**Course Name: Canning Technology and Value Addition in Seafood**
**Professors name: Dr. Maya Raman, Dr. Abhilash Sasidharan**
**Department: Food Science and Technology**
**Institute: Kerala University of Fisheries and Ocean Studies**
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# Quality standards for seafood value added products - Part 1

Welcome to the new session of NPTEL course, "Canning Technology and Value Addition of Seafoods." In the previous sessions, we discussed the composition and nutritional quality of seafood. We have seen that seafood is a rich source of protein. They also contain high amounts of polyunsaturated fatty acids and minerals. We discussed how these nutrients are distributed in the muscle tissue and explored different muscle proteins and the musculature of seafood, contrasting it with other animals.

We also addressed various spoilage mechanisms in seafood and methods for prevention. Traditional preservation methods such as freezing, scanning, pickling, and drying were discussed, along with novel non-thermal methods like HPP (high-pressure processing), microwave, ohmic, or UV treatments.

Furthermore, we explored different value-added products that can be developed from seafood byproducts. Typically, these byproducts are indiscriminately dumped, contributing to environmental pollution. However, by recycling or reutilizing them, we can mitigate pollution and create valuable products.

Today's session will focus on quality standards for seafood value-added products. We'll explore various standards at national and international levels within the seafood industry and other products derived from seafood.

Before we go into the subject, let's grasp the concept of food law. Essentially, it comprises two components: a food act and regulations. An act establishes broad principles, while regulations provide detailed provisions on how these principles are to be followed. Regulations outline the specific considerations to be adhered to. Each product typically has its own set of regulations, which may vary across products.

Generally, a law is managed by multiple acts, which, in turn, are governed by regulations and rules. Often, regulations and rules are used interchangeably. The act serves as a guiding principle, defining how a community or society should behave. However, the specifics of implementation are outlined in the regulations.

Regulation is the authority's directives, specifying the order in which rules must be followed. Rules dictate behaviors or actions according to the law or custom, outlining what can or must be done as per regulation. Thus, rules encompass both aspects.

For instance, in cricket, the required number of players and their positions are determined by rules. However, the conduct of the game itself falls under the purview of acts. This illustrates the distinction between rules and acts. Now, let's explore their differences further.

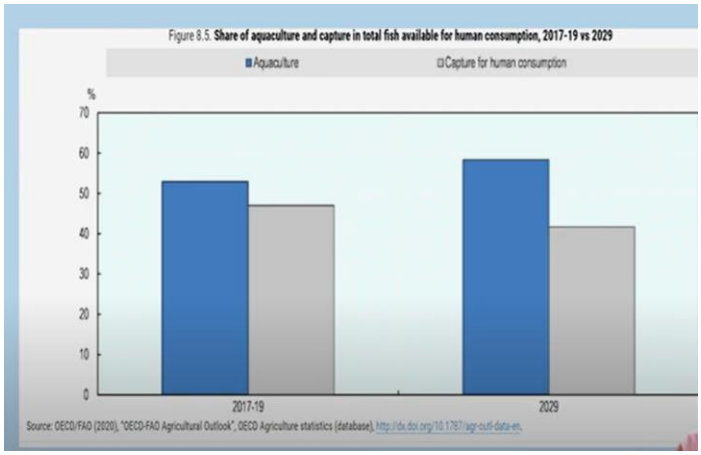
An act serves as primary legislation, while rules constitute secondary legislation. Acts are concise and precise, containing only the original legislation. However, questions regarding how, what, whom, or why things must be done are addressed by rules and regulations. Without them, acts cannot function effectively. Acts are legal documents typically passed by higher authorities, such as the parliament in our country. Rules are formulated by authorized bodies of the parliament in accordance with the act. The parliament may delegate this task to a committee or another body. Rules can be modified or cancelled based on necessity, unlike acts, which are more rigid once enacted. Acts define what is to be regulated, while rules and regulations outline how regulations are to be enforced. Amendments to acts are infrequent, whereas changes to rules and regulations can be made as needed.

Now, why are rules and regulations necessary in the food industry? You may have heard of Hippocrates, who famously said, "Let food be thy medicine and medicine be thy food." This underscores the shift towards food as medicine in contemporary times, as scientists have demonstrated the health benefits of proper nutrition. Maintaining a healthy diet can help prevent non-communicable diseases, age-related disorders, malnutrition, and poisonings. Additionally, underlying medical conditions or side effects from drugs can weaken the immune system. These issues have become more prevalent in recent years, with corresponding increases in morbidity and mortality. Preventing these ailments is often easier than treating them, highlighting the importance of consuming balanced and healthy food.

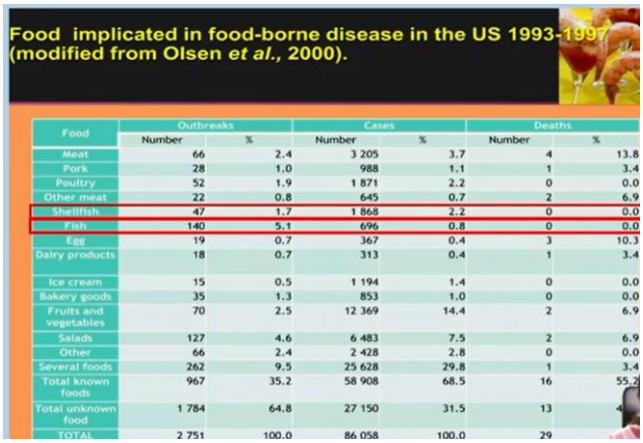
When food is viewed as medicine, proper regulations and rules are essential for its management and control. Fish is particularly relevant in this context due to its prominence in the food industry. It is not only a significant contributor to the economy through trade but also widely consumed, with water bodies being abundant in many countries.

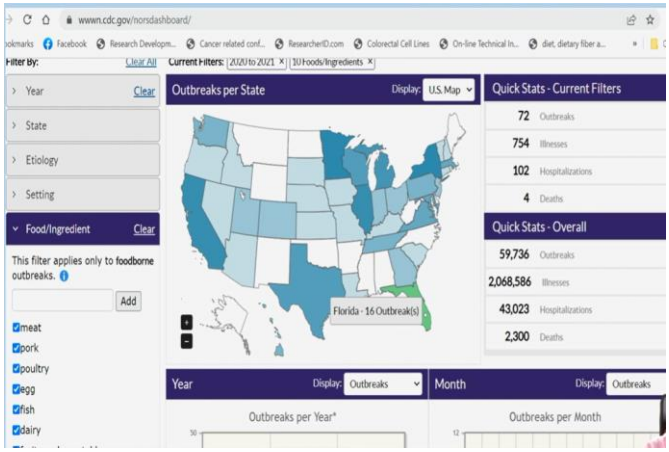
They play a significant role in the export and import of fishery products, contributing greatly to the economy. The high demand for fish stems from its rich protein content and affordability compared to other animal proteins. Additionally, fish contains valuable macromolecules and micromolecules like PUFA and minerals.

Projections for 2029 indicate that 90 percent of fish produced will be consumed as food, with an expected increase in production and consumption rates. Per capita consumption is forecasted to rise, reaching 21.4 kg, a 4.7 percent increase. While recent per capita increases have been modest, at 1.3 percent, significant variations may occur, influenced by geographic, economic, and cultural factors.




By 2029, aquaculture production is estimated to contribute around 60 percent of the projected value, encompassing various commodities produced through aquaculture. There's a slight decrease in projected values for capture, possibly due to the increasing demand for aquaculture-produced or cultured fish products. Looking at the 1993-97 data, it reveals various diseases in the US linked to the consumption of different food products. Notably, outbreaks associated with fish and shellfish were more prevalent than with other products. This underscores the importance of caution when consuming such products, as they directly impact health.




Recent figures from the CDC government depict outbreaks across almost all US states due to the consumption of fish or fishery products. Fish and fishery products are particularly susceptible to contamination and diseases for several reasons. They are often consumed raw, as in the case of sushi, or lightly preserved without extensive preservation

methods, increasing the risk of disease transmission. Additionally, improper storage conditions or undercooking can lead to contamination. Cross-contamination from raw materials to finished products is another significant factor.

This is why fish and fishery products can transfer diseases. We've already explored this aspect. The quality of fish can be influenced by physical, chemical, or microbiological changes. These factors depend on various parameters such as the species, method of capture (cultured or captured), handling procedures, immediate icing after capture, size of the fish, and the stress it undergoes. Improper icing can trigger contamination, and processing at pre-processing centers, including immediate processing versus storage, also impacts quality. Factors like water conditions, including potable water and microbial load, are crucial considerations as well. All these parameters directly affect product quality. Additionally, pathogenic microbes must be considered.

Some microorganisms inhabit the gut of fish and are released during autolysis or come from the aquatic environment where the fish was caught. These may include Vibrio, *Clostridium botulinum*, and Aeromonas, originating from the water where the fish was caught. Pathogens from the general environment can contaminate fish through contact or exposure. These may include *Clostridium botulinum* type A and B, *C. Perfringens Bacillus cereus*, Listeria, and Salmonella. Contamination from human handling, such as improper handwashing or illness, can introduce Staphylococcus, E. coli, and Shigella to food products. Contamination from human sources is another concern, as it can occur during product handling.

Pathogenic parasites like roundworms, tapeworms, and flukes are commonly found in raw seafood products, posing a serious threat. While cooked products are less susceptible to these parasites, raw foods pose a greater risk. Additionally, viral infections are a concern. To mitigate the risk of microbial, viral, bacterial, fungal, and parasitic contamination, antibiotics are often used in aquaculture. However, excessive antibiotic use can lead to antibiotic resistance in both fish and humans, rendering some microorganisms resistant to treatment. AMR, or antimicrobial resistance, has increased due to frequent antibiotic use. The US has prohibited antibiotics in fishery products destined for export, necessitating a reduction in antibiotic usage. Scientists are now advocating for the use of probiotics in aquaculture to reduce antibiotic dependency.

Hazards in seafood can be categorized as physical, chemical, or biological agents with the potential to cause adverse health effects in humans. Biological hazards include bacteria, viruses, and parasites originating from fish. Chemical hazards can arise from antibiotics and pesticides used in farms to boost production and control microorganisms, posing risks to human health. Physical hazards in seafood can include bones or metals. Sometimes, in processing plants, workers may accidentally drop personal items like wedding rings or earrings into the product, potentially contaminating the finished

product. Controlling these hazards requires raising awareness among workers, ensuring they adhere to safety protocols. Laws are necessary to enforce compliance with safety measures.

The food trade is a complex system involving technical and administrative operations and the movement of large quantities and varieties of products across borders. To ensure the safe transportation and trade of these products, proper regulations and guidance are essential. This not only safeguards against inferior products entering the market but also prevents quality compromise.

Consumer trust is crucial in considering all these factors when engaging in trade.The scientific basis required to gain consumers' trust and provide quality food products necessitates laws and regulations. Therefore, this topic emphasizes a safety and quality assurance approach. Fish, being a cost-effective source of protein rich in amino acids, proteins, and PUFA, can help prevent various age-related disorders, cardiovascular diseases, cancer, obesity, and diabetes. Combined with an active lifestyle, consuming healthy food can significantly improve health. Considering fish's positive impact on health, ensuring its quality is crucial. While awareness can be raised, it's essential that rules and regulations are strictly followed, monitored by authorities. Hence, laws and regulations are vital in the food sector. That's all for today.