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INTRODUCTION TO QUALITY CONTROL IN FISH AND FISHERY PRODUCTS

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Quality is the driving force in any industry. The desire for quality is the major factor providing a boost towards the operational efficiency. Most often quality refers to the aesthetic appearance and freshness of the fish. The term quality may also involve the safety aspects also. Quality is a subjective concept. As per the International Organization for Standardization (ISO) the term quality is defined as "degree *to which a set of inherent characteristics that fulfills requirements*".

Food safety can be termed as the assurance that the food will not cause an adverse health effect for the consumer when it is prepared and/or consumed in accordance with its intended use. Due to the ever-growing global population and raising demand for food to meet the requirements, food safety became a very important aspect. In the manufacturing process it is vital to ensure that the products delivered to consumers do not interfere with the consumers' health adversely. If the production system fails to comply with the food safety regulations, that will lead to the transmission of foodborne illness. According to World Health organization reports, about 2 million deaths occur every year from contaminated food or drinking water. Around 600 million cases are caused by 22 different enteric diseases (disease caused by intestinal infection) and among that about 52000 deaths are caused by enteric disease caused by Salmonella typhi. Over 40% people suffering from enteric diseases caused by consumption of contaminated food were children under the age of 5 years.

Quality Assurance and Quality Control

The minimum requirement for a quality assurance system is to prevent any hazard to the consumer. Industry needs routine tools of quality assurance (QA) linked with HACCP plan and quality control functions to perform necessary analysis to evaluate the safety of the process/products. As per ISO 8402, Quality Assurance can be defined as all those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality. While Quality Control (QC) is defined as the operational techniques and activities that are used to fulfill requirements for quality. Hazard Analysis and Critical Control Point (HACCP) is a quality assurance approach based on prevention, rather than correcting the occurrence of the potential hazards that may cause illness/injury to the consumer during the manufacturing process. Total Quality Management (TQM) is a theory of management based on the principles of quality assurance. There are nine TQM practices adopted for food manufacturing such as cross-functional product design, process management, supplier quality management, customer involvement, information and

feedback, committed leadership, strategic planning, cross functional training, and employee involvement.

All these quality assurance systems are intended to provide confidence to the management, customer and regulatory agencies that the company meets all the relevant food quality and safety requirements.

Quality and safety issues in fish products:

Quality issues	Safety issues
Live/fresh/chilled/frozen fishes	
Belly bursting Discoloration Blackening/ melanosis in crustaceans Pink discoloration in squid and cuttlefish Freezer burn/ dehydration Off flavors	Pesticide residues and Other Persistent organic pollutants Residues of veterinary drugs and extra label chemicals Unapproved additives Presence of adulterants Growth of pathogenic bacteria Allergens
Dried fish	
Shrinkage Casehardening Protein denaturation and rehydration Maillard reaction Rancidity Dun, Pink/Red Insect infestation Fragmentation	Growth of pathogenic bacteria Clostridium botulinum toxin production (for uneviscerated products) Staphylococcus aureus toxin Pesticide residues Unapproved additives Allergens
Fish mince and surimi	
Dehydration Presence of foreign matter Denaturation of protein	Parasites Growth of pathogenic bacteria Pathogenic bacteria survival Heavy metals Natural toxins Allergens and Food intolerance substances Metal inclusion
Smoked fish	
Presence of pathogens Decomposition Parasites	Growth of pathogenic bacteria Clostridium botulinum toxin production Pathogenic bacteria survival Allergens and Food intolerance substances Metal inclusion Natural toxin Polyaromatic hydrocarbons
Canned fish	

Struvite formation Sulphide blackening Blue discoloration Curd and adhesion Honey combing Retort burn Case hardening Softening and mush	Growth of pathogenic bacteria Clostridium botulinum toxin production Pathogenic bacteria survival Allergens and Food intolerance substances Metal inclusion
Convenient products	
Discoloration Rancidity Protein denaturation Loss of nutrients	Growth of pathogenic bacteria Clostridium botulinum toxin production Pathogenic bacteria survival Allergens and Food intolerance substances Metal inclusion
Coated products	
Shelling Blow off Poor adhesion Gummy interface	Clostridium botulinum toxin production (Reduced Oxygen Packaging -ROP) Staphylococcus aureus toxin (ROP & other than ROP) Allergens and Food intolerance substances Metal inclusion
Fish pickles	
Soft, slippery slimy/dark appearance Shriveled/bitter tasty pickle Yeast and mold growth Presence of pathogenic bacteria	Growth of pathogenic bacteria Clostridium botulinum toxin production Allergens and Food intolerance substances Metal inclusion Glass inclusion
Fermented fishery products	
Parasites Natural toxins Histamine Presence of pathogenic bacteria Rancidity Dehydration/ dryness and discoloration Presence of extraneous matter	Growth of pathogenic bacteria Clostridium botulinum toxin production Allergens and Food intolerance substances Metal inclusion Glass inclusion

The most important factors deciding the quality and safety of fish are the time temperature tolerance. The rigor period starts immediately after death depend on various factors such as temperature, stress and species. If the fish is properly iced and kept at 0°C, the rigor can last up to 2-4 days. Most of the consumers, except those who are in proximity to fish landing centers/harbors or fishermen, prefer taste and texture of post-rigor fish only. So, this pre-rigor and rigor period can be used for transportation purpose, so that high quality fish can be served

to consumers. Along with that if there is an effective quality assurance system in practice, the safety of the product also can be assured.

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