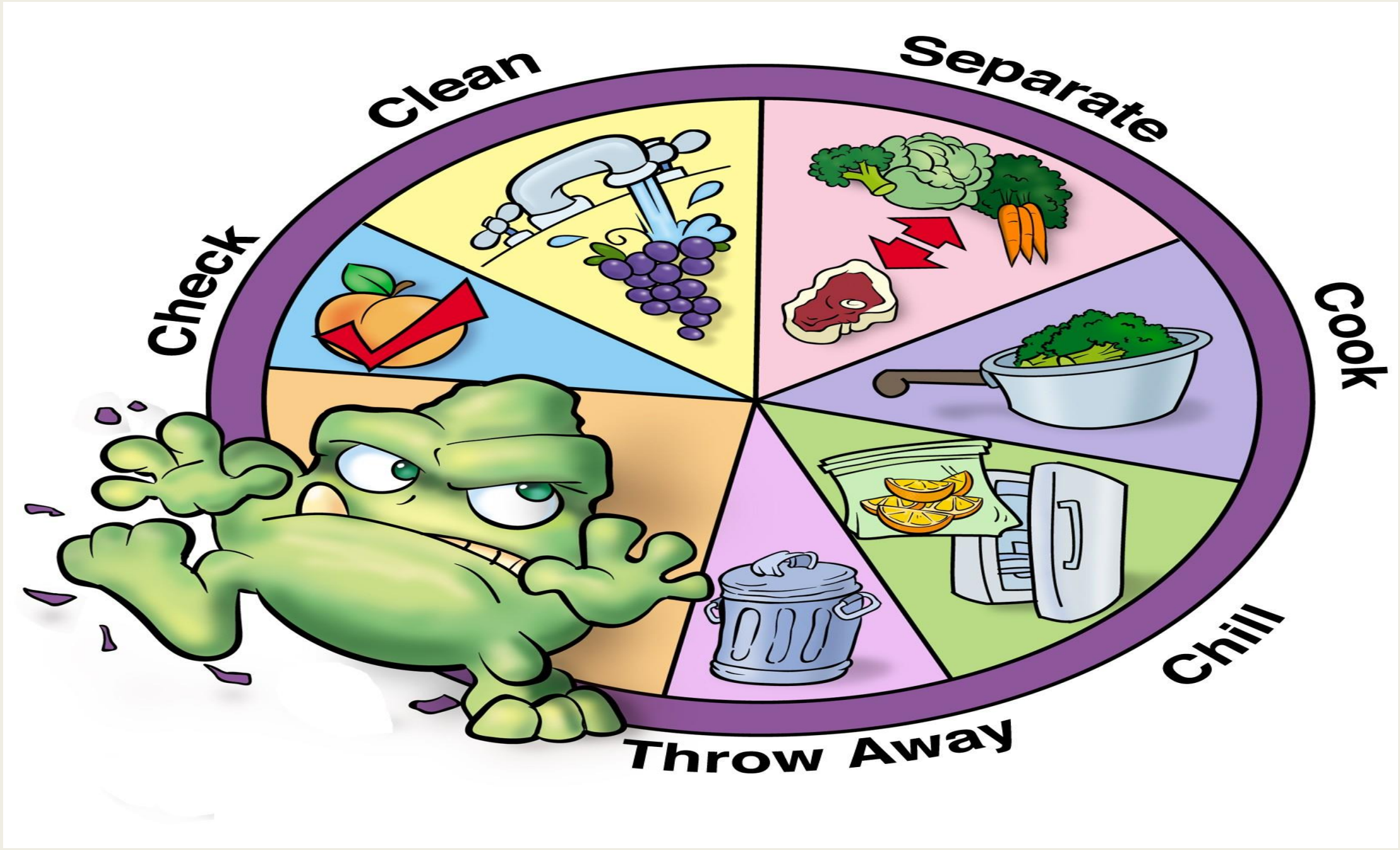
- Boats
  - *Ensure good conditions for treating the raw material*
    - Bleeding and gutting
    - Enough clean water for washing
    - Enough amount of refrigerant from clean water or/and uncontaminated seawater
    - No risk of contamination the fish caused by undesirable substances
      - *Smoke, oil, grease or wastewater*
      - *Toilet facilities*
        - Must be met along with the options to clean working clothes and tools

What we need to do before the actual HACCP system is established

- Housing design and the working environment
  - *Minimize all possible delays in the process*
  - *Prevent cross-contamination of finished products and raw materials*
  - *Important to ensure safe cooling all the time*

Figure 1: Examples of cross-contamination




Clean
Separate
Check
Cook
Chill
Throw Away

What we need to do before the actual HACCP system is established

- Housing design and working environment
  - *Ensure that the facility is designed with regards to cleanliness and hygiene*
    - Surfaces, walls and floors with a flat impermeable material
    - All surfaces raw material (fish products) comes into contact with
      - *Corrodible*
      - *Light colors*
      - *Smooth surface*
      - *Easy to clean*

What we need to do before the actual HACCP system is established

- Housing design and working environment
  - *Floor*
    - Adequate water gradient
    - Drains, supply and drainage will not overload even though the intensity is great
    - Ceilings and ceiling lights
    - Do not accumulate dust and other impurities that are capable of falling down on the processing lines
    - Corners shall be rounded to make cleaning easier

What we need to do before the actual HACCP system is established

- Housing design and working environment
  - *Processing Steps*
    - The surface should be made of good materials, be smooth and impermeable
      - *Not possible to contaminate the product*
      - *Enough of running water*
        - Rinsing
        - Cleaning
    - Light
      - *Ensure that the broken glass will not be able to affect the products*

What we need to do before the actual HACCP system is established

- Housing design and working environment
  - *Trash and/or waste*
    - Prevent accumulation
    - No dangerous substances where production takes place
  - *Washbasins and toilets*
    - Separated from the production area
  - *Processing Area*
    - Prevent the animals from entering the processing area
      - *Birds*
      - *Insect*
      - *Pests*
    - Good lightning necessary

What we need to do before the actual HACCP system is established

- Design of machines and tools
  - *Design machinery, equipment and tools with regards to how to clean and hygiene the processing area*
    - How to remove easily water and/or dirt
      - *Good drainage system is present*
  - *Use only approved soaps and detergents*
    - Ensure that the raw materials and products get undamaged through all the processing line

What we need to do before the actual HACCP system is established

- Cleaning program
  - *Prevent the accumulation of waste*
  - *Prevent fish from contamination*
  - *Remove all substances that can ruin raw fish products*
  - *Monitor*
    - The health of all the employees
    - Pest control
    - Cleaning and disinfection systems
    - Quality and safety of water and refrigerants

What we need to do before the actual HACCP system is established

- Cleaning program
  - *The Fishing Vessels should for example have their own plan and the manufacturing companies another one that fit their plans*
    - Neccesary to review plan every time any changes occur
      - *One part of the program should for example focus on responsible hygiene during processing*

What we need to do before the actual HACCP system is established

- Standard cleaning and disinfection procedure consists of the following factors
- Preparations
  - *Remove all the fish*
  - *Put plastic cover over sensitive devices and containers*
  - *Use a scraper or shovel to get rid of waste that is too big to go into drains*

What we need to do before the actual HACCP system is established

- Rinsing ⟹ remove visible dirt and waste
- Cleaning ⟹ remove visible dirt and waste
- Washing ⟹ clean with purified water and remove all visible dirt
- Disinfection ⟹ use approved chemicals to get rid off most of the bacteria from the surface
- Final rinsing ⟹ clean off the disinfectant with purified water
- Storage ⟹ store all chemicals, cleaning equipement and utensils
- Inspection ⟹ complete or not?

What we need to do before the actual HACCP system is established

- The cleaning staff should be trained
  - *Know how to use equipment and chemicals*
  - *How to open the machines to guarantee satisfactory cleaning*
  - *Important to have someone who is responsible for cleaning procedures*

  Important to have maintainance plan
    - Machinery, equipment, housing, drainage system
      - *Important to have workers that monitor these things regularly*
- Pest control
- Water potable, clean and within regulation limits
- Make sure that all waste is removed regularly

What we need to do before the actual HACCP system is established

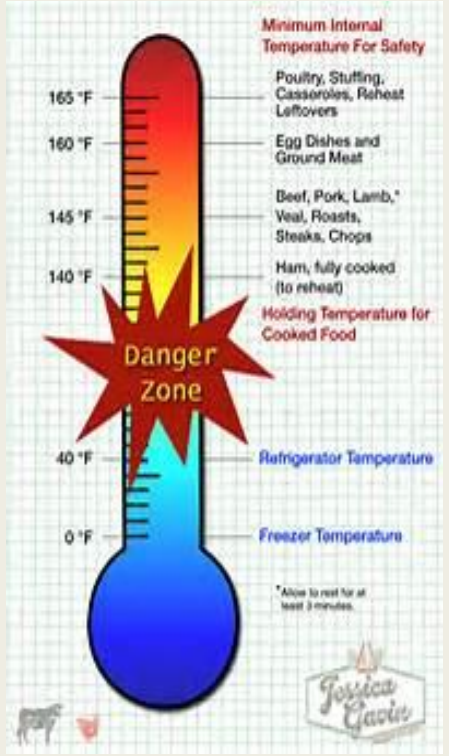
- Cleanliness and health of employees
  - *The building meets the requirements for sanitation*
  - *Guarantee that employees with serious infectious diseases or open wounds do not come close to the production and/or transportation of food*
  - *Guarantee that all employees wear protective clothing*
    - Gloves
    - Hair-nets
    - Footwear
    - Guarantee good access to sinks
      - *Emphasize on hand washing before you start working and every time after coffebreak, lunch e.t.c.*

What we need to do before the actual HACCP system is established

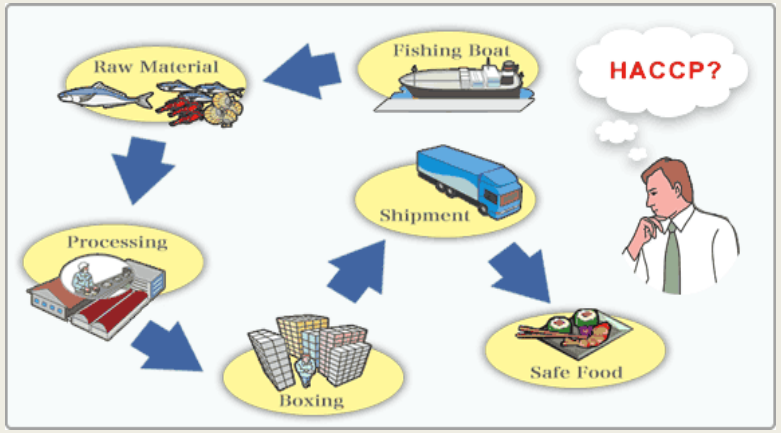
- Follow these sympol rules on what should be strictly forbidden in food processing areas
  - *Smoking*
  - *Spitting on the floor*
  - *Chewing gum*
  - *Eat*
  - *Sneezing or coughing over unprotected food*
  - *Jewelry*

What we need to do before the actual HACCP system is established

- Transportation
  - *Transport space is impermeable, smooth and easy to clean*
    - Cooling
    - Cooler close to 0°C
    - Freezer higher than -18°C
    - Do not use open trucks
      - *Temperature*
      - *Sun*
      - *Wind*
      - *Accessibility of birds*



What we need to do before the actual HACCP system is established



- Traceability and recall
  - *Necessary part of good practice*
    - Traceability by using batch labeling
      - *Each unit of product that goes on the market must be clearly marked manufacturer and batch number*
      - *Get rid of fish products if they are not good enough*

What we need to do before the actual HACCP system is established

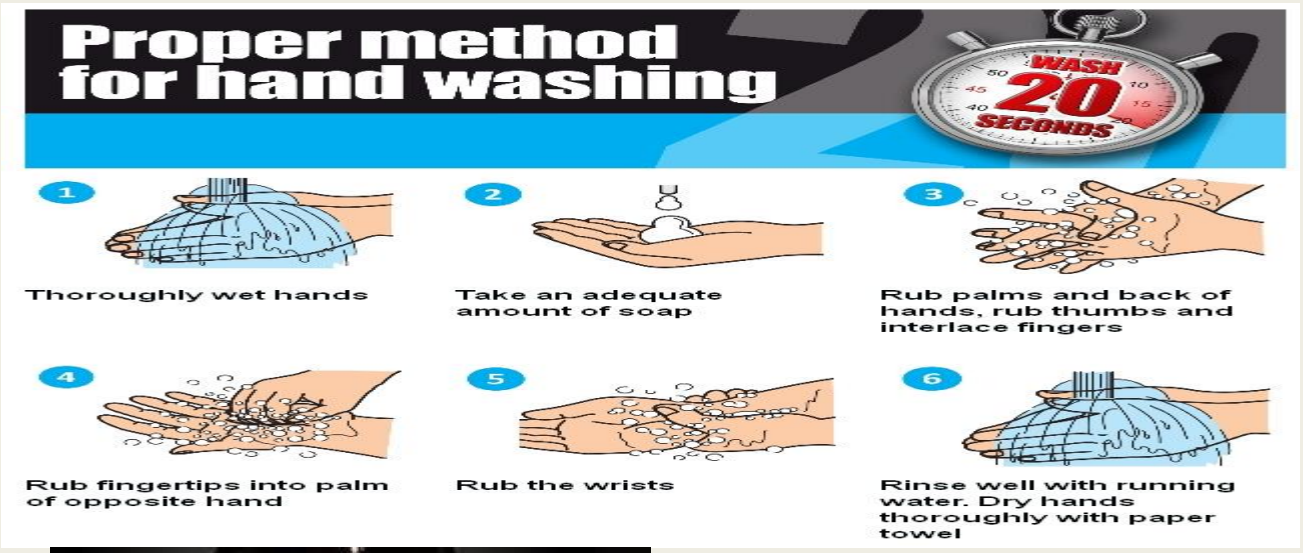
- Recall is very costly for all companies
  - *The American Food Producers' Association found that in 2011 recalls cost American companies billions of dollars every year*
    - Direct costs
      - *Remove products from store shelves*
      - *Get new warehouse supplies*
      - *Recall products from consumers*
      - *Report to regulators, consumers, retailers and partners*
      - *Security deviation investigation*
      - *Disposal of recalled goods*
    - Indirect cost
      - *The company's reputation*
      - *Bad brand*
    - Reputation and consumer safety are one of the main concerns for companies

What we need to do before the actual HACCP system is established

- Training
  - *Teaching and training of workers is the key to success*
    - Guarantee safe and wholesome seafood
    - Work with strong detergents (sanitation agents)
    - Train employees on how to work with HACCP and other systems that are made to guarantee quality and safety
    - HACCP can only work if employees have received appropriate training
      - *Important to maintain such training and be open for changes*

TRAINING PLAN

- All staff are expected to attend courses in food hygiene and handling, and as a minimum obtained a Food Handling Certificate or equivalent qualification.
- Team Leaders, managers and Food Safety Supervisors are expected to have obtained a current Food Safety Supervisors Certificate. This certificate must remain with 3 years of currency.
- Records of training are kept maintained in the Human Resources Department.
- Site Managers are to arrange orientation of new staff, agency staff of casual staff.

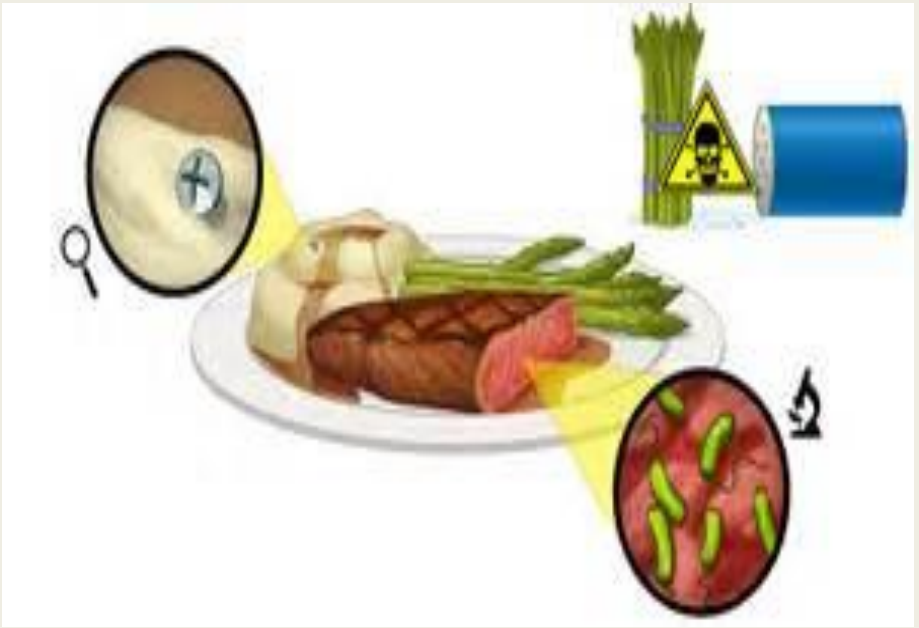

Proper method for hand washing
WASH 20 SECONDS
1
Thoroughly wet hands
2
Take an adequate amount of soap
3
Rub palms and back of hands, rub thumbs and interlace fingers
4
Rub fingertips into palm of opposite hand
5
Rub the wrists
6
Rinse well with running water. Dry hands thoroughly with paper towel


Restrooms

Bacteria Multiplication

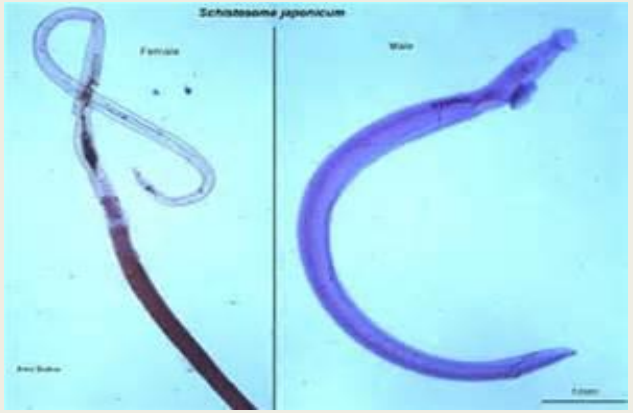
A complete guide to hand washing

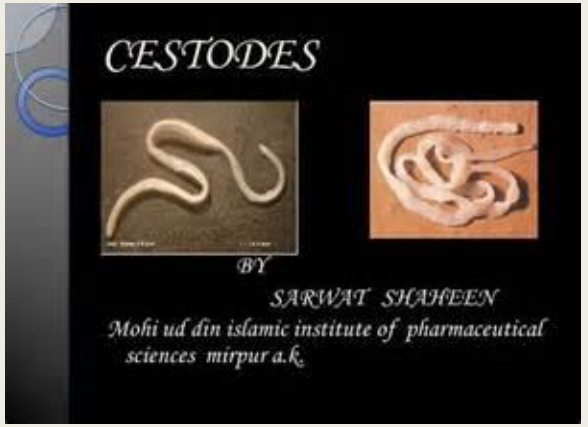
Definition of risks



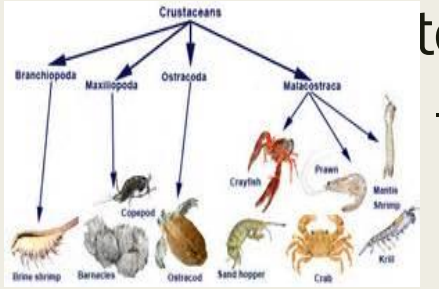
- Biological hazards
  - *Bacteria and parasites*
    - HACCP is about to prevent damage to producers and consumers
- Chemical hazards
  - *Could be all substances*
    - Only dangerous if quantity of these substances exceed certain limits
- Physical hazards
  - *Things that should not be present in food*

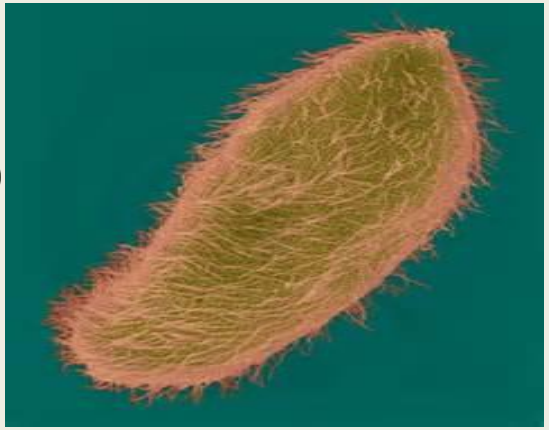
Definition of risks

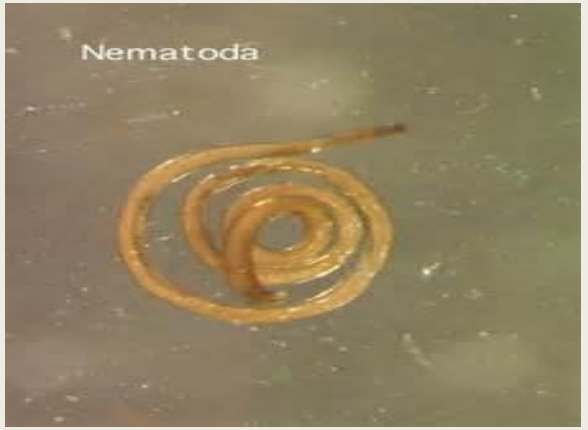


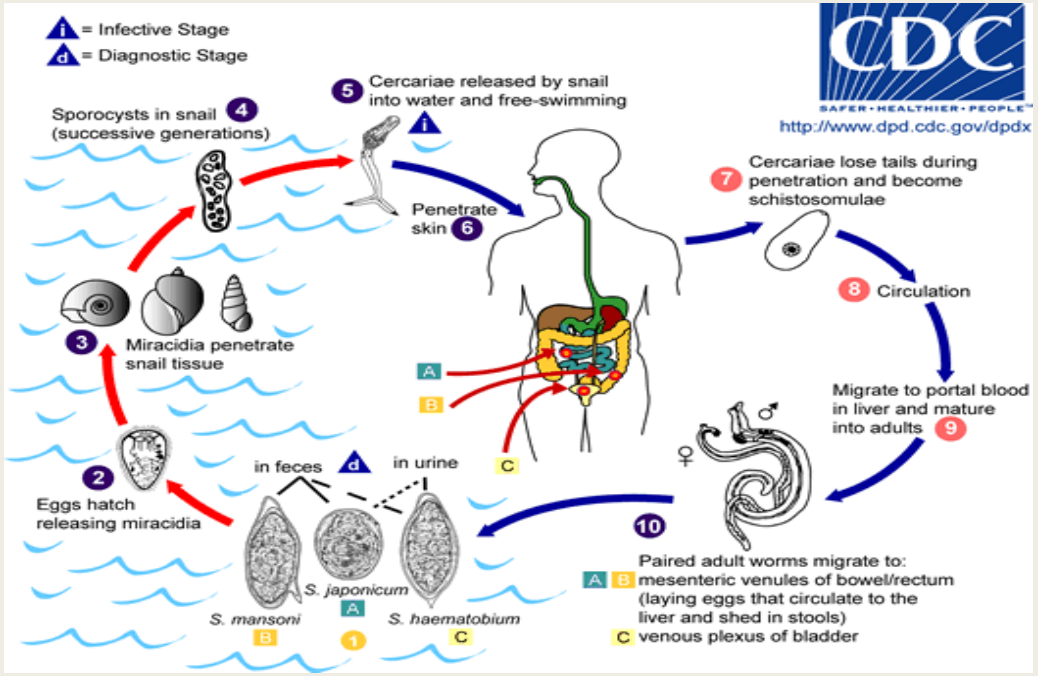


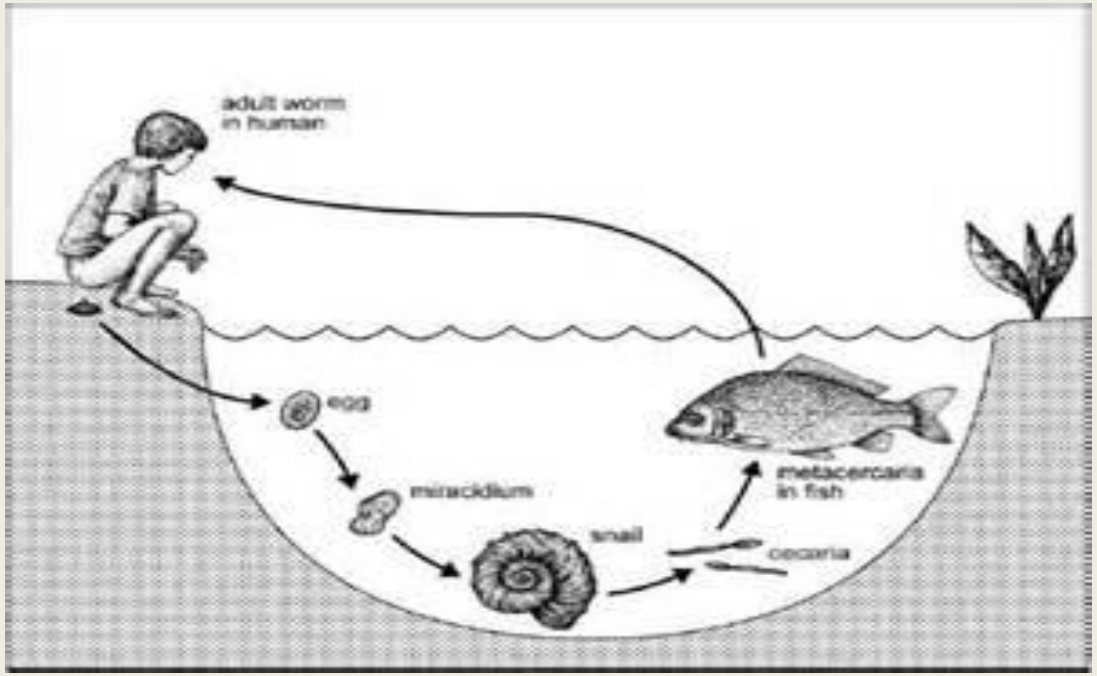
- Biological hazards
  - *Parasites*
    - Fish carry considerably amounts of parasites, most of them invisible to the naked eye
      - *Roundworms (cause infections in people who eat poorly cooked or raw fish and shellfish)*
        - Nematoda (þráðormar)
        - Cestodes (bandormar)
        - Trematodes (flatormar)
      - *Crustaceans (krabbadýr)*
      - *Fish lice (fiskilýs)*
      - *Gill worms (tálknormur)*
      - *Protozanes (ýmis frumdýr)*
        - Do not cause infections in people

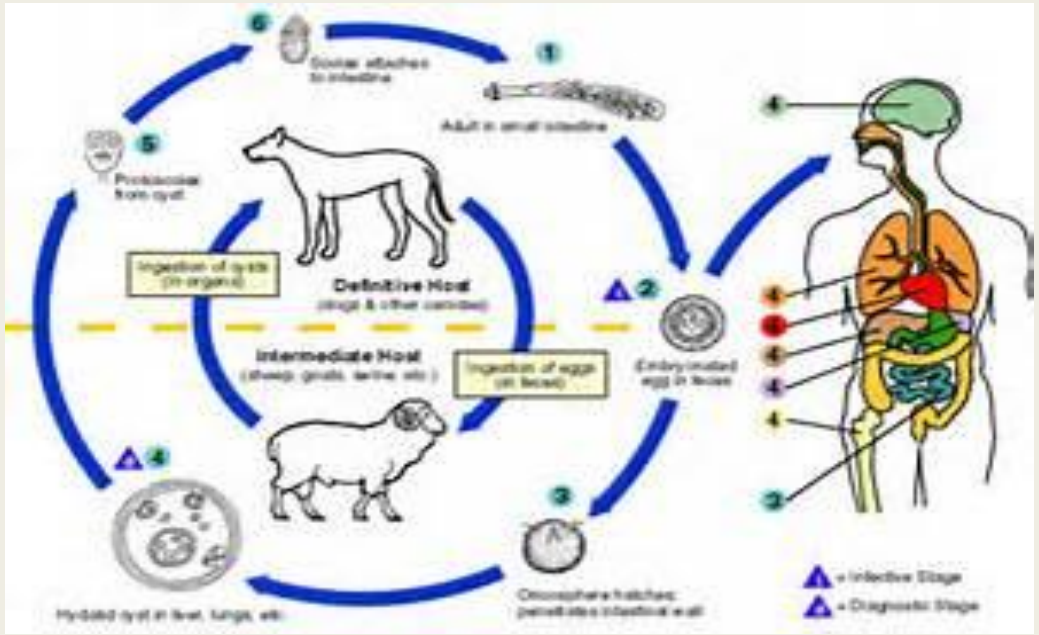


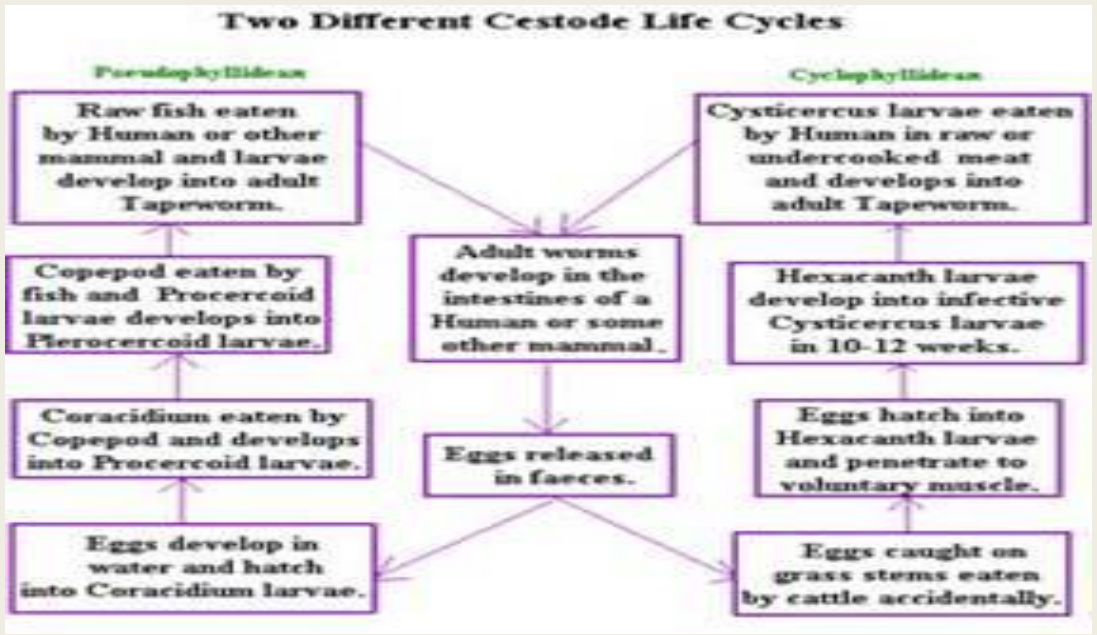


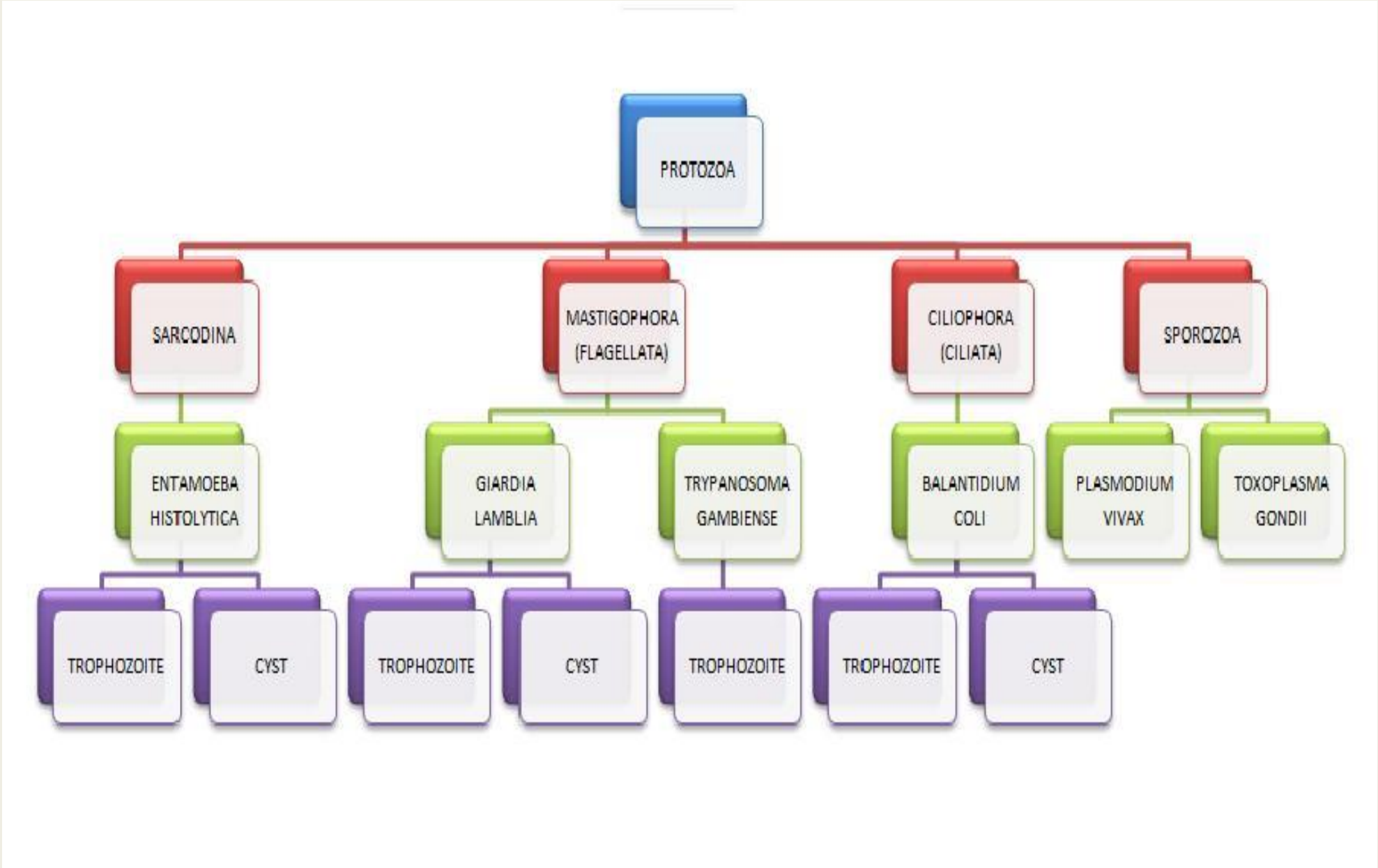



i = Infective Stage
d = Diagnostic Stage
CDC
SAFER·HEALTHIER·PEOPLE
http://www.dpd.cdc.gov/dpdx
5 Cercariae released by snail into water and free-swimming
Sporocysts in snail (successive generations) 4
Penetrate skin 6
7 Cercariae lose tails during penetration and become schistosomulae
8 Circulation
Migrate to portal blood in liver and mature into adults 9
3 Miracidia penetrate snail tissue
2 Eggs hatch releasing miracidia
in feces
in urine
10
Paired adult worms migrate to:
A B mesenteric venules of bowel/rectum (laying eggs that circulate to the liver and shed in stools)
C venous plexus of bladder
S. japonicum
S. mansoni
S. haematobium


adult worm in human
egg
miracidium
snail
cercaria
metacercaria in fish


Definitive Host
Intermediate Host


Two Different Cestode Life Cycles
Raw fish eaten by Human or other mammal and larvae develop into adult Tapeworm.
Copepod eaten by fish and Procercoid larvae develops into Plerocercoid larvae.
Coracidium eaten by Copepod and develops into Procercoid larvae.
Eggs develop in water and hatch into Coracidium larvae.
Adult worms develop in the intestines of a Human or some other mammal.
Eggs released in faeces.
Cysticercus larvae eaten by Human in raw or undercooked meat and develops into adult Tapeworm.
Hexacanth larvae develop into infective Cysticercus larvae in 10-12 weeks.
Eggs hatch into Hexacanth larvae and penetrate to voluntary muscle.
Eggs caught on grass stems eaten by cattle accidentally.

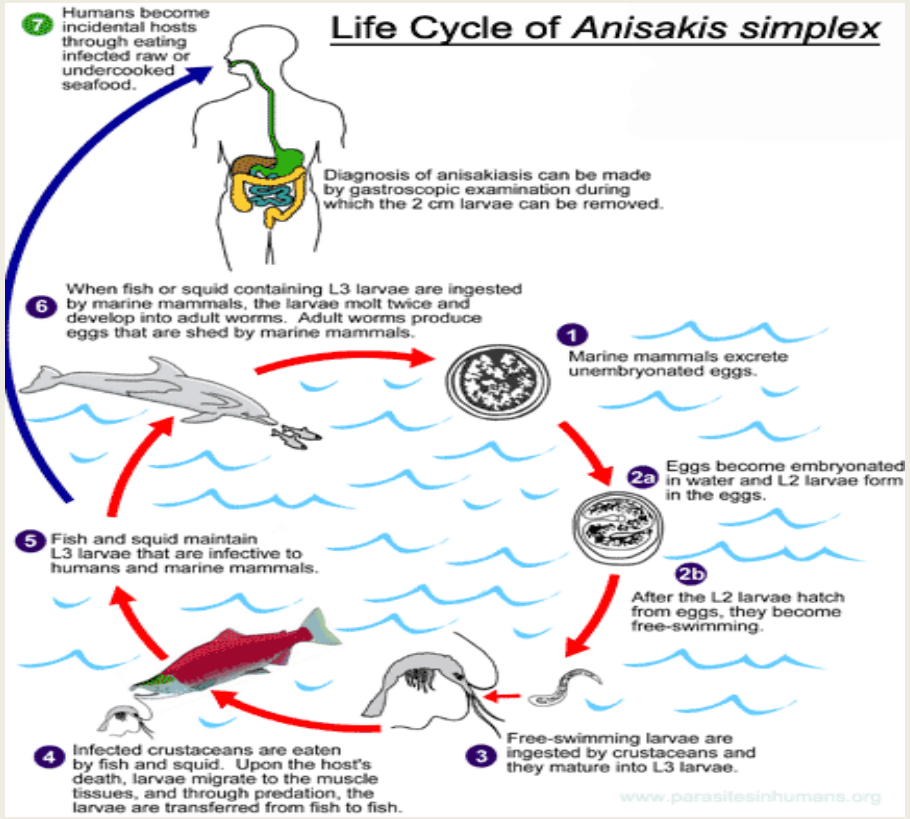

PROTOZOA
SARCODINA
MASTIGOPHORA (FLAGELLATA)
CILIOPHORA (CILIATA)
SPOROZOA
ENTAMOEBA HISTOLYTICA
GIARDIA LAMBLIA
TRYPANOSOMA GAMBIENSE
BALANTIDIUM COLI
PLASMODIUM VIVAX
TOXOPLASMA GONDII
TROPHOZOITE
CYST
TROPHOZOITE
CYST
TROPHOZOITE
TROPHOZOITE
CYST

Definition of risks

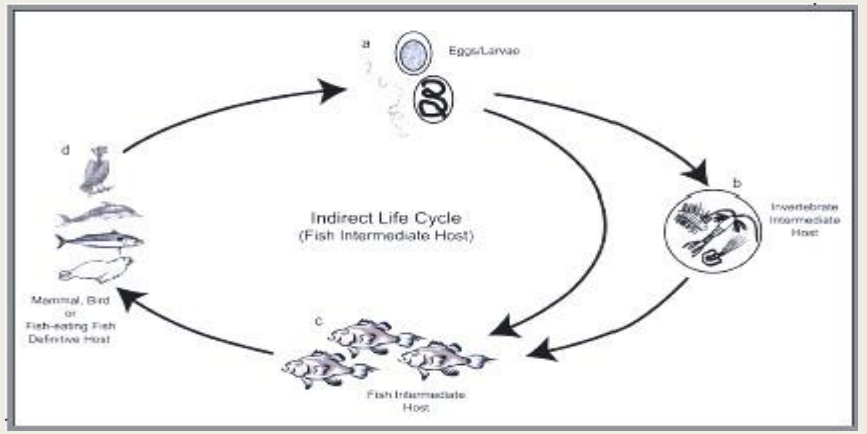
- *Parasites (Sníkjudýr)*
  - *Food Regulation EU No 1276/2011 consumption of raw fish*
    - -20°C for at least 24 hour
    - -35°C for at least 15 hour
  - *Kill all parasites other than trematodes (flatorma)*
  - *Putting the fish in salt reduces the risk of getting parasites but will not eliminate the risk*
  - *Putting the fish fillets through a lightbox where parasites are cut off or removed from the fish will reduce the risk but will not eliminate the risk at all*

Definition of risks

- Parasites (sníkjudýr)
  - *Nematodes (þráðormar) (Found in liver, abdominal and flesh of marine fish)*
    - Anisakis species
    - Capillaria species
    - Gnathistoma species
    - Pseudoteranova species



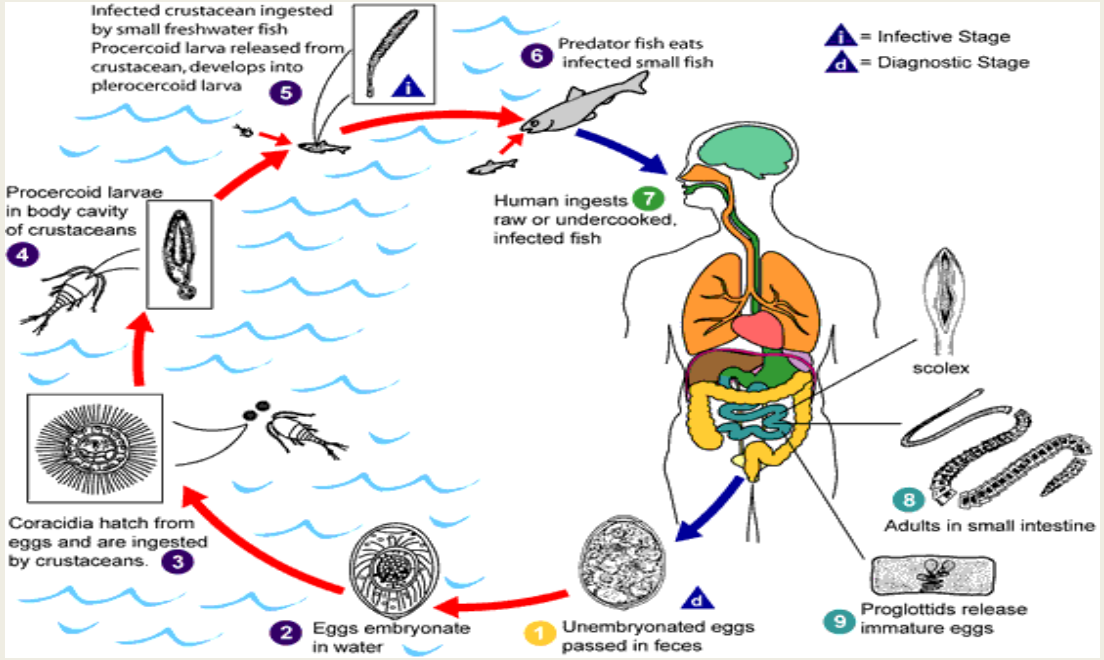
Definition of risks



- Parasites (sníkjudýr)
  - *Nematodes (þráðormar) (Found in liver, abdominal and flesh of marine fish)*

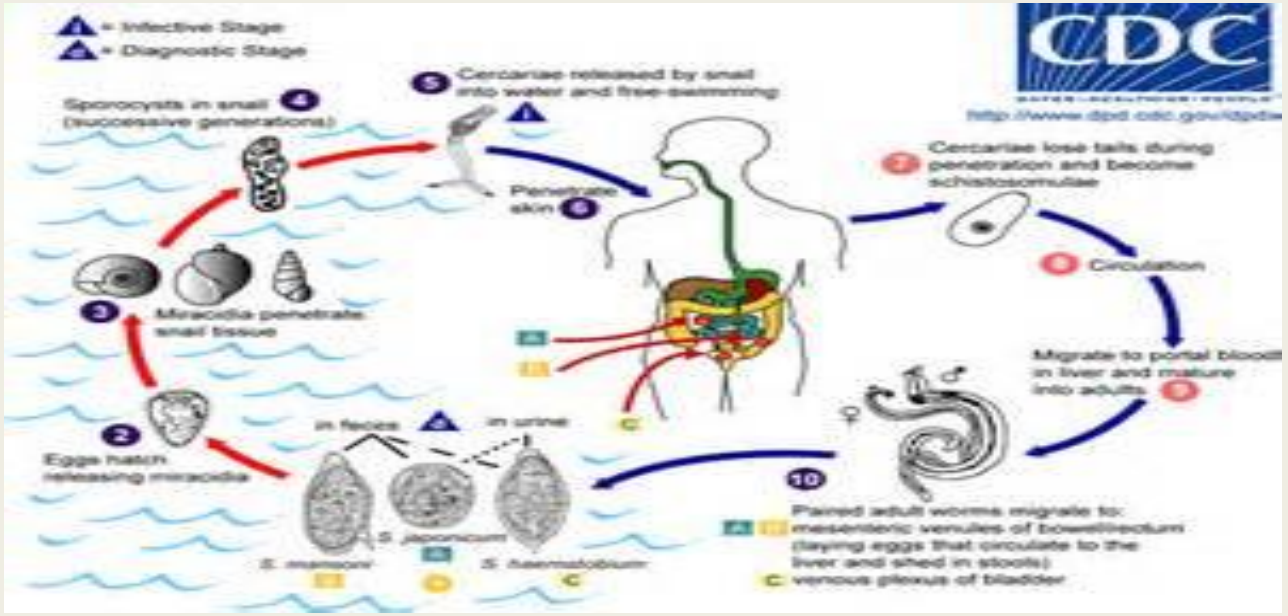
- Pseudoteranova decipiens (seal worm (selormur), cod worm (þorskormur))
- Anisakis simplex (whale worm (hvalormur) or herring worm (síldarormur))
- Cause infections in people
  - *Killed if the temperature rises above 60°C for one min.*
  - *Or under -20°C for 24 hour*

Definition of risks

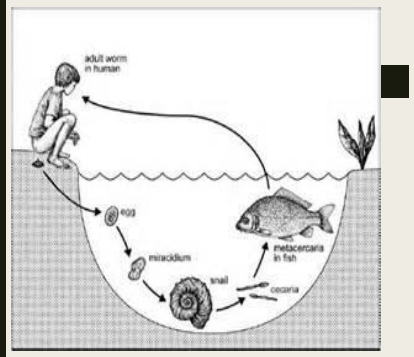


- Parasites (sníkjudýr)
  - *Cestodes (bandormar) (Found in liver, abdominal and flesh of marine fish)*
    - Dibothriocephalus latus
      - *Found in both fresh water and salt water worldwide*
        - Same techniques used to kill tapeworms (cestodes (bandorma)) and roundworms (nematoda (þráþorma))

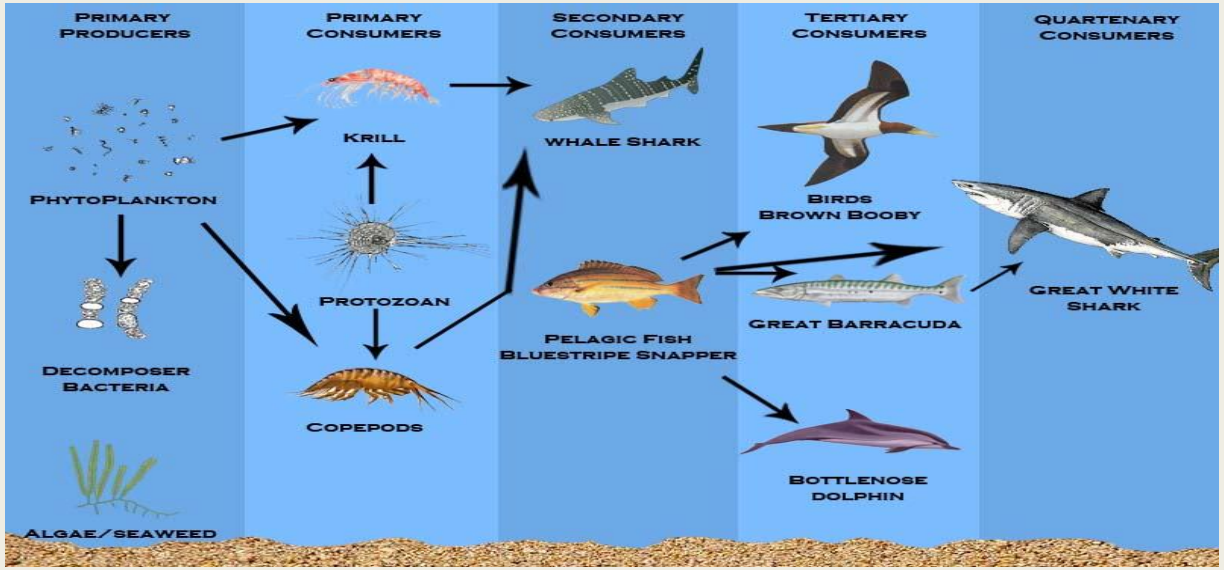
Definition of risks



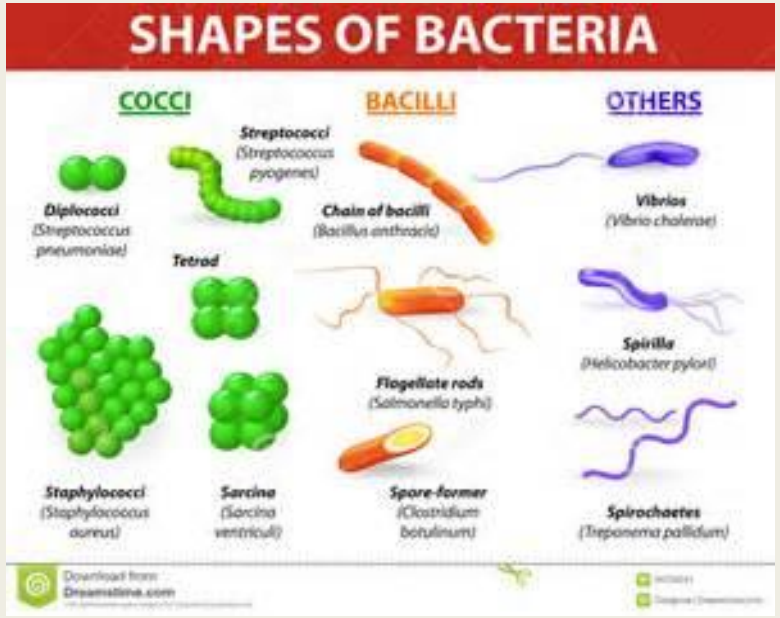
- Parasites (sníkjudýr)
  - *Trematodes (flatormar) (Found in liver, abdominal and flesh of marine fish)*
    - The most important final host for trematodes (flatwor
      - *Humans*
      - *Other mammals*
    - Infection occurs with the consumption of raw or poorly cooked products
      - *Kill at -20° C for seven days or -35° C for 24 hours.*



Definition of risks

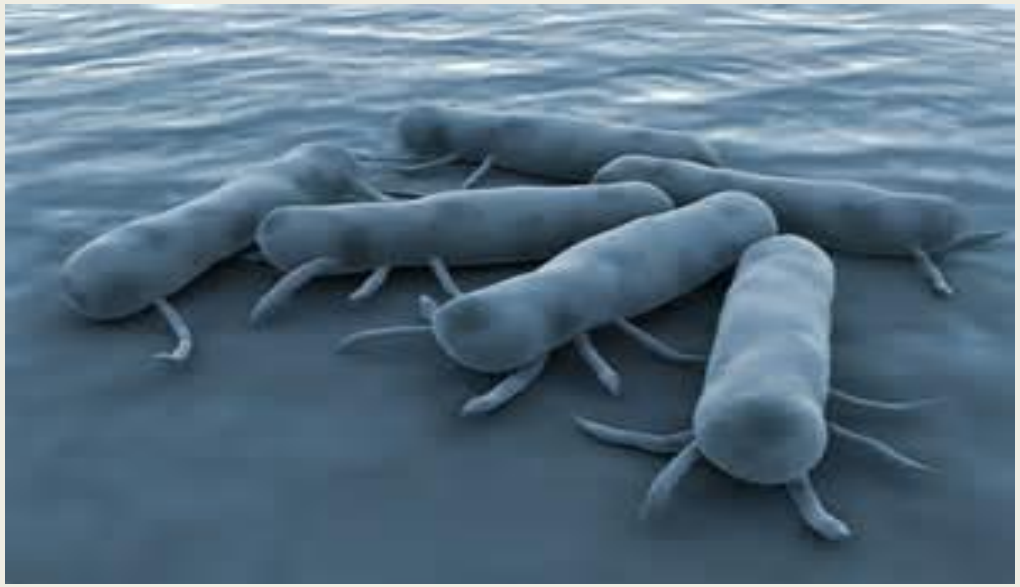


- Microbes (bacteria)
  - *Environment and how much bacteria is in the water/sea will tell you about the level of bacteria in the fish*
    - Temperature
    - Salt content
    - Fishing around large communities
    - Quantity and quality of feed
    - Handling of fish



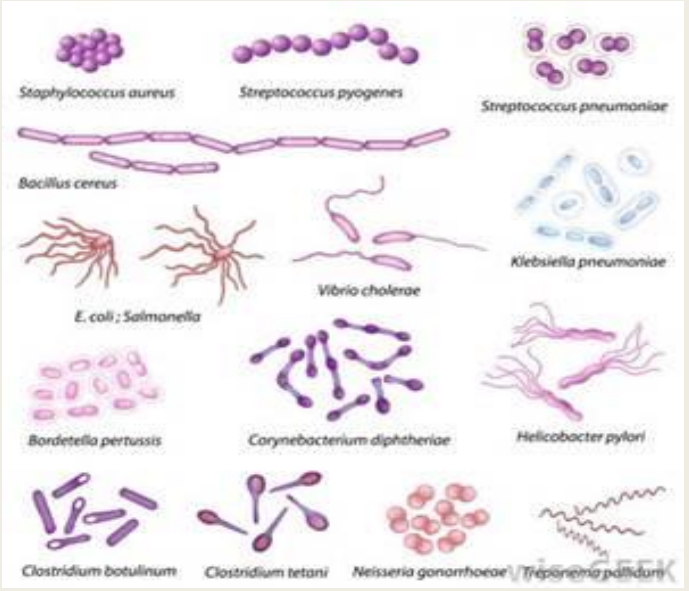
Definition of risks

- Microbes (bacteria)
  - *Fish muscle*
    - No bacteria
  - *We find bacteria*
    - Skin
    - Gills
    - Abdominal cavity



Definition of risks

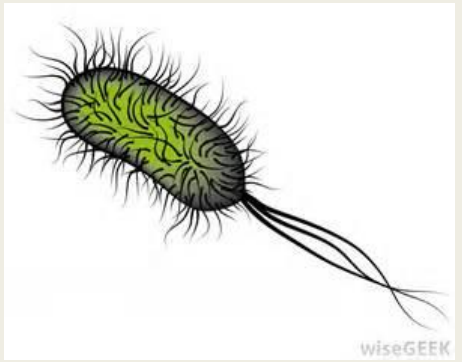
- Microbes (bacteria)
  - *Two large groups of bacteria that could contaminate the fishing catch*
    - Belong to a particular area and are a natural part of the environment
    - Is present because of contamination
      - *Drainage*
      - *Industrial companies*
      - *Residential areas*



Definition of risks

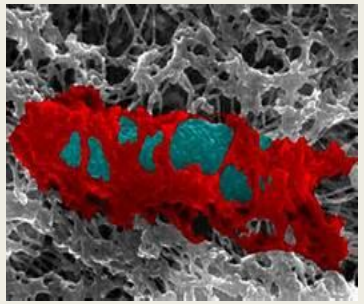
- Microbes (bacteria)
  - *Are part of the invironment and can cause disease*
    - Bacteria that do not cause food poisoning grow faster than bacteria that causes food poisoning
      - *The fish become damaged and smelly before pathogenic microorganisms create a risks*
    - Aeromonas hydrophyla
    - Clostridium botulinum
    - Vibrio species, little danger around Iceland because they do not grow below 10°C (how about Denmark?)
      - *Vibrio parahaemolyticus*
      - *Vibrio cholerae*
      - *Vibrio vulnicus*
    - Listeria monocytogenes

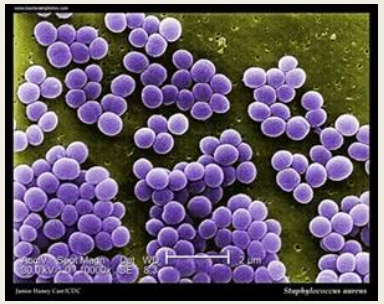
Definition of risks



- Microbes (bacteria)
  - *Pathogenic micro-organisms resulting from pollution*
    - Important to heat fish products over 75°C to kill all the bacteria
    - Store the fish at low temperatures 0-4°C
    - Prevent cross contamination
      - *Enterobacteriaceae (iðragerlar)*
      - *Salmonella species*
      - *Shigella species*
      - *Escherichia coli*

    - Other species that have been isolated in fish and causes food borne illnesses
      - *Edwardsiella tarda*
      - *Pleisomonas shigeloides*
      - *Yersinia enterocolitica*
      - *Staphylococcus aureus*
        - Can produce heat resistant toxins





Foodborne infections in EU group infections (EFSA, 2010)

- 2005-2010: Were 32,915 group infections
  - *4.106 because of viruses*
- The biggest and most serious was the bean sprout issue
  - *E-coli contaminated bean sprouts*
    - Summer of 2011
      - *Origin of Egypt*
      - *The disease started in Germany, but spread to other countries like France, caused death of many people in different countries*

Coli bacteria

- Coli bacteria are many different type of soil microorganisms/bacteria and can e.g. entered a food companies with impurities/dirt
- Measurement of coliform bacteria is a common test to assess the health and hygiene of food in its production
- Faecal coliforms are found in human and animal faeces and can enter food through contact with humans and animals directly or indirectly
  - *Direct: e.g. by the hands of the people*
  - *Indirectly: e.g. from contaminated water or due to cross-contamination during slaughter/gutting*

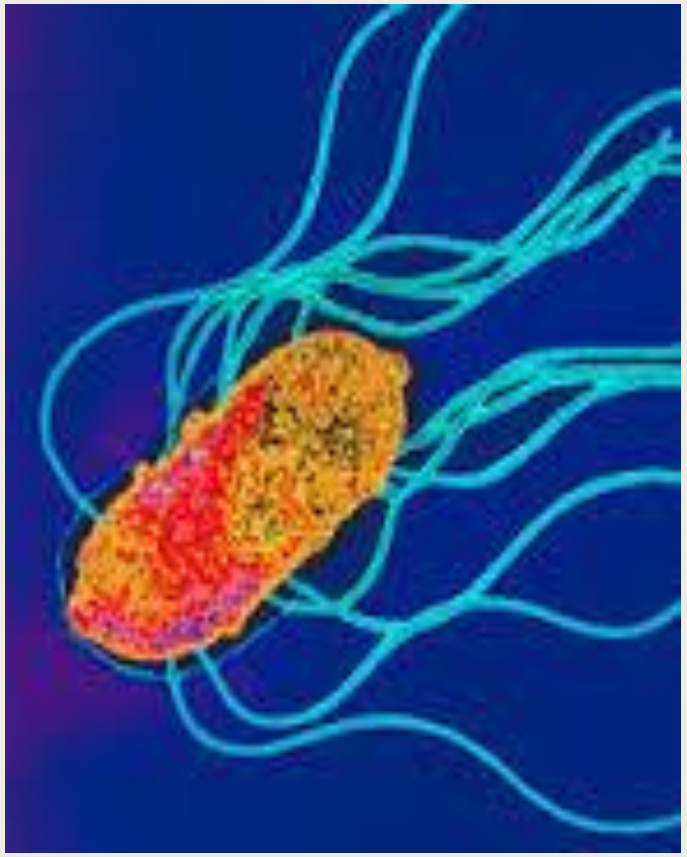
E. coli

- EHEC infections - E.coli that produce toxins
- E.coli 0157 - the hamburger bacterium
- E.coli 0104 - In Germany 2011
- Faecal contamination - directly or indirectly into meat – vegetables
- MAST took samples from 169 cattle farms in 7 districts between January 2010 and January 2011 to investigate whether salmonella or E. coli 0157 could be detected in the samples
  - *All the samples turned out to be negative*
- The institute says that these are good results and it can be concluded from the study that E. coli and salmonella are unlikely to be transmitted to people with Icelandic cattle products
- In 2019 it changed and E. coli was found in cattle farm in Iceland a lot of people got sick

Listeria monocytogenes

- Found in soil, rotting plant and animal remains
- Often found in raw foods
  - *Has been found in fish products, dairy products, meat, Processing environment*
- May be present in cooked foods with cross-contamination
- Can grow in the range of 1-45°C
- May cause miscarriage, sepsis and meningitis

Salmonella



- Found in the gastrointestinal tract of animals, soil and contaminated water - transmitted by birds – animals
- Has been found in Iceland in all livestock, pets, pests and birds
- Heat over 70°C or (64-65°C for 10 min) will kill them
- Can continue to multiply up to 10% salt (brine)

Campylobacter

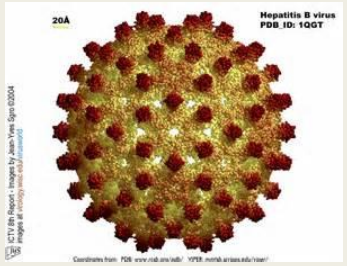
- Natural habitat: Digestive tract of livestock, poultry, birds and pests
- From there, the bacterium can enter drinking water, raw milk and go elsewhere
- In Iceland, chickens have been the main cause of infections the last few years (15-20 years), individuals become infected easily if we don´t cook the chicken through
- Highly heat sensitive, dies on heating at 48°C for 13 minutes or 55°C for 1 minute

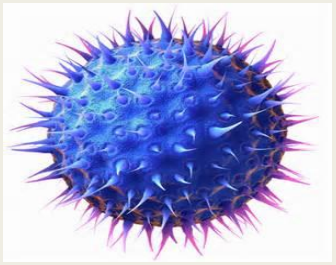
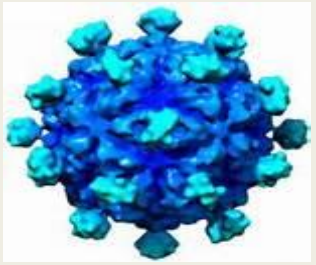
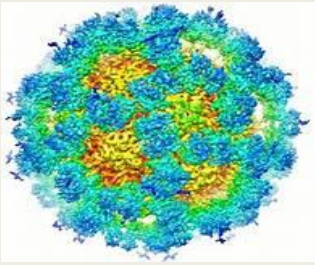
BIOLOGICAL HAZARDS TO FOOD SAFETY

BIOLOGICAL HAZARD	Campylobacter jejuni	Salmonella	Shigella spp.	Listeria	Vibrio spp.	Escherichia coli (E. coli)	Bacillus cereus	Staphylococcus aureus	Clostridium botulinum	Clostridium perfringens
CLASSIFICATION	Infection	Infection	Infection	Infection	Infection	Infection	Intoxication	Intoxication	Intoxication	Intoxication
SYMPTOMS	Diarrhea (bloody) Abdominal cramps Fever Headache	Diarrhea Abdom. cramps Vomiting Fever Headache Nausea	Diarrhea (bloody) Abdominal cramps Chills, Fever Dehydration	Nausea, Fever Vomiting, Chills • life-threatening to suseptible • spontaneous abortion of fetus	Vomiting Diarrhea Abdominal cramps Chills, Fever Headache	Abdominal pain Nausea, Vomiting Diarrhea (bloody) Kidney failure Death	Vomiting Diarrhea	Vomiting Acute abdominal cramps Diarrhea	Headache Double vision Weakness Difficult to speak or swallow Death	Abdominal pain Diarrhea
ONSET	2-5 days	6-48 hours	1-7 days	1-3 days	2-48 hours	12-72 hours	6-12 hours	2-6 hours	12-36 hours	8-22 hours
COMMON FOODS	• Raw poultry • Raw milk • Raw meats • Contaminated water	• Undercooked / raw eggs, beef, poultry, pork • Dairy products • Cream-filled desserts	• Poultry • Raw vegetables • Milk & Dairy • RTE salads	• RTE deli meat • Hot dogs • Raw meat, poultry,veggies • Seafood salads • Unpasteur. milk	• OYSTERS ! • Crabs, Clams, Shrimp, Fish, Lobsters	• Undercooked or raw ground beef • Produce	Vomiting type: Rice, pasta & potatoes Diarrhea type: Meats, milk & vegetables	• Pre-cooked & RTE foods • Vegetable & Egg salads • Milk & Dairy • Complex food preparations	• Low acidic food • Food in metal cans • Vacuum-packed • Garlic or onions stored in oil • Home-canned	• Meat • Vegetables • Spices • Poultry • Stews / gravies • Improperly cooled foods
CAUSES	Cross contamination	Cross contamination by contact with: raw foods, food contact surfaces, workers	• Fecal contaminated water • Food & utensils contaminated by infected workers	• Cross contamination • Improperly cooked foods	• Cross contamination • Eating raw and undercooked seafood	• Meat contaminated during slaughtering • infected not washing hands	Improperly cooked or hot-held foods	• Cross contamination • Saliva near food • Improper tasting • Recontamination	• Improperly canned food • Reduc'd oxygen packaging • Temp abused	Improperly cooled or reheated foods
PREVENTION	• Cook to proper temperatures • Avoid cross contamination between raw & cooked or RTE foods • Wash hands after touching raw animal food	• Cook to proper temperatures • Clean, sanitize food-contact surfaces • Wash hands • Prevent cross contamination	• Exclude infected workers • Cook foods to proper internal temperatures • Prevent cross contamination • Ensure facility has potable water to wash produce & foods	• Cook foods to proper internal temperatures • Prevent cross contamination • Practice safe food handling • Practice FIFO to ensure timely use of foods	• Buy seafood from approved sources • Cook seafood to proper temps • Avoid eating raw or lightly cooked seafood	• Cook ground meats to at least 155°F for 15 seconds • Practice proper personal hygiene • Avoid cross contamination	• Cook foods to proper internal temperatures • Cool foods rapidly to 41°F or below before storage • Hold hot foods at 135°F or higher	• Use single-use gloves properly • Cover infected wounds • Proper hand-washing • Proper tasting techniques • Proper temperature controls	• Purchase from approved sources • Inspect canned food for damage • Discard or refuse damaged cans	• Cook foods to proper temps • Cool foods fast 135°F to 70°F in 2 hrs and 70°F to 41°F in 4 hrs (=6 hrs) • Reheat to 165°F within 2 hours • Hold hot foods 135°F or above

Definition of risks

- Viruses
  - *Hepatitis A*
  - *Calici*
  - *Astro*
  - *Noro*
  - *Shellfish that is caught or cultivated in inshore areas could become contaminated with pathogenic viruses because how close they are to contaminating sewage system*
    - Residential areas
    - Industry
    - Farms
  - *Infections can be traced to faecal contamination*

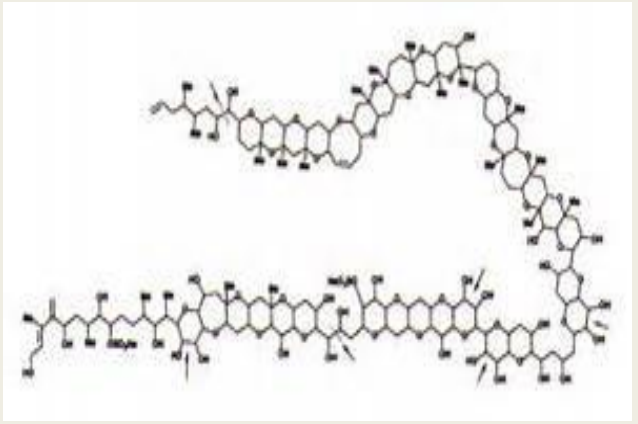


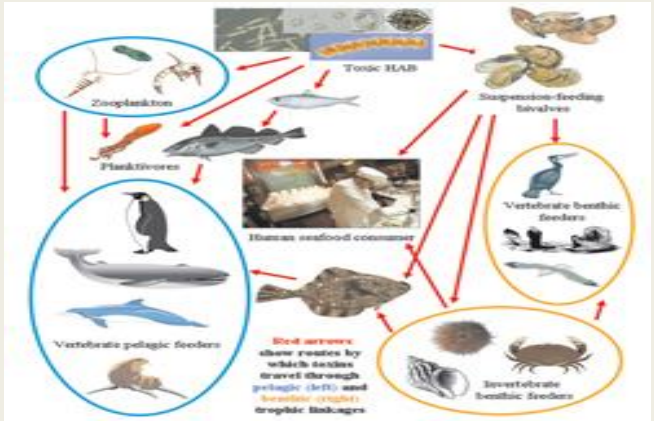




Definition of risks

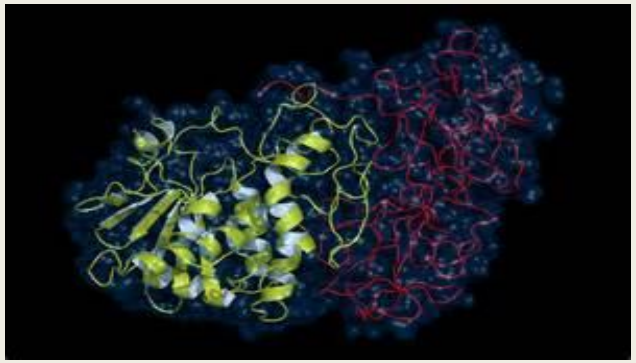
- Viruses
  - *Depend on living cells and will not multiply outside the host cell*
    - Therefore is it difficult to detect their presence and types
    - It is best to monitor faecal bacteria contamination in water or processing environment
  - *Heating shellfisk to 85-90 ° C enough to kill the viruses*

Definition of risks

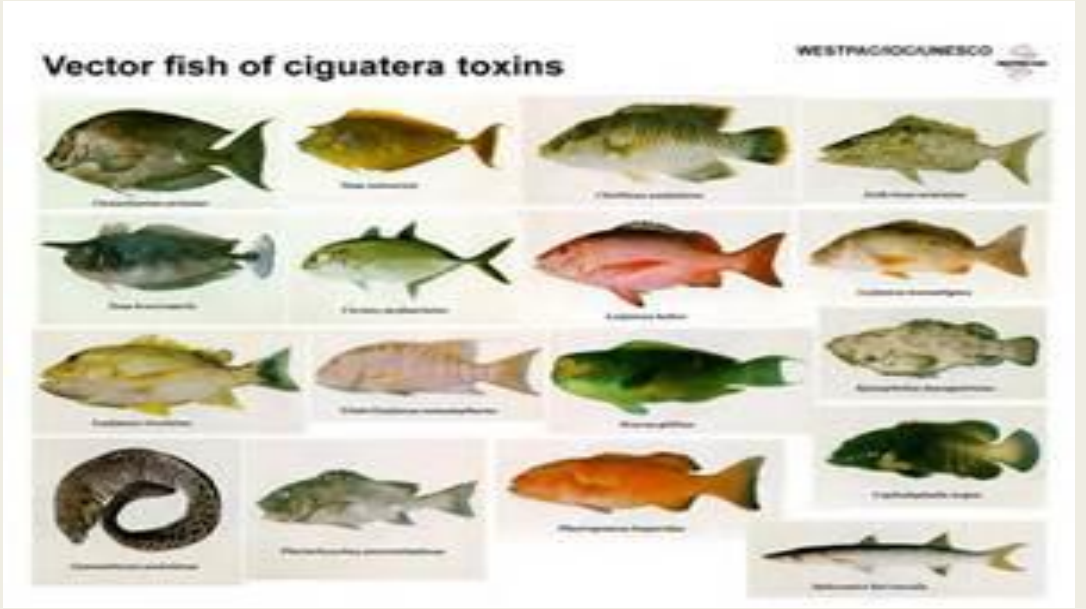




- Biotoxins
  - *400 toxic fish species can been found around the world*
    - The toxin can be in certain organs or present only part of the year
    - In blood and/or distributed to all tissues in the fish
    - Types of eel species (álategundir in the Adriatic Sea (Adriahaf), moray eel (moray áll) and stone pains (steinsugur), blowfish (blöðrufiskur)
      - *Heat resistant (hitaþolin)*

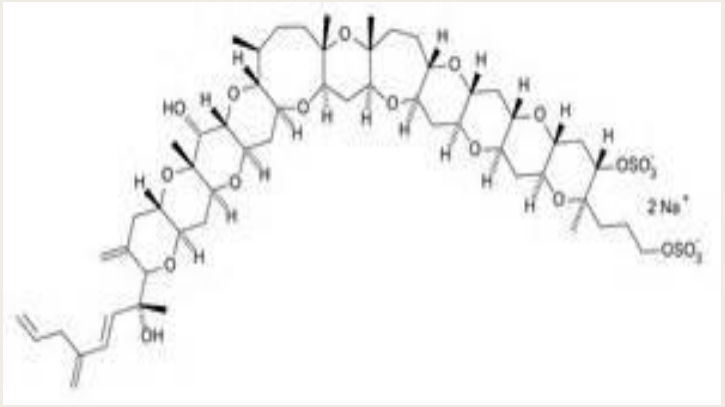


Definition of risks



- Phycotoxins
  - *Ciguatoxin*
    - Tropical coral reefs
      - *The origin of the toxin is from phytoplankton*
        - We will find phytoplankton mostly in fish that eat other fish
        - Heat resistant poison

Definition of risks



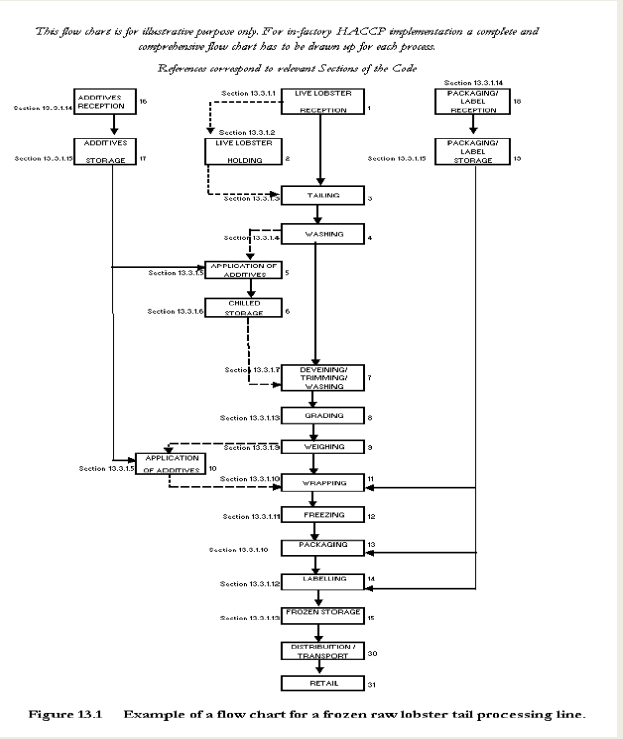
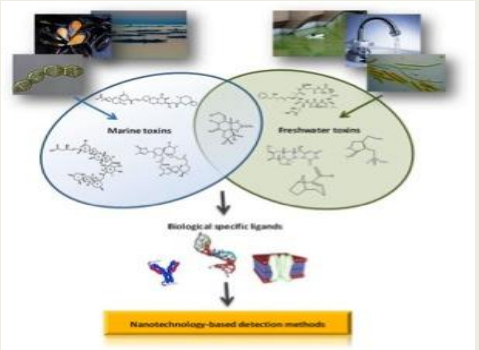


Figure 13.1 Example of a flow chart for a frozen raw lobster tail processing line.

- Phycotoxins
  - *PSP/DSP/NSP/ASP – shellfish poisoning (skelfiskeitrun)*
    - Shellfish
      - *Mussels (Kræklingur), Ocean Quahog (Kúskel), Oysters (Ostrur), Scallops (Hörpuskel)*
        - Filtration
          - *Mainly phytoplankton, accumulate in the tissues of the shellfish*
          - *Accumulate as well in tissues of fish*

Definition of risks



- Phycotoxins
  - *PSP/DSP/NSP/ASP – shellfish poisoning - Heat resistant (hitaþolin)*
    - **PSP-poisoning** or paralytic poisoning causes paralysis and even death
      - *Greatest danger because it can lead to acute death*
    - **NSP-poisoning** or neurotoxicity causing gastro and intestines disease and breathing difficulties
    - **DSP-poisoning** or diarrhea poisoning causing indigestion
    - **ASP-poisoning** or amnesia because of poisoning causing memory loss
    - Seaweed are causing the poisoning and we can find them almost everywhere around Iceland and Denmark
      - *Important to monitor the temperature of the sea and the increase of algae/seaweed from one year to another*

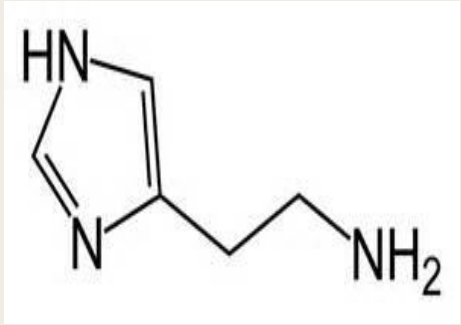
Definition of risks

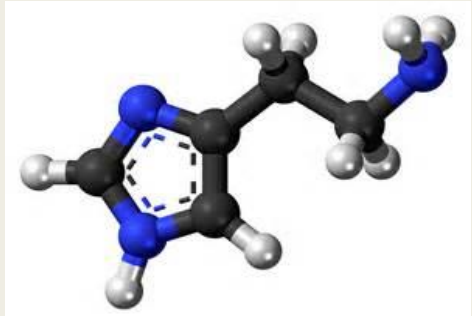
- Phycotoxins
  - *Tetrotoxin*
    - We will find it in blowfish („blöðru fiskum“)
      - *Most often in liver, roe or other internal organs, less frequently in the flesh*

- Speculation that the bacterial flora is responsible for the accumulation of this toxin/poison

Definition of risks

- Phycotoxins
  - *Scombrotoxin*
    - Histamine poisoning
      - *Rarely fatal*
      - *Mild symptoms*
      - *Rapid cooling and good handling procedures prevents the danger of forming this kind of poisoning*
      - *Heat resistant poison*
      - *You will not see whether the fish is with or without the toxin*
    - Microorganisms can produce high levels of histamine and related amines in fish muscle, we need to cool the fish-products down quickly after harvesting
      - *Tuna*
      - *Mackerel*
      - *Herring*





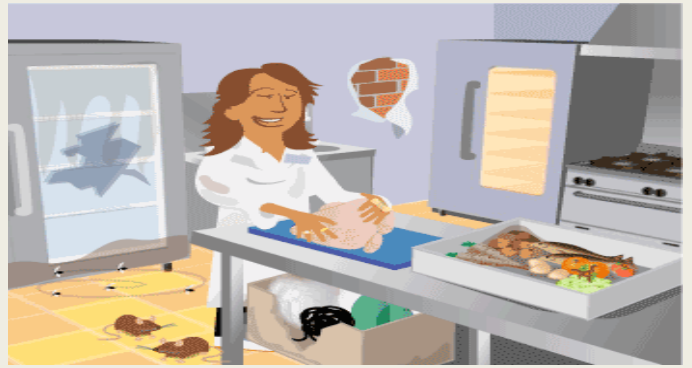
Biological Hazards

Bacteria (spore-forming)	Bacteria (non-spore-forming)	Viruses	Protozoa & Parasites
Clostridium botulinum	*Brucella abortis*	Hepatitis A and E	*Cryptosporidium parvum*
Clostridium perfringens	*Brucella suis*	Norwalk virus group	*Diphyllobothrium latum*
Bacillus cereus	*Campylobacter* spp.	Rotavirus	*Entamoeba histolytica*
	Pathogenic *Escherichia coli*		*Giardia lamblia*
	Listeria monocytogenes		*Ascaris lumbricoides*
	Salmonella spp. (*S. typhimurium, S. enteriditis*)		*Taenia solium*
	Shigella (*S. dysenteriae*)		*Taenia saginata*
	Staphylococcus aureus		*Trichinella spiralis*
	Streptococcus pyogenes		
	Vibrio cholerae		
	Vibrio parahaemolyitcus		
	Vibrio vulnificus		
	Yersinia enterocolitica		

Definition of risks

- Risks from chemicals (Chemical hazards)
  - *More likely that fish get contaminated close to land than fishing grounds farther away*
    - Chemical compounds
    - Persistent compounds
      - HCH, HCB, PCB, klórdan, DDT og TBT
    - Organic chlorine compounds
    - Heavy metals
      - Lead, cadmium, mercury, copper and zinc
    - Drugs may be present in aquaculture products
    - Oil
    - Cleansers
    - Other materials used during harvesting and processing

Definition of risks



- Physical hazards
  - *Physical hazards are either foreign materials unintentionally introduced to food products (ex: metal fragments in ground meat) or naturally occurring objects (ex: bones in fish) that are hazardous to the consumer*
  - *A physical hazard contaminates a food product at any stage of production. Food processors should take adequate measures to avoid physical hazards in food*

Definition of risks

- Physical hazards
  - *Physical Hazards Risk in Food*
    - Hard or sharp objects are potential physical hazards and can cause
      - *cuts to the mouth or throat*
      - *damage to the intestines*
      - *damage to teeth or gums*

    - The presence of physical hazards in food can trigger a food recall, affecting the brand name of your company and product

Definition of risks

- Physical hazards
  - *Factors Determining a Potential Risk Factors that cause potential risk to consumers in food products include*
    - Size: Health Canada states that anything in a food product, that is extraneous, and measures two millimeters or more in size can be a health risk
    - Type of consumer: Products that target infants, the elderly, etc. have a higher risk level
    - Type of product: The form the product takes such as infant formulas, beverages, etc. can increase risk level
    - Physical characteristics: hardness, shape and sharpness of a product can affect risk level

Definition of risks

- Physical hazards
  - *Common Physical Hazards Common sources of physical hazards in food include*
    - Glass: light bulbs, glass containers and glass food containers
    - Metal: fragments from equipment such as splinters, blades, needles, utensils, staples, etc.
    - Plastics: material used for packaging, fragments of utensils used for cleaning equipment
    - Stones: incorporated in field crops, such as peas and beans, during harvesting
    - Wood: splinters from wood structures and wooden pallets used to store or transport ingredients or food products
    - Natural components of food: hard or sharp parts of a food (ex: shells in nut products) if consumers do not expect them

Definition of risks

- Physical hazards
  - *Preventing Common Physical Hazards*
    - There are many ways food processors can prevent physical hazards in food products
    - Assess every step of your operation for potential sources of contamination

  - *Inspect raw materials and food ingredients for field contaminants, such as stones in cereals that were not found during receiving*
  - *Handle food according to Good Manufacturing Practices (GMPs). (Ex: avoid inclusion of physical hazards such as jewelry or false fingernails in food products by using proper personnel practices.)*
  - *Eliminate potential sources of physical hazards in processing and storage areas. (Ex: use protective acrylic bulbs or lamp covers to prevent contamination by breakable glass.)*
  - *Install an effective detection and elimination system for physical hazards. (Ex: metal detectors or magnets will detect metal fragments in the production line while filters or screens will remove foreign objects at the receiving point.)*
  - *Establish an effective maintenance program for the equipment in your facility to avoid sources of physical hazards such as foreign materials that can come from worn out equipment.*

Definition of risks

- Physical hazards
  - *Detecting and Eliminating Physical Hazards*
    - There are several methods available to detect foreign bodies on food processing production lines
      - *Magnets can be used to attract and remove metal from products*
      - *Metal detectors can detect metal in food and should be set up to reject products if metal is detected. Equipment should be properly maintained to ensure it is always accurate and doesn't produce false positives*
      - *X-Ray machines can be used to identify hazards such as stones, bones and hard plastics, as well as metal*
      - *Food radar systems transmit low-power microwaves through food products to identify foreign bodies such as metals, plastics, bones or kernels in food*

The Five preliminary steps to Developing a HACCP plan

- **Preliminary HACCP Step 1**
  - ***Bring Together the HACCP Resources/Assemble the HACCP Team***
    - The first step is to assemble the HACCP resources and team. For the development of a HACCP plan, a fish processing company should bring together as much knowledge as possible. Companies should assemble written materials and company documents that relate to food safety as well as assemble a team of individuals that represent different segments within the industry. One HACCP coordinator with HACCP skills should be appointed. HACCP skills are not necessary for other members to be on team. The team should be multi-disciplinary and represent all areas of plant such as engineering, production, sanitation, and quality assurance. Some companies may consider including outside experts from universities or trade associations. Larger companies may develop teams of seven or eight people while small companies may have teams as small as two or three people.

    - The HACCP Coordinator should have overall responsibility for the HACCP program and should play the role of team leader. The HACCP coordinator must have management skills, must be trained in the HACCP principles and needs to have the company resources to implement HACCP.

The Five preliminary steps to Developing a HACCP plan

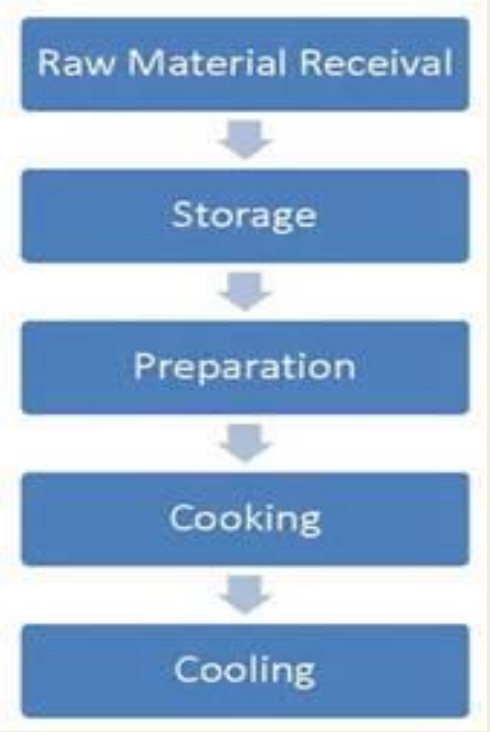
- **Preliminary HACCP Step 1**
  - *Bring Together the HACCP Resources/Assemble the HACCP Team*

The Five preliminary steps to Developing a HACCP plan

- **Preliminary HACCP Step 2**
  - ***Describe the Product and its Method of Distribution***
    - The second step is to describe completely each food product the plant makes. This can include a brief description of how the process occurs and/or how the product is produced or prepared. This will help to focus on potential hazards that may occur in the product. To describe the product, the company should answer the questions (see next slide)

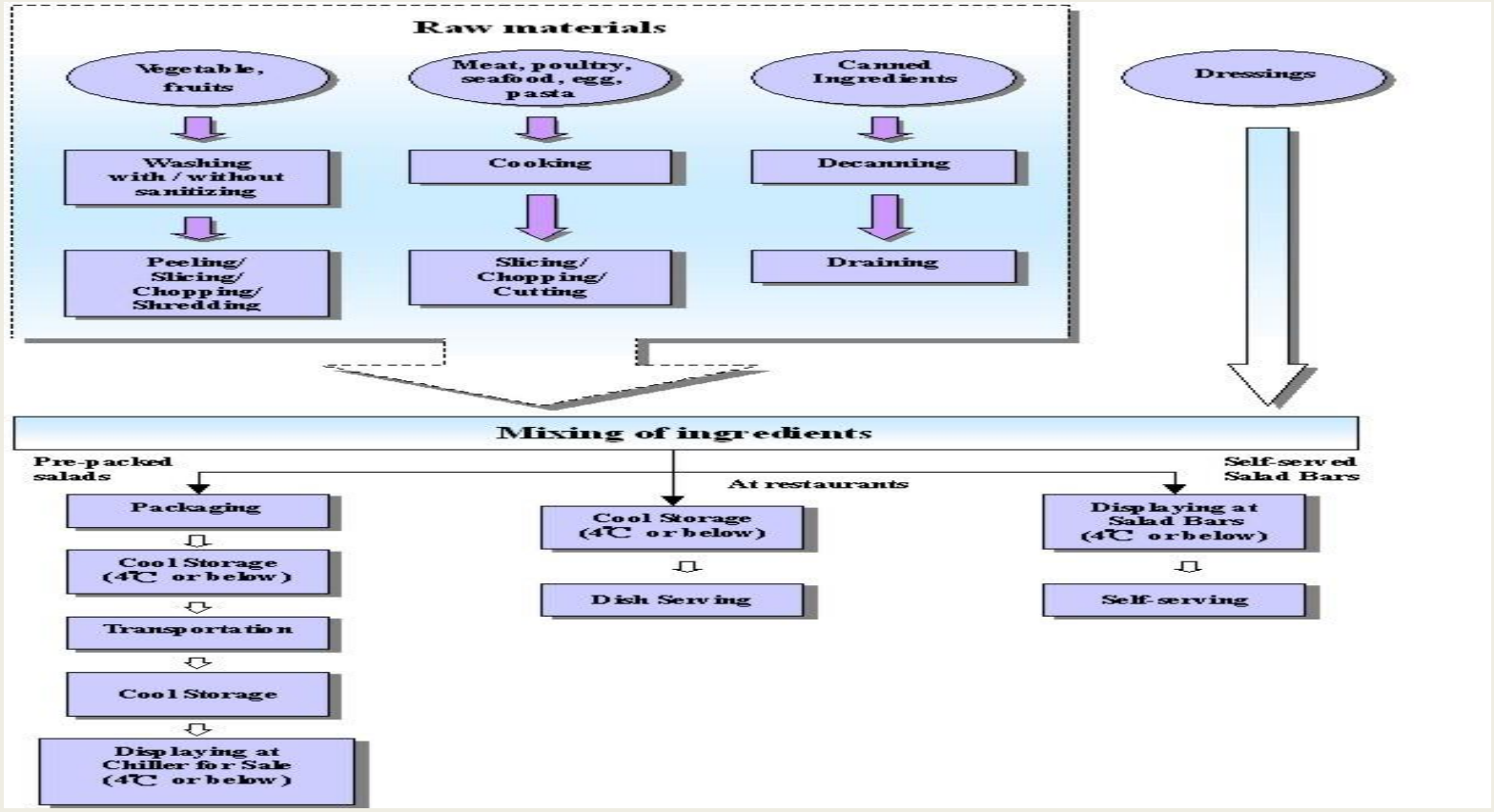
The Five preliminary steps to Developing a HACCP plan

- **Preliminary HACCP Step 2**
  - ***Describe the Product and its Method of Distribution***
    - **Product Category Description**
      - *The following areas need to be defined when developing the product category description.*
        - Common Name/Description:
        - Process Description:
        - How is it to be used?
        - Type of Package?
        - Length of shelf-life; at what temperature?
        - Where will it be used?
        - Labeling instructions:
        - Is special distribution control needed?
        - More information needed?



The Five preliminary steps to Developing a HACCP plan

- **Preliminary HACCP Step 2**
  - *Describe the Product and its Method of Distribution*
    - Product Category Description



The Five preliminary steps to Developing a HACCP plan

- **Preliminary HACCP Step 3**
  - ***Develop a Complete List of Ingredients and Raw Materials***
    - The third step is to develop a written list of ingredients and raw materials for each process/product. The ingredients and raw materials will help to focus on potential hazards in the fish product produced. Some processors have found it helpful to divide the ingredients as indicated in (see next slide).

The Five preliminary steps to Developing a HACCP plan

- **Preliminary HACCP Step 3**
  - ***Develop a Complete List of Ingredients and Raw Materials***
    - **Product and Ingredients**
      - *Fish Ingredients:*
      - *Non-Fish Ingredients:*
      - *Restricted Ingredients:*
      - *Packaging Materials:*
      - *Casing:*

The Five preliminary steps to Developing a HACCP plan

- Preliminary HACCP Step 3
  - *Develop a Complete List of Ingredients and Raw Materials*

POTENTIAL HAZARDS IN THE FOOD PROCESS FLOW

INGREDIENTS	PURCHASING	RECEIVING	STORING	THAWING	COOKING	SERVICE
4 Bell peppers	☑	☑	☑		☑	☑
1 medium yellow onion	☑	☑	☑		☑	☑
1 clove of garlic	☑	☑	☑		☑	☑
½ cup tomatoes	☑	☑	☑		☑	☑
1 tablespoon fresh chopped oregano or 1 teaspoon of dried oregano	☑	☑	☑		☑	☑
1 lb of lean ground beef	☑	☑	☑	☑	☑	☑
5 Tablespoons Extra Virgin olive Oil			☑		☑	☑
Ground Pepper			☑		☑	
Salt			☑		☑	
½ cup ketchup			☑		☑	
½ teaspoon Worcestershire sauce			☑		☑	
Dash of Tabasco sauce			☑		☑	

The Five preliminary steps to Developing a HACCP plan

- **Preliminary HACCP Step 4**
  - ***Develop a Process Flow Diagram***
    - The next step is to construct a process flow diagram that identifies all the steps used to prepare the product, from receiving through final shipment, that are directly under the control of the processing plant. After the flow diagram is constructed it should be verified by walking through the plant to make sure that the steps listed on the diagram describe what really occurs in producing the product.

The Five preliminary steps to Developing a HACCP plan

- ***Develop a Process Flow Diagram***
  - Every step should be counted for, everything that enters the processing area in the fish factory and everything that goes out, from reception to distribution:
    - *Raw materials, additives, water, packaging, recycling, waste*
  - Make one or more flow charts for the processing area
    - *See how the flow chart can be divided up if the processing area is very "complex"*

The Five preliminary steps to Developing a HACCP plan

- ***Develop a Process Flow Diagram***
  - Make one flow chart for each product category that is produced in a similar way and/or in the same production line
  - Try to limit the number of flowcharts as much as possible
    - *Use boxes, circles, arrows, numbers, colors, special symbols: All to make the flow chart easy to understand and clear and with clear references*

The Five preliminary steps to Developing a HACCP plan

- ***Develop a Process Flow Diagram***
  - Each box describes the production stage, not the device
  - However, a reference to the device must be provided
    - *Example: Steam welding is not a steam boiler or just a boiler*
    - *Put important time, temperature, and other factors of production into your flowchart*
  - Verify the flowchart by actually looking at the process. "Walk" the processing line from reception (on ingredients and packaging) to distribution

The Five preliminary steps to Developing a HACCP plan

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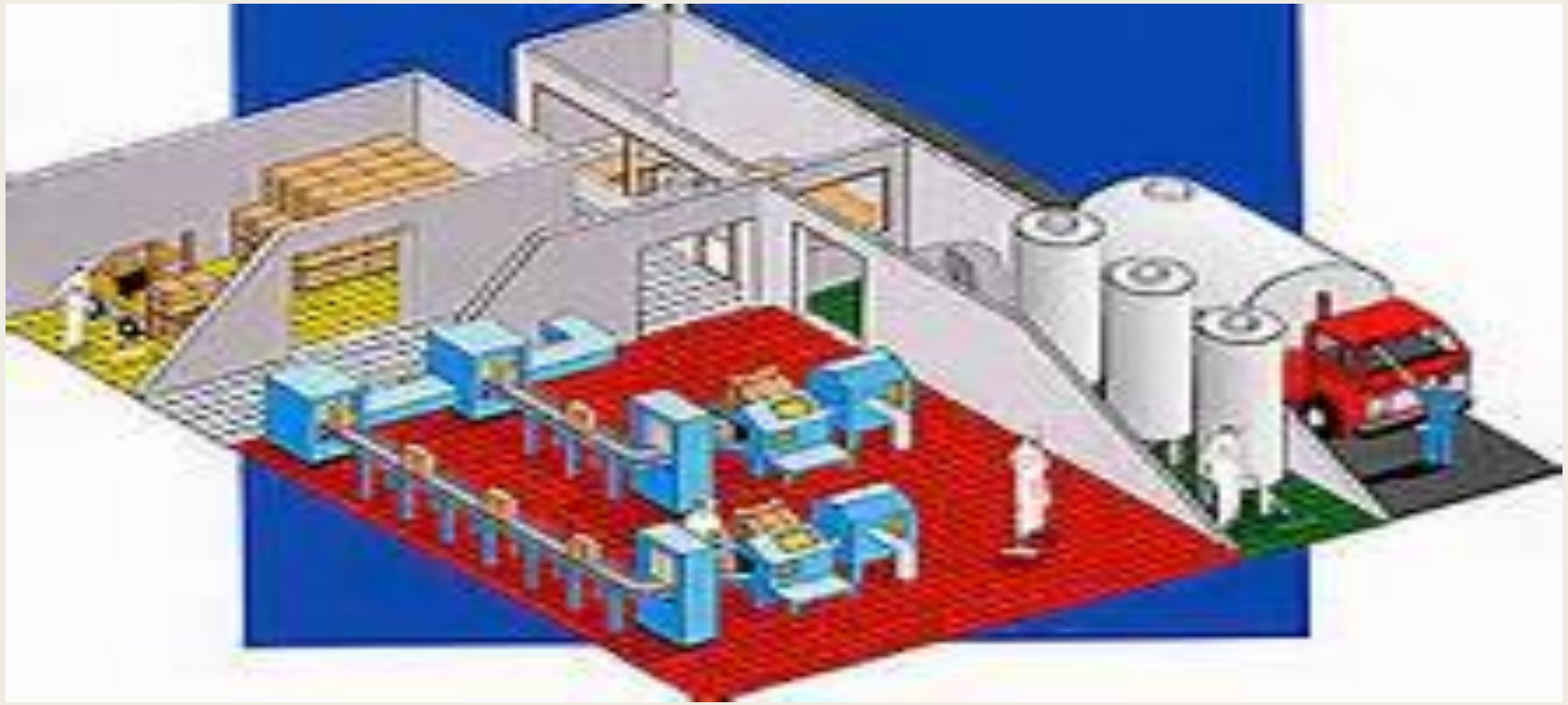
The Five preliminary steps to Developing a HACCP plan

- *Describe the processing steps*
  - Written processing instructions can be useful when explaining each step of the process according to the HACCP system
  - It is important to write down what happens at each step of the processing line
  - Necessary for everyone in the HACCP group to have the same understanding of the process
  - Example:
    - *What can a product wait a long time without cooling at different places in the fish factory*
    - *How high may the temperature go in a specific work area*
    - *How high may the temperature go in the product itself*

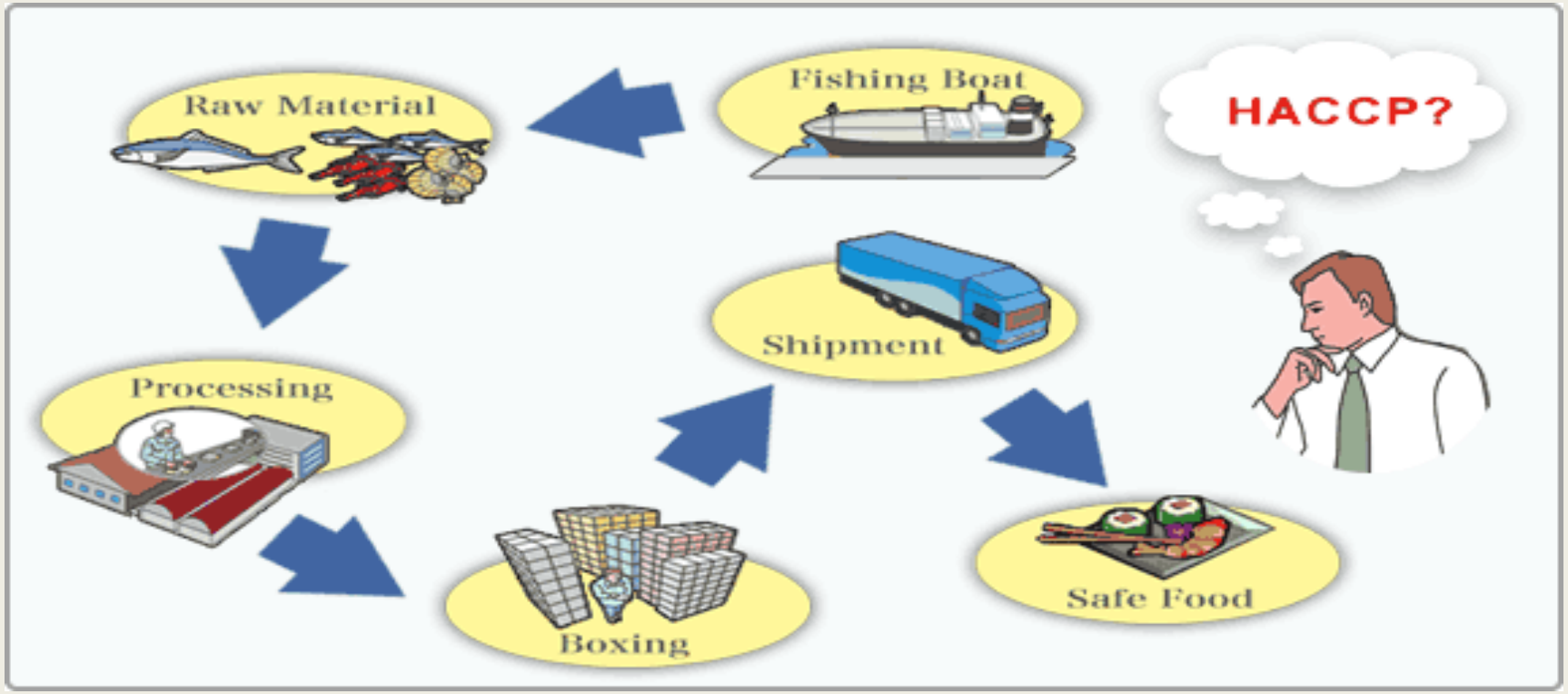
The Five preliminary steps to Developing a HACCP plan

- **Preliminary HACCP Step 4**
  - *Develop a Process Flow Diagram*



The Five preliminary steps to Developing a HACCP plan

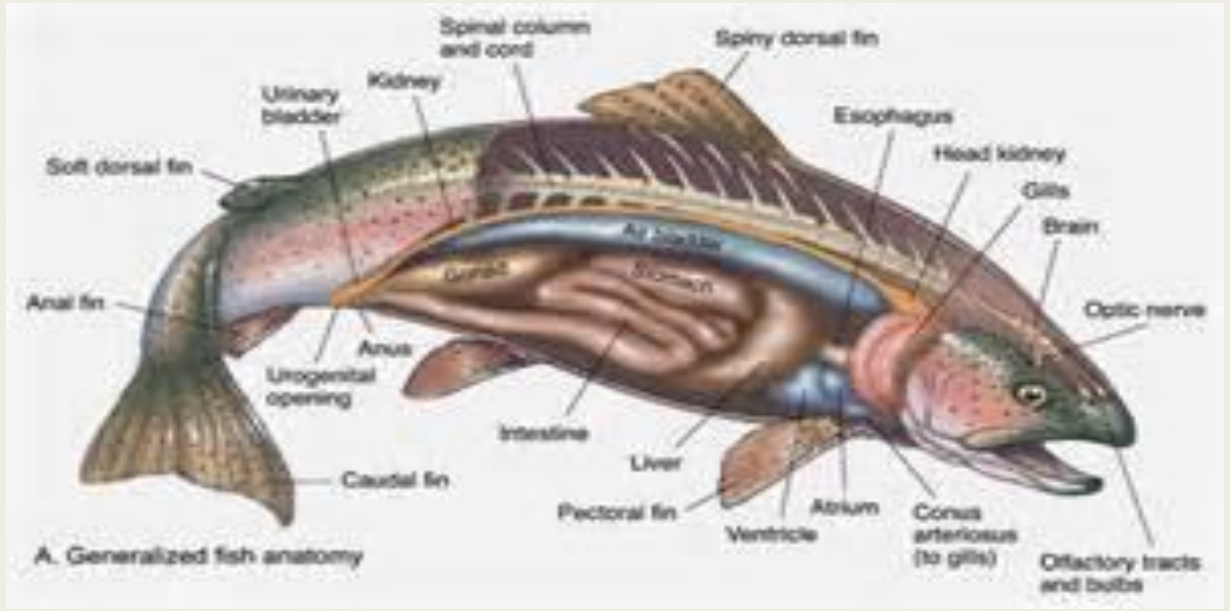
- **Preliminary HACCP Step 4**
  - *Develop a Process Flow Diagram*



The Five preliminary steps to Developing a HACCP plan

- **Preliminary HACCP Step 4**
  - ***Develop a Process Flow Diagram***
    - Flowchart - Fresh fish processing
      - *Receiving raw material ⟹ gutting ⟹ sorting ⟹ icing ⟹ cutting the head off the fish ⟹ cooling ⟹ filleting ⟹ fish skin filleting ⟹ cooling trimming ⟹ cutting ⟹ packing ⟹ labeling ⟹ cooler*

- Side products
  - *Offal*
  - *Liver*
  - *Heads*
  - *Spines*
  - *Skin*
  - *Bones*
  - *Minced fish*



The Five preliminary steps to Developing a HACCP plan

- **Preliminary Step 5 – On-site Confirmation of Flow Diagram**

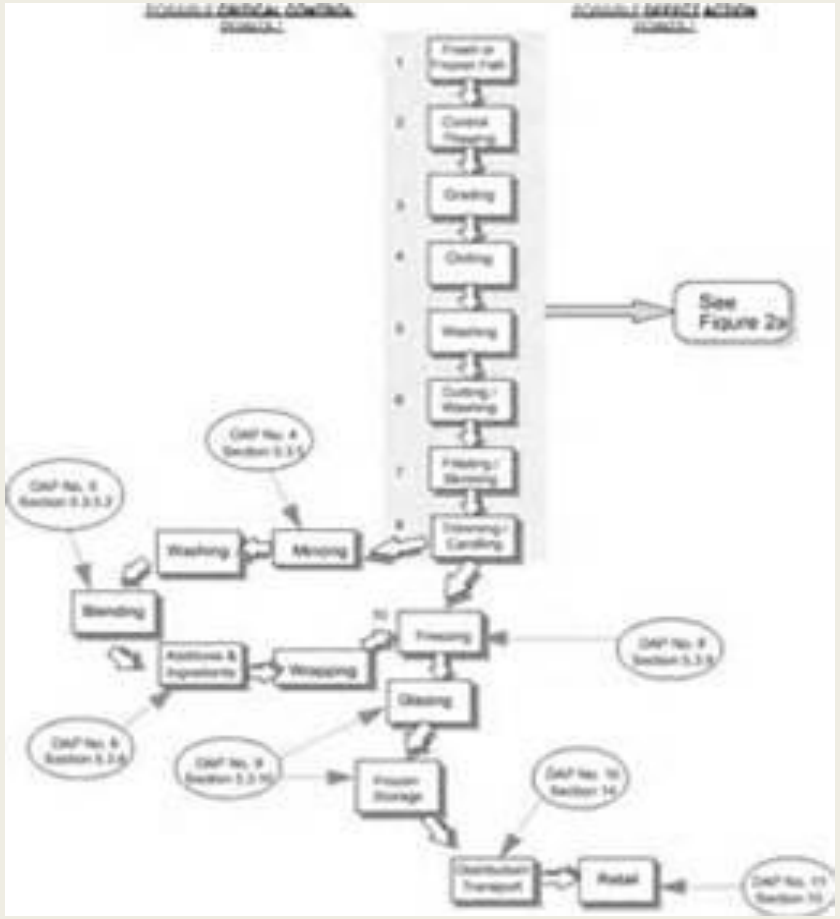
  An on-site review of the flow diagram must be carried out to check that the flow diagram accurately reflects the production process for the product. The HACCP Team should follow the production process on-site and check that the flow diagram includes all steps that are carried out

  When verifying the accuracy of the flow diagram consideration needs to be given to different shifts and hours of operation, different batch sizes, optional ingredients and non-routine steps such as maintenance of equipment

  After the five preliminary steps to developing a **HACCP plan** have been completed, a solid foundation is in place to successfully apply to the seven principles of HACCP

The Five preliminary steps to Developing a HACCP plan

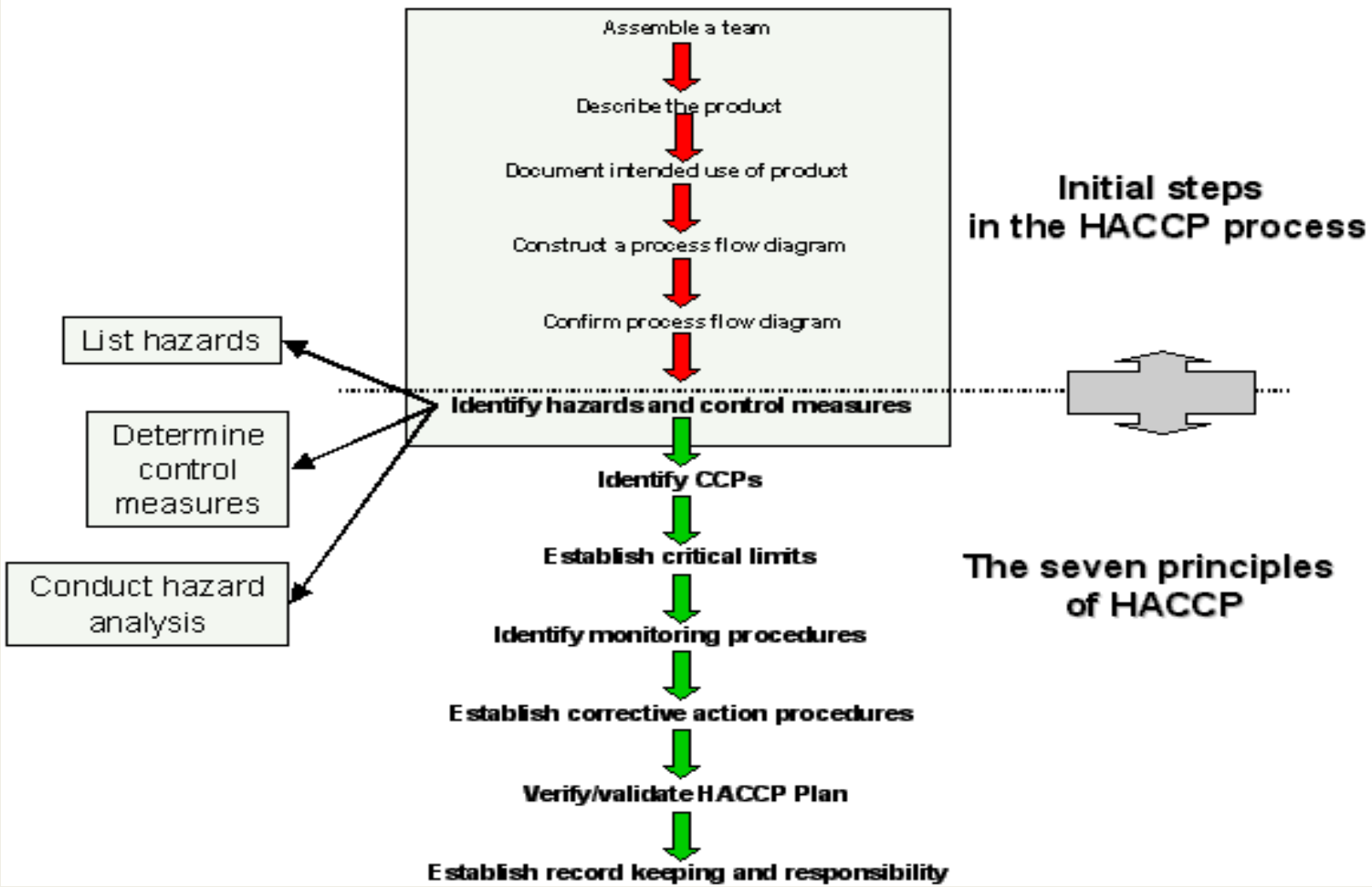
- Preliminary Step 5 – On-site Confirmation of Flow Diagram



Gerð vörulýsinga (Type of descriptions) (Dæmi (Example) ☺)

Fisktegund (Fishproduct):		
Hvaðan kemur hráefnið? (Where is the raw material coming from?)	Beint af bát (Directly from the boat)	
	Af fiskmarkaði (From the fishmarket)	
	Annað (Something else)	
Hvernig er hráefnið geymt? (How is the raw material stored?)	Kælt (Chilled)	
	Ísað (Iced)	
	Frosið (Frozen)	
Hvernig á að geyma afurðir? (How to store the products?)	Kælt (Chilled)	
	Ísað (Iced)	
	Frosið (Frozen)	
Hvernig er afurðinni pakkað? (How is the product packaged?)	Ekki lofttæmt (Not vacuum packed)	
	Lofttæmt (Vacuum packed)	
	Loftskipti (Air exchange, Gas exchange)	
Ætluð notkun (Intended use)	Hrátt, skal sjóða (Raw, will be cooked)	
	Hrátt, tilbúið til neyslu (Raw, ready for consumption)	
	Soðið, tilbúið til neyslu (Cooked, ready for consumption)	
Ætlaðir notendur (Intended users)	Almenningur (The public)	
	Börn, eldri neytendur og aðrir viðkæmir hópar (Children, elderly consumers and other vulnerable groups)	

The way to HACCP



The seven principles of HACCP

- **Principle 1 – Conduct a Hazard Analysis**
- Effective hazard identification and hazard analysis are essential to the development of a successful **HACCP plan**
- Firstly, the HACCP Team must think about the product and process to identify all hazards (biological, physical and chemical) that may be reasonably expected to occur at each step in the production process.
  - *When identifying hazards it is necessary to consider:*
    - Hazards introduced by inputs at each step
    - Hazards introduced as a consequence of applying the process step itself (e.g. metal fragments from processing equipment)
    - Hazards carried over in the product from the previous step
    - Adverse impacts of process steps on existing hazards (e.g. growth of microorganisms)
- Secondly, the HACCP Team must carry out a hazard analysis to identify for the HACCP plan which hazards are of such a nature that their elimination or reduction to acceptable levels is essential to the production of safe food
- Thirdly, the HACCP Team must consider what control measure(s), if any, exist which can be applied for each hazard

Principle 1 – Conduct a Hazard Analysis

Hazard-Analysis Worksheet

Fisheries Association 1997/98

Provided by Southeastern

Firm Name: _____

Firm Address: _____

Product Description: Spiny Lobster (Panilirus argus spp.)

Method of Storage and Distribution: Cold storage for fresh , freezer for frozen

Intended Use and Consumer: Product will be eaten already cooked products

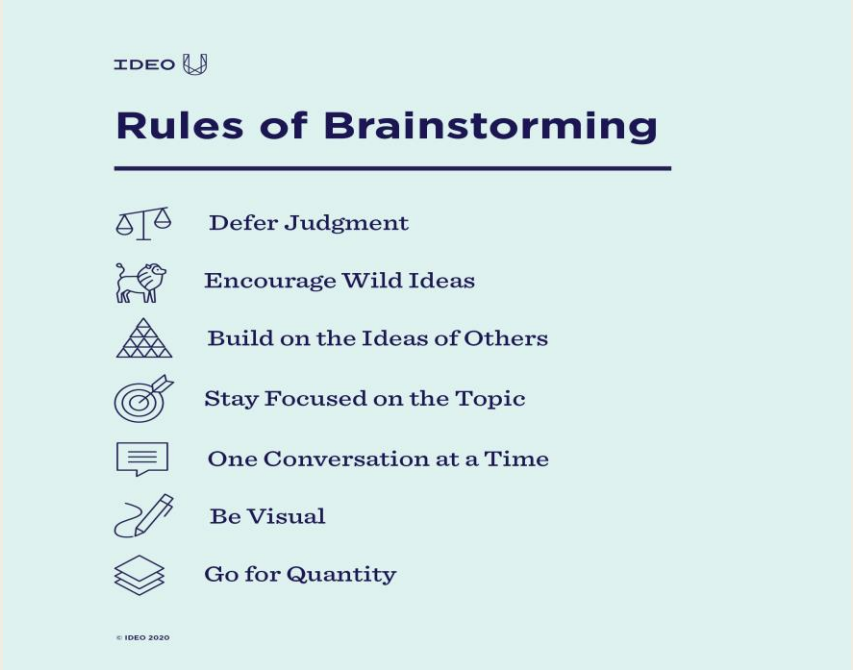
(1) Ingredient processing step	(2) Identify potential hazards introduced, controlled or enhanced at this step (1).	(3) Are any potential food-safety hazards significant? Yes/No	(4) Justify your decisions for column (3).	(5) What preventative measures can be applied to prevent the significant hazards?	(6) Is this step a critical control point? (Yes/No)
RECEIVING Live spiny lobsters	**Biological** (Potential naturally occurring pathogenic bacteria)	Yes	Seafood products can be a natural reservoir for pathogenic bacteria and depending on the water can be subject to listeria	Washing will eliminate some of the naturally occurring bacteria and a cook step follows that assumes a high bacterial load.	NO
	Chemical	No	No chemicals are known to exist in historical harvest areas and no chemical used in most instances.	In the event of a state or federal alert on spills or other contaminants, product will be monitored	NO
	Physical	No	Lobsters examined at unloading—no debris	Visual inspection at unloading	No
STORAGE	**Biological**	No	Thermal abuse could cause pathogenic bacterial growth	Proper handling of live product coupled with a Standard Sanitation Operating Procedure (SSOP)	No
	Chemical	No	No chemical added at this step of processing		No
_____	**Physical**	No	SSOP	SSOP	No

The seven principles of HACCP

- **Principle 2 – Determine the Critical Control Points (CCPs)**
- A Critical Control Point (CCP) is a step at which control can be applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level.
- The HACCP team must evaluate whether there are any CCPs in the process and whether there is more than one CCP for controlling hazards. It is imperative that CCPs are determined logically and carefully as this is the most important principle of HACCP.
- As well as the HACCP team's professional judgement, expertise and knowledge of the process, a CCP Decision Tree can be used to help determine if a process control measure is a CCP.

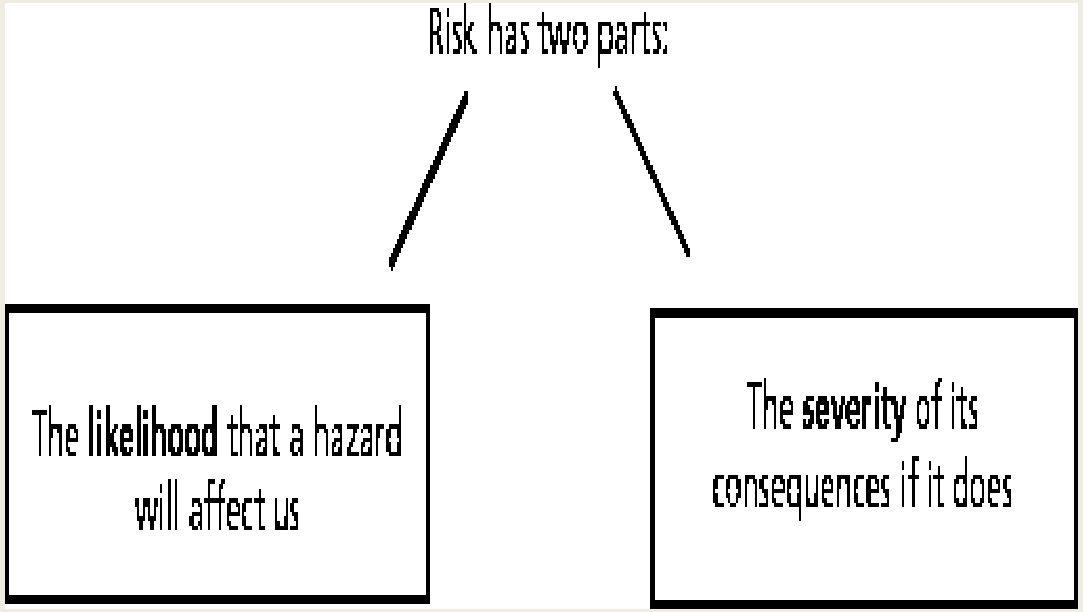
The seven principles of HACCP

- **Risk analysis - where do we find the information**
  - *Knowledge of HACCP group – Brainstorming*
  - *Scientific publications and articles*
  - *Internet (recognized sites)*
  - *Regulations*
  - *Microbiological knowledge*
  - *Consultant*
  - *Experience*
  - *Requirements of buyers*



Risk analysis - purpose

- To identify any danger that must be averted, eliminated or reduced so that it is considered acceptable



The seven principles of HACCP

- **Risk analysis**
  - *To identify any danger that must be averted, eliminated or reduced so that it is considered acceptable*
    - Identify hazards in food
      - *Can be delivered with raw materials, packaging*
      - *Can be transported by staff, equipment, air, water*
      - *May be present in raw material/product due to the risk of cross-contamination*
  - *Let's follow a flow chart and look at each step separately*
  - *Let's think about everything that can go wrong in each step and write it down – imagination*
    - Biological, chemical and physical hazards

The seven principles of HACCP

- **Risk analysis**
  - *Biological, chemical or physical factors or factors which may cause harm to the health of the consumer*
    - Biological
      - *Bacteria and dangerous parasites*
    - Chemical
      - *Substances that can harm the body, e.g. cause cancer and other ailments if consumed in excess*
    - Physical
      - *Small, sharp foreign objects that can cause internal physical injury*
    - Allergens and intolerances
      - *Proteins and other substances in foods that cause symptoms caused by histamine*

RISK ANALYSIS

Hazard	Likelihood	Danger to consumer
Physical	Glass (low) Metal (medium) Wood (low)	Glass (high) Metal (high) Wood (low)
Chemical	Pesticides (low) Machinery grease and oils (low) Cleaning agents (low)	Pesticides (high) Machinery grease and oils (medium) Cleaning agents (medium)
Biological	All biological agents such as *Salmonella* and *Escherichia coli* (medium)	All biological agents such as *Salmonella* and *Escherichia coli* (high)

Table 1: HACCP Risk Assessment

Risk Analysis

- Assess the nature of what can go wrong
  - *Is there a danger (safety) or is there a quality issue or quality factor*
    - Probability and severity are assessed
      - *What is the probability of danger?*
      - *What does the story/experience tell us?*
      - *If the danger arises, how serious can it be?*

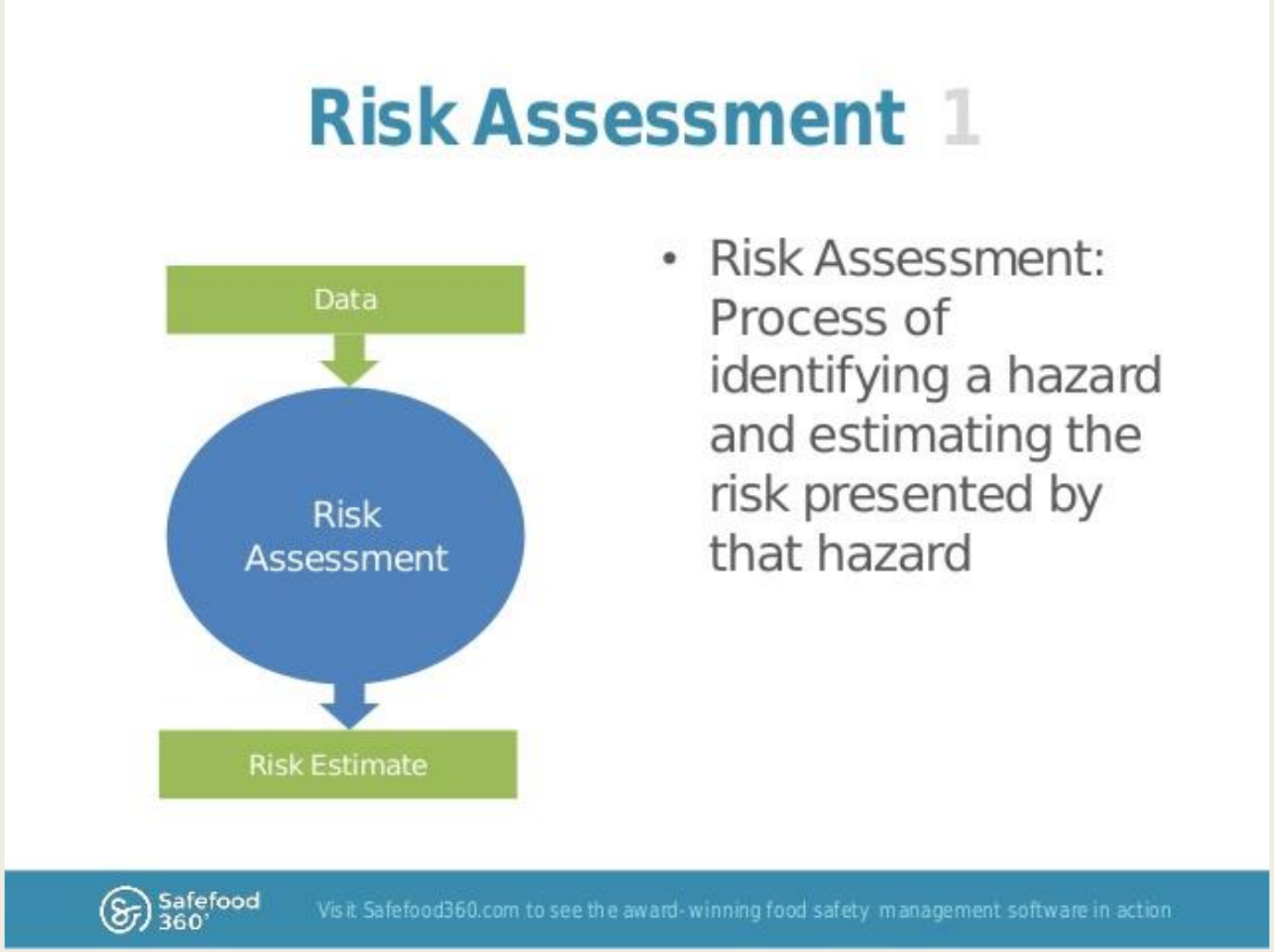
Risk analysis - Severity

- Assess the consequences of the risk in the range 1-4
  - *1 - No illness but discomfort*
  - *2 - Minor illnesses that go away in one to two days without consequences*
  - *3 - Illness and absence from work 2-14 days*
  - *4 - Very serious, illness> 14 days - Permanent injury - death*

		Potential severity of harm		
		Slightly Harmful 1	Harmful 2	Extremely Harmful 3
Likelihood of harm occurring	Highly unlikely 1	Trivial 1	Tolerable 2	Moderate 3
	Unlikely 2	Tolerable 2	Moderate 4	Substantial 6
	Likely 3	Moderate 3	Substantial 6	Intolerable 9

Risk analysis - Probability

- Assess the probability of danger in the range 1-4
  - *1 - Less than once in 10 years*
  - *2 - Once a year - Once every 10 years*
  - *3 - Once a month - Once a year*
  - *4 - Once a month or more*

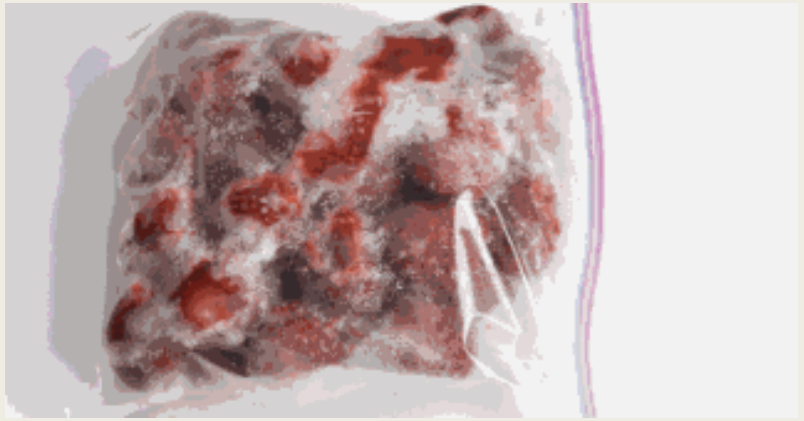


Risk analysis - Assessment

Likelihood		Consequence				
		Negligible 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
	5 Almost certain	Moderate 5	High 10	Extreme 15	Extreme 20	Extreme 25
	4 Likely	Moderate 4	High 8	High 12	Extreme 16	Extreme 20
	3 Possible	Low 3	Moderate 6	High 9	High 12	Extreme 15
	2 Unlikely	Low 2	Moderate 4	Moderate 6	High 8	High 10
	1 Rare	Low 1	Low 2	Low 3	Moderate 4	Moderate 5

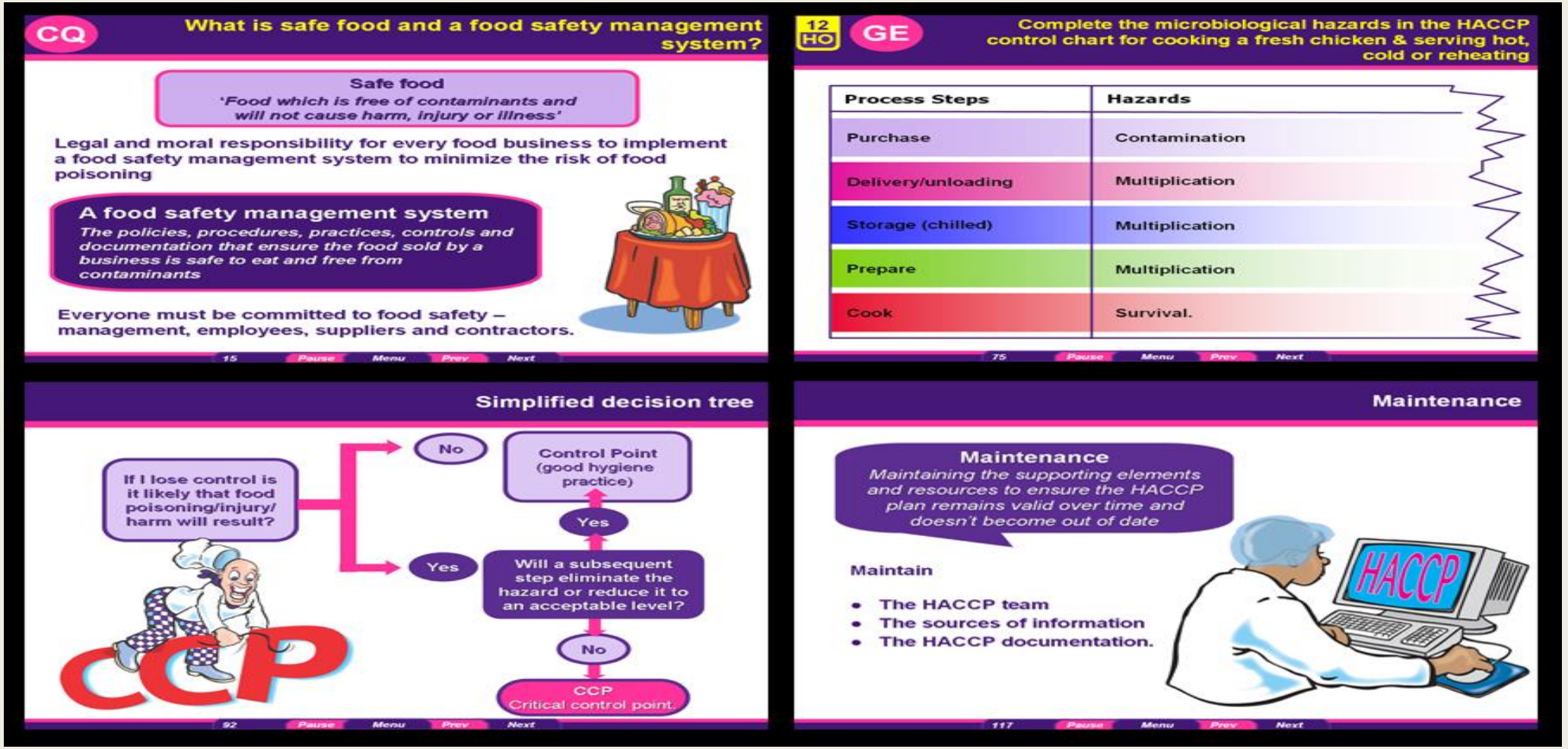
Make a distinction between quality and safety issues

- Damage - quality issues
  - *Microorganisms, metals, yeasts, viruses*
  - *Foreign objects*
  - *Hair, patches, dirt, plastic, elastics ….*
- Unfair business practices
  - *Underweight, wrong brand, wrong labels, wrong quantity, damaged packaging, wrong finish product, expired product ……*



The seven principles of HACCP

- Principle 2 – Determine the Critical Control Points (CCPs)

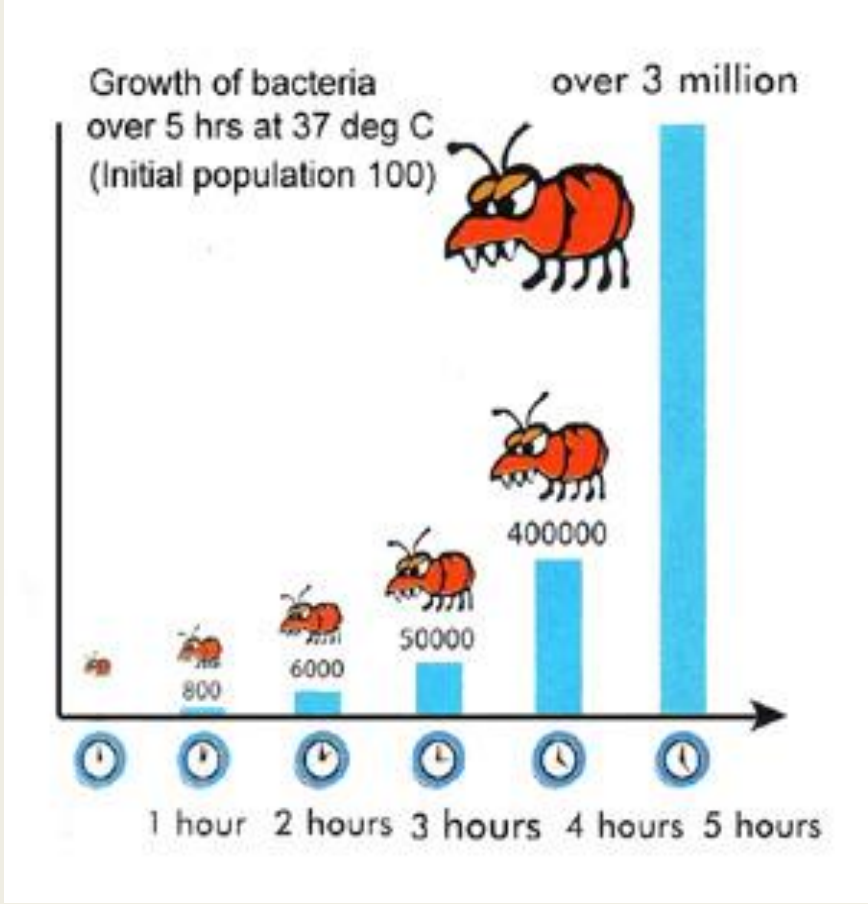


Critical Control Points (CCP)

- Key places in the production process where it is important to monitor to avert or eliminate a hazard or reduce it so that it is considered acceptable
  - *Example:*
    - Cooling to minimize the growth of certain pathogens
    - Boiling to eradicate certain germs/bacteria
    - Canned to destroy certain spores (Clostridium botulinum)
    - Acidification to prevent the germination of certain spores (Bacillus Cereus)
    - Packing - Metal search to identify metal objects of a certain size
    - Inspection? (bones, feces, intestines, worms)

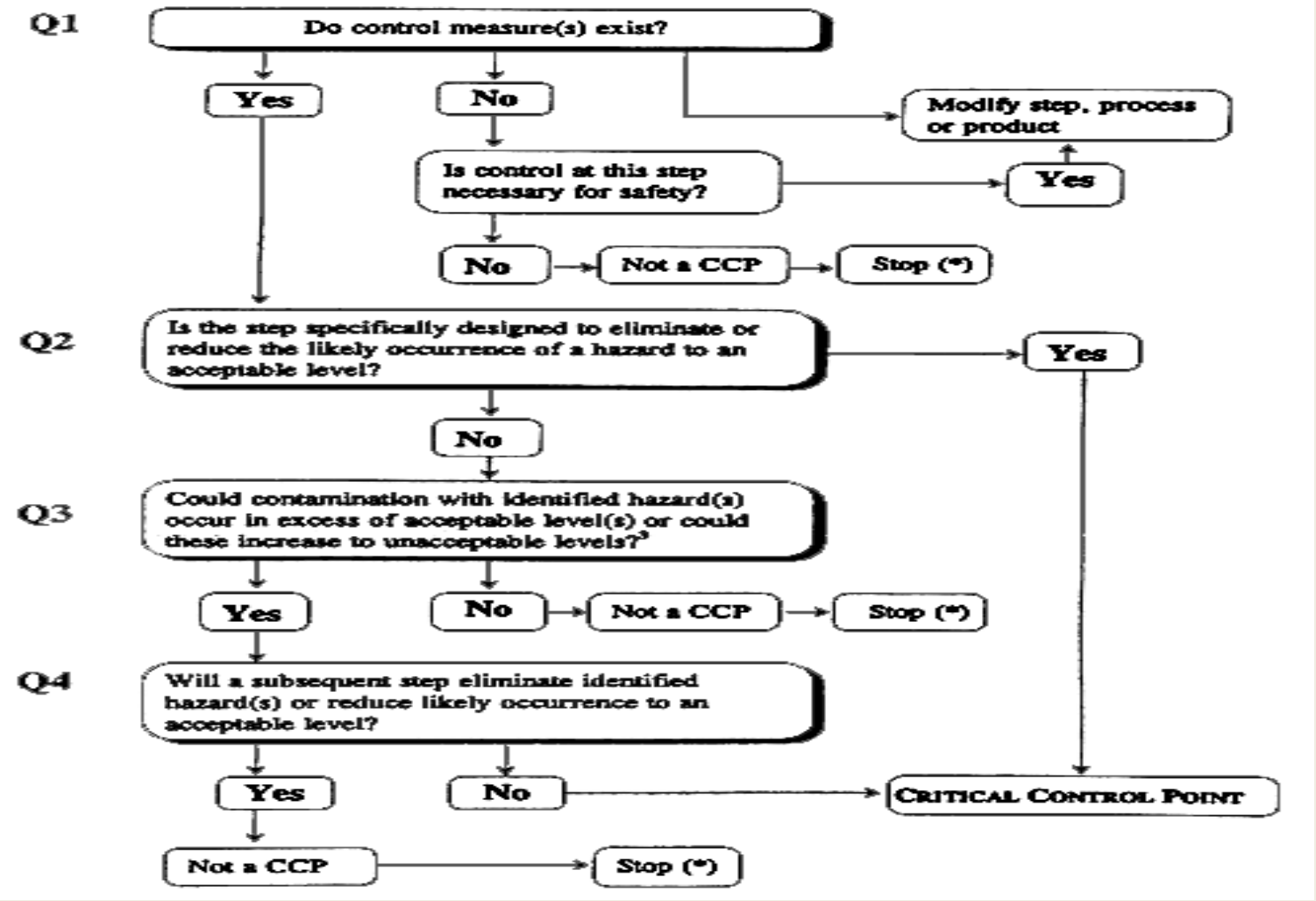
Control Points (CP)

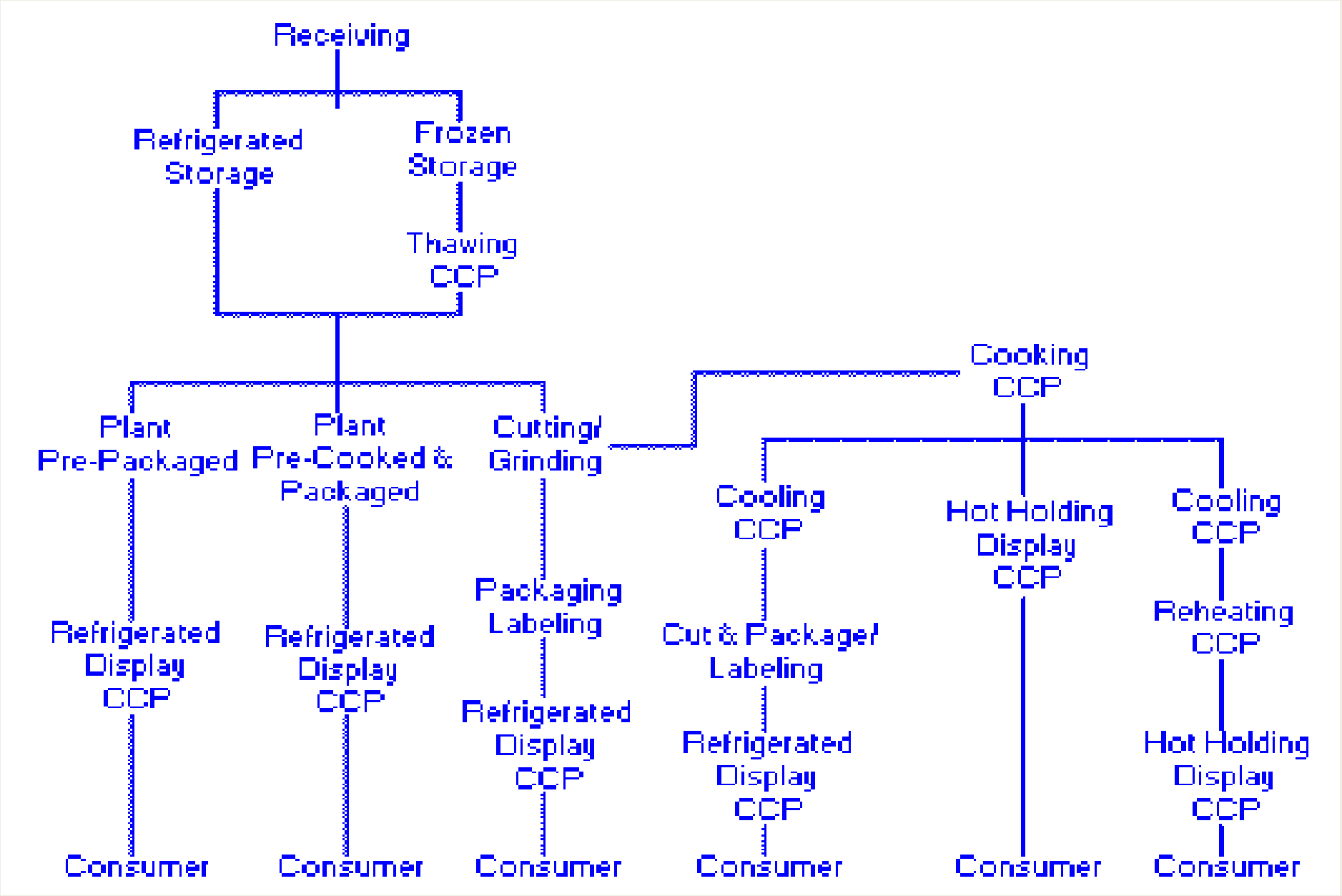
- Locations in the manufacturing process/storage/transport that need to be monitored to ensure the effectiveness of preventive measures, product quality and fair trade practices:
  - *Example*
    - Cooling
    - Freezer
    - WC
    - Weighing
    - Inspection of food labeling



The seven principles of HACCP

- Principle 3 – Establish Critical Limit(s) for Each CCP




Receiving
Refrigerated Storage
Frozen Storage
Thawing CCP
Plant Pre-Packaged
Plant Pre-Cooked & Packaged
Cutting/ Grinding
Cooking CCP
Refrigerated Display CCP
Refrigerated Display CCP
Packaging Labeling
Refrigerated Display CCP
Cooling CCP
Cut & Packaged Labeling
Refrigerated Display CCP
Hot Holding Display CCP
Cooling CCP
Reheating CCP
Hot Holding Display CCP
Consumer
Consumer
Consumer
Consumer
Consumer
Consumer

The seven principles of HACCP

- **Principle 3 – Establish Critical Limit(s) for Each CCP**
- Critical Limits are criterion which separates acceptability from unacceptability at a CCP.
- The HACCP Team must define and justify critical limits for each CCP. In some processes, more than one critical limit may be needed at a particular step. Setting critical limits (or the amount of acceptable deviation for each CCP) allows evaluation of when a CCP is out of control and when product safety is compromised.
- Critical limits must be measurable and they should be parameters that can be effectively monitored on an on-going basis. Common parameters used for critical limits include measurements of temperature, time, moisture level, pH, water activity, available chlorine and sensory parameters such as visual appearance and texture.

Limit of tolerance - Reference limit

- Defined goal that must not be exceeded if the risk/quality is to be controlled
  - *Criteria - not lower than:*
    - ham cooked at > 72°C.
  - *Criteria - not higher than:*
    - pH in mayonnaise < 4.1
  - *Deviation limits within a certain range:*
    - temperature in the refrigerator 0-4°C.
  - *Criteria can be twofold:*
    - cooling below 4°C in less than 2 hours
- Deviation limits/limit values based on regulatory provisions
  - *Temperature: 0-4°C, 2°C, -18°C, 12°C, 7°C, 60°C*
  - *Sensory evaluation: Evaluation rules in Regulation 233/1999*
  - *Labeling: Regulation 503/2005 about labeling, advertising and promotion of food*
- Deviation limits/thresholds based on requirements from buyers
- Deviation limits/thresholds based on rules set by the company

What, how, who, when?

- Regular (routine) measurements or inspections of hazard/quality factors or monitoring items
- It is important to use quick methods so that immediate action can be taken in the event of deviations
- The quick-acting methods usually need to be verified by measurements (often microbial or chemical) that will take longer time

The seven principles of HACCP

- **Principle 4 – Establish a System to Monitor Control of Each CCP**
- Each CCP must be monitored to confirm that critical limits at each CCP are being met and food safety ensured

  Monitoring methods must be able to quickly detect a loss of control at a CCP in order to enable corrective actions to be taken immediately. Common CCP monitoring procedures involve visual observations, aroma, and measurements of temperature, time, pH and moisture
- If monitoring is not continuous, the monitoring frequency chosen must be sufficient to ensure the adequate and consistent control of each CCP

Monitoring

- Monitoring – Responsibility
  - *Define job title:*
    - Employee working at the processing line
    - Assessor
    - Meat craftsman
    - Foreman
    - Driver
    - Choose a conscientious person
    - Training required
    - Substitute

- Monitoring
  - *When and how often?*
  - *Monitoring can be continuous:*
    - Thermostat in cold storage
    - Foreign objects during packing
    - Monitoring can be regular
      - *Once every hour*
      - *2 times a day, before and after noon*
    - Look at every tub
    - In each cargo load - each batch

Monitoring Conditions

- Measuring devices must be accessible - at hand
- Handling of measuring instruments - e.g. disinfection and how to keep instruments save/clean at all times
- The measuring point must be "accessible“
- Conditions for registration

The seven principles of HACCP

- **Principle 5 – Establish the Corrective Action to be Taken when Monitoring Indicates that a Particular CCP is Not Under Control**
- Specific procedures must be developed for each CCP to describe what corrective action will be taken if monitoring indicates that critical limits are not being met and a CCP in not under control.
- Corrective action procedures should include the following information:
  - *Person responsible for taking corrective action*
    - How to regain control at a CCP
    - What to do with the product produced during the period of loss of control
    - Action to prevent the problem from happening again
    - Escalating response if preventative action fails
    - Records to be kept.

Improvements

What is good to keep in mind?

- Define responsibilities (substitute)
  - *Who has the responsibility to decide what to do with the raw material/product*
  - *Who has the responsibility and knowledge needed if the process needs to be changed to prevent deviations from recurring again?*
- Ensure that product deviation are handled correctly
- Ensure that the deviation will not happen again (prevention)
- Where can we seek specialist help if needed (technical, chemical, microbiological, etc.)?
- Registration of improvements … Who, how, how exactly?
- Check if the improvements have been effective

Improvement examples

- Repair of tools and equipment
- Talk to staff, retraining of the staff
- Supplier Warning - Replace Suppliers
- Warning to the owner of the product
- Increase monitoring frequency - Change monitoring
- Customize products and use for other purposes
- Slow down production - Stop production
- Change production process, reset device
- Throw the production away

The seven principles of HACCP

- **Principle 6 – Establish Procedures for Verification to Confirm that the HACCP System is Working Effectively**
  - *Verification is the application of methods, procedures, tests and other evaluations, in addition to monitoring to determine compliance with the HACCP plan*
  - *Verification procedures must be established to check that the **HACCP system** is working effectively. The frequency of verification should be sufficient to confirm that the HACCP system is working correctly and consistently*

The seven principles of HACCP

- **Principle 6 – Establish Procedures for Verification to Confirm that the HACCP System is Working Effectively**
- HACCP system verification activities include:
  - *Review of the HACCP system and its records*
  - *Observation of operations at CCPs*
  - *Asking employees questions, especially those that monitor CCPs*
  - *Routine checks of monitoring procedures and equipment*
  - *Review of critical limit deviations and non-conforming product handling and dispositions*
  - *Internal auditing of the HACCP system*
  - *External 3rd party auditing of the HACCP system*
  - *Microbiological sampling of product contact surfaces*
  - *Microbiological sampling of the product*
  - *Official evaluation of the product.*

Improvement plan

- Describe what is done/should be done
- Appoint a guarantor
- Set a deadline
- Receipt when improvements are completed

A BC HACCP PLAN
Product Name: Cod fish with herb & rice

Ingredients	HAZARD DESCRIPTION	IS THIS HAZARD CONTROLLED BY A PP OR A BC HACCP PLAN	CCP?	JUSTIFICATION	CRITICAL LIMITS:	MONITORING PROCEDURES	CORRECTIVE ACTIONS	VERIFICATION PROCEDURES:	HACCP RECORDS:
				Receiving					
Raw Frozen Cod Fish	Biological hazards and toxins: C.botulinum ciguatoxin vibrio spp Various viruses such as: norovirus	Yes	Visual evaluation & Time and temperature measuring	contamination & spoilage	CCP Freezer ≤ 0°F. Vacuumed packaged with oxygen. transmission rate of 10,000 cubic centimeter per square meter every 24 hours or less. Package Supplier provides parasite destruction record. Check for evidence of thawing. Packaging Intact.	Supervision including Using thermometer & visual evaluation by Quality Control staff during receiving step. Known source. Visually checking tags every time it is received from supplier.	Reject delivery. Action Plan for disposition and documentation	Thermometer calibration Check the packages. Supervisory review and sign off on recorder charts	Actual monitoring information. Date&time the activity took place. Signature or initials of person conducting the monitoring procedure.

The seven principles of HACCP

- **Principle 7 – Establish Documentation Concerning all Procedures and Records Appropriate to these Principles and their Application**
- Accurate documentation and records must be developed as they are an essential part of HACCP. Hand written and computer records are equally acceptable, but documentation and record keeping does need to be appropriate to the nature and size of the operation
- Examples of documentation and records are:
  - *Original HACCP study (e.g. HACCP Team, product description, hazard analysis, CCP determination, identification and selection of critical limits etc.)*
  - *CCP monitoring activities*
  - *Critical limit deviations and the associated corrective actions taken*
  - *Verification procedures*
  - *Internal and external audits*
  - *HACCP system reviews and modifications*

Establish Documentation Concerning all Procedures and Records Appropriate to these Principles and their Application

Why are we writing down information? (Registrations)

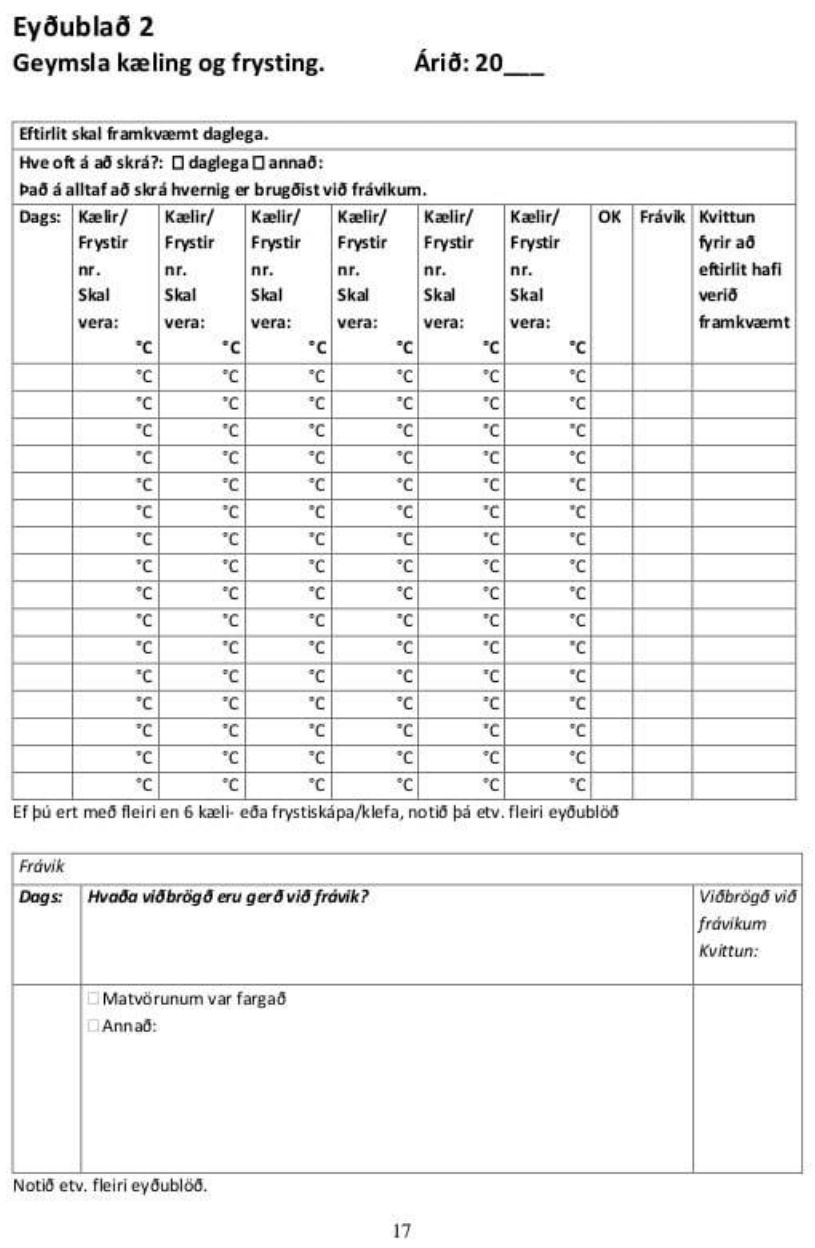
- Evidence
- Promotes Conscience?
- Product traceability
- You can track the process and see how it develops
- You can take out the fish/meat processing house and make it better

Recording

- Write down what needs to be recorded, no more and no less
- Have the registration forms at hand
- Record everything that is different and abnormal - REGISTER DEVIATIONS AND IMPROVEMENTS
- THE GOLDEN RULE: Do everything right away

Registration Forms

- NO SPECIAL FORMULA
- Keep sheets as simple and indicative as possible
- Have a margin of error inside the forms
- Have improvements inside the forms
- Fill in all the fields
- Have columns for dates, and signatures
- Have plenty of room for comments/improvements



Eyðublað 2
Geymsla kæling og frysting. **Árið: 20___**

Eftirlit skal framkvæmt daglega.									
Hve oft á að skrá?: ☐ daglega ☐ annað:									
Það á alltaf að skrá hvernig er brugðist við frávikum.									
Dags:	Kælir/ Frystir nr. Skal vera: °C	Kælir/ Frystir nr. Skal vera: °C	Kælir/ Frystir nr. Skal vera: °C	Kælir/ Frystir nr. Skal vera: °C	Kælir/ Frystir nr. Skal vera: °C	Kælir/ Frystir nr. Skal vera: °C	OK	Frávik	Kvittun fyrir að eftirlit hafi verið framkvæmt
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Ef þú ert með fleiri en 6 kæli- eða frystiskápa/klefa, notið þá etv. fleiri eyðublöð

Frávik		
Dags:	***Hvaða viðbrögð eru gerð við frávik?***	*Viðbrögð við frávikum Kvittun:*
	☐ Matvörunum var fargað ☐ Annað:	

Notið etv. fleiri eyðublöð.

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Verification

- Is the form we have set up working?
- Does the system work from day to day?
- Internal audits (reassessment): Is the system working in general and over a longer period of time ...
- Are we getting anything out of this?

- Sampling to verify shelf life
- Sampling to verify the quality of raw materials
- Sampling to verify chemical content
- Visits to suppliers to verify that he has active internal control
- Sampling of contact surfaces to verify cleaning
- Tests on measuring instruments to verify that they show correct results
- Water sampling to verify water quality
- Product sampling to verify quality

Verification (Chemical)

- Content descriptions and nutritional value
- Tests on meat and meat products to verify quality classification, compared to regulation
- Measurements of lean meat, fat content
- Nutritional value e.g. for processed meat products, compared to regulation on meat and meat products
- Protein, fat, dry matter, ash, minerals (carbohydrates calculated)

Internal audits

- Verify that the quality system is being worked on
- Highlight system vulnerabilities and failures so that they can be fixed immediately
- Update the quality system
- Procedures for internal audits/verification must be recorded

CE

High-risk (tick) or low-risk (cross)?

Hold up ✓ or X

- ✗ Margarine 
- ✓ Vacuumed packed ham 
- ✗ Digestive biscuits 
- ✓ Rice pudding 
- ✓ Baked potato in foil 
- ✓ Oysters 
- ✗ Dried prunes 
- ✗ Wine 
- ✗ Gravy granules 
- ✓ Raw milk 
- ✓ Raw egg products 
- ✗ Toast 
- ✗ Bag of sugar 2 years old 
- ✗ Pickled onions 
- ✓ Gravy 
- ✓ Prawn cocktail 
- ✗ Breakfast cereals 

Food words

HACCP
Hazard Analysis and Critical Control Points

How to store food, limit cross contamination and health and safety – i.e. Blue plasters and magnets to remove foreign bodies.

Hazard
A hazard is anything that will cause harm to the consumer

Analysis
Analysis is when you look in detail at something

Critical
Critical means it is very serious.

Control points
A control point is a step in the process where hazards or risks are likely to occur

COSHH
Control of Substances Hazardous to Health

Correct storage of chemicals including bleach, washing up liquids and cleaning fluids. Also DATA sheets saying how to deal with spills , swallowed and or chemicals in cuts or eyes.

Risk assessment
Controls and assessment – putting in place safety measures to limit injury or illness.

Hazard
Anything that could go wrong during buying/ storing/ making/ packaging/ transport of a product that is a hazard

Risk

The risk is the likelihood of it happening

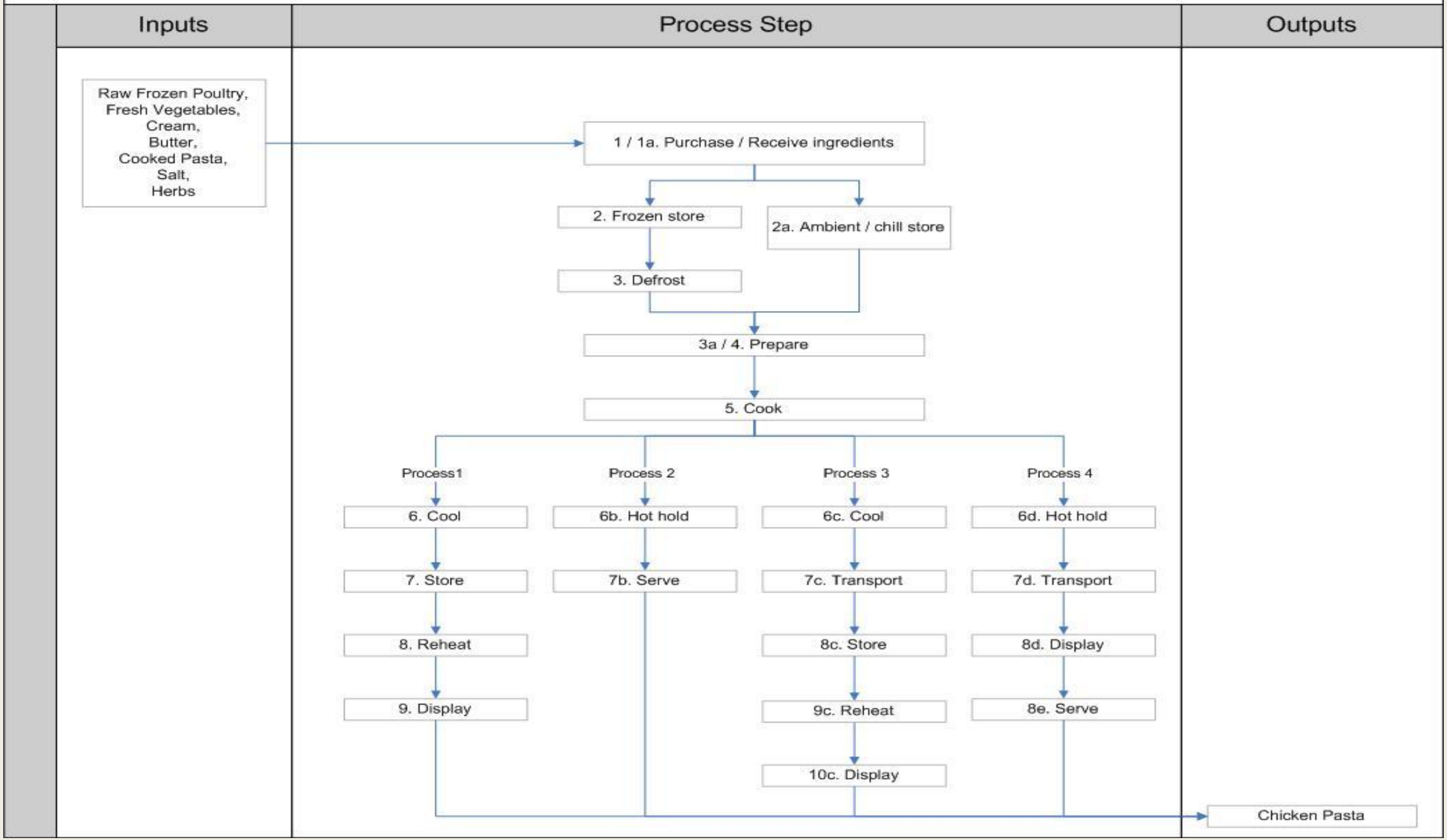
Risk assessment

Risk assessment means thinking about: what could happen/ when it could happen and taking steps to prevent it happening.

Cross-contamination

This is wear food of different sorts touch each other and bacteria is able to move from one food to another. i.e. Raw meet dripping blood on to a salad in a refrigerator, this can cause food poisoning.

Process Flow Diagram for Chicken Pasta that is Cooked, Cooled, Reheated and Displayed



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