

Microbiology of fish and fish product assignment



**ASSIGN
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Microbiology of Fish and Fish Products Introduction: Fish is a major staple food in most parts of the world and are second only to meat as the major animal protein in most diets. Whilst foods such as 'meat' form relatively well-defined groups of raw materials, fish' constitutes a large range of types (some sources recognize over 20, 000 identified species), caught over a wide range of conditions (from the arc-tic/Antarctic to the tropics, fresh or salt water and harvested tooth from Wild' and farmed' environments).

If we move away from the raw material itself, fish are made into a wide range of 'added value' products from high cost traditionally smoked chilled fillets, to lower cost frozen breaded fish fingers. Fish products are preserved using almost every food processing technique that has ever been develop(drying, smoking, freezing, canning, fermenting, high pressure processing), and of course, there is the increasing trend towards the consumption of high quality raw fish in the form of sushi.

All of this variety does of course mean that the microbiology of fish and fish products is ample and can cover a wide range of both quality and safety related issues. Initially, in the microbiology of raw fish will be considered.

Freshly caught fish Microorganisms are found on all of the outer surfaces and within the intestine of live fish. Skin may contain 10^2 - 10^6 organisms per CM, whilst the gills and intestine can contain 10^3 - 10^9 organisms per CM.

The bacterial loading on freshly caught fish tends to reflect the environment from which it was caught, rather than the fish species; those from cold clean waters carry a lower load than those from warm waters. After catching and

death, the microfilms may begin to change due to the offering environmental conditions. Usually fish are stored on ice, which will clearly reduce temperature but will also reduce the salt concentration surrounding marine fish. These changes will affect the ability of organisms to grow and will start to change the microfilms of the fish.

Contamination of Fish: The tailor to living ties depends upon the microbial content to the water in which they live. The slime that covers the outer surface of fish has been found to contain bacteria of the genera Pseudonymous, Corroborate, Microcosmic, Planetarium, Crematoriums, Sarnia, Seriate, Brio, and Bacillus. In the intestines of fish from both sources are found bacteria of the genera are Combaters, Pseudonymous, Planetarium, Brio, Bacillus, Colostomies and Escherichia.

Boats, boxes, bins and fish houses, and fishery men are heavily contaminated with these bacteria and transfer them to the fish during cleaning. The numbers of bacteria in slime and on the skin of newly caught ocean fish may be as low as 100 and as high as several million per square centimeter, and the intestinal fluid may contain from one thousand to 100 million per millimeter. Gill tissue may harbor a thousand to 100 million per millimeter per grams. Fish and their Environment At the time of being captured, fresh fish contain on their bodies a wide variety of microorganisms, also known as the microfilms of the fish.

Depending on the region of water from which the fish are caught, the microfilms of the fish can have different degrees of complexity. For example, fish that are caught in very cold and clean waters have a lower number of

cryptographic and cryptographic microbes whereas fish caught in warmer waters have somewhat higher counts of mesospheric microbes. In addition, fish captured from polluted warm water have a selection of unique scribes due to the presence of a large number of Intercontinental.

However, regardless of where the fish has been caught, only a number of the microbes are able to proliferate on the post-mortem fish. Of these surviving microbes, only a small portion can generate metabolites that create the off-flavors, off-odors and disconsolation that humans find unsuitable for consumption. In fresh fish, the specific spoilage bacteria include Channels putrefaction and Pseudonymous SSP. Temperate Water Fish The microfilms of wild fish is mainly Gram negative rods belonging to genera such as:

Pseudonymous, Marmoreal, Counteracted, Allegiances, Channels, Planetarium, Brio and Aeron's. Some Gram positive organisms (bacillus, microcosmic, and colostomies) can be found although lactic acid bacteria are rare. It should be noted that CLC. Botulism is found in the aquatic environment and this should be kept in mind when further processing of fish is done. The microfilms of farmed fish from temperate waters is similar to that of wild fish, however, as farm environments are usually closer to human waste sources, higher contamination with organisms such as listener can occur Tropical water fish

Gram positive organisms such as bacillus and microcosmic tend to be Dunn on ties caught in tropical waters; besides these the flora will tend to be the same as that found on temperate water fish. There are also several human pathogens in tropical waters; for example, Brio parasymphetic's, Brio

cholera, and Brio fulfilling, the potential presence of these organisms should be noted when handling fish from these waters.

The microfilms of farmed fish from tropical water does not differ significantly from that of wild fish. However, as farms tend to be near areas of human habitation, the eater may be contaminated with higher than normal levels of human and animal waste. This brings concerns of contamination with enteric organisms such as Salmonella and Escherichia coli. Such organisms do not survive in colder nutrient deprived temperate waters, but do persist and may even grow in more nutrient rich tropical environments.

Microbiological issues When fish are live, muscle tissue is considered to be sterile, but after death the barriers to microbiological invasion begin to break down and bacteria are able to grow more freely, although will be rarely found within deep muscle tissue. Microbial Spoilage Fish and other seafood may be spoiled by autolysis, oxidation, or bacterial activity, or most commonly by combinations of these. Bacteria Causing Fish Spoilage The bacteria most often involved in the spoilage of fish are part of the natural flora of the external slime of fishes and their intestinal content.

The predominant kinds of bacteria causing spoilage vary with the temperatures at which, the fish are held, but at the chilling temperatures usually employed, species of Pseudomonas are most likely to predominate, with Corroborate and Planctomyces species next in order of importance. In higher temperatures are Microcosmic and Bacillus. Escherichia, Proteus, Serratia, Sarcina, and Colostomyces would grow only at ordinary atmospheric temperatures and probably would do little at chilling temperatures.

A musty or muddy odor and taste of fish has been attributed to the growth of Streptomycin species in the mud at the bottom of the body of water and the absorption of the flavor by the fish. Discoloration of the fish flesh may occur during spoilage; yellow to greenish-yellow colors are caused by Pseudomonas fluorescence, yellow microcosmic, and others; Deep or pink colors are from growth of Serratia, Microcosmic or Bacillus species or by molds or yeasts; and a chocolate - brown color by an spontaneous yeast.

Pathogens parasitizing the fish may produce discoloration or lesions, Characteristics of a Spoiled Fish Fish spoilage manifests itself physically in numerous ways. In terms of smell, spoiled fish will generally have a fishy, sour, or ammonia-like stench. Appearance-wise, spoiled fish may appear to be dry or mushy in certain areas, and the gills may have slime and it may turn to light pink and finally grayish-yellow color. The eyes rapidly sink and shrink, the pupil becoming cloudy and the cornea opaque.

Spoiled fish will also have flesh that is soft, or does not spring back when pressed upon. Typically, spoiled fish will also have a green or yellowish discoloration; however, this arises not from spoilage metabolites, but rather oxidation of the oxygen transporters in fish blood (myoglobin to methemoglobin) during frozen storage or from prolonged or unnecessary exposure of the fish to air. Factors Influencing Kind and Rate of Spoilage The kind and rate of spoilage of fish will vary with a number of factors: 1. The kind of fish.

Flat fish spoil more readily than round fish because they pass through rigor mortis more rapidly, but a flat fish like the halibut keeps longer. Fatty fish deteriorate rapidly because of the oxidation of the unsaturated fats of their

oils. 2. The condition of the fish when caught. Fish that are exhausted as the result of struggling, lack of oxygen, and excessive handling spoil more rapidly than those brought in with less ado, “Fetishism that is full of blood when caught are more perishable than those with an empty intestinal tract. 3. The kind and extent of contamination of the fish flesh with bacteria.

These may take come from mud, water, handlers, and the exterior slime and intestinal content of the fish which enter the gills of the fish. From which they pass through the vascular system and thus invade the flesh or to penetrate the intestinal tract and thus enter the body cavity. This contamination may take place in the net (mud), in the fishing boat, on the docks or in the plants.

4. Temperature. Chilling of the fish is the most commonly used method for preventing or delaying bacterial growth and hence spoilage until the fish is used is otherwise processed.

The cooling should be as rapid as possible to 32 to 30 F 0-ICC), and this low temperature should be maintained. Obviously, the warmer the temperature, the shorter will be the storage life of the fish. Prompt and rapid freezing of the fish is still more effective in its preservation. 5. Use of an antibiotic ice or dip. Preservation of Fish Fish processing plays a role in preserving excess catch especially if transportation to bring the fresh fish to market is not always available. It prevents spoilage and makes it easier to transport them in processed form than in its fresh condition.

Fresh fish easily spoils; it would eventually damage because of long distance travel when not ropey stored. Different Methods of Processing Fish A.

Canning is the process of applying heat to food that’s sealed in a Jar in order

to destroy any microorganisms that can cause spoilage. Proper canning techniques stop this spoilage by heating the food for a specific period of time and killing these unwanted microorganisms. During the canning process, air is driven from the Jar and a vacuum is formed as the Jar cools and seals.

Two types of Canning Method Water-bath canning: This method sometimes referred to as hot water canning, uses a large kettle of boiling water. Filled Jars are submerged in the water and heated to an internal temperature of 212 degrees for a specific period of time. Pressure canning: Pressure canning uses a large kettle that produces steam in a locked compartment. The filled Jars in the kettle reach an internal temperature of 240 degrees under a specific pressure (stated in pounds) that's measured with a dial gauge or weighted gauge on the pressure-canner cover.

Use a pressure canner for processing low-acid foods, such as meat, poultry, and fish. B. Chilling and Freezing; Fish is exposed to a low temperature environment, the growth of the microorganisms could be prevented; this could lead to spoilage prevention. The appropriate temperature is 0 degree Celsius which involves the use of ice or a refrigerator. Chilling This is obtained by covering the fish with layers of ice. However, ice alone is not effective for, long preservation, because melting water brings about a sort of leaching of valuable flesh contents which are responsible for the flavor.

But ice is effective for short term preservation such as is needed to transport landed fish to nearby markets or to canning factories, etc. Here tautology enzymes activities are checked by lowering the temperature. The use of ice for chilling is very much convenient and widely used in the markets. If you

are going to use ice for fish preservation, make sure that you have sufficient amount of ice. To keep the fish properly chilled with ice, usually the coarser ice should be put on the top while the melted ice should be put below.

Freezing foods is the art of preparing, packaging, and freezing foods at their peak of freshness.

You can freeze most fresh vegetables and fruits, meats and fish, breads and cakes, and clear soups and casseroles. The keys to freezing food are to make sure it's absolutely fresh, that you freeze it as quickly as possible, and that you keep it at a proper frozen temperature (0 degrees). C. Drying and Dehydration Drying is the oldest method known for preserving food. This involves the removal of water content from fish tissues until the moisture of the fish is extracted. In this process the growth of microorganisms is prevented. This can be done naturally using the heat of the sun.

It is called as solar drying. When you dry food, you expose the food to a temperature that's high enough to remove the moisture but low enough that it doesn't cook. Good air circulation assists in evenly drying the food.

Dehydration is another method in drying fish. It is done through the use of artificially heated air through the use of mechanical driers. An electric dehydrator is the best and most efficient unit for drying, or dehydrating, food. Today's units include a thermostat and fan to help regulate temperatures much better.

You can also dry food in your oven or by using the heat of the sun, but the process will take longer and produce inferior results to food dried in a dehydrator. Smoking Smoking is also another method in fish preservation.

This process gives the fish a desirable flavor and odor as well as preserving it. Smoking is usually done through four processes. First is cleaning the fish. Second is brining which is soaking the fish in a brine solution. The third is drying and the fourth one is smoking the fish. In smoking process, the length of smoking time usually takes up to 30 to 45 minutes and the temperature is 85 degree Celsius.

Hardwoods together with plant leaves are commonly used. Two of two types of Smoking: ' 1 . Hot smoking – This is a slow type of broiling where fish are placed near the fire at smoke temperature. 2. Cold smoking The fish are placed away from the fire at a distance of almost two meters with a smoke temperature ranging from ICC to ICC. E. Salting Fish can also be preserved by the way of salting. Salting is a very old method of preserving fish. Salting depends on the size of the fish, the species, and on the amount and quality of the salt used.

Fish which have been salted well last a long time without spoiling. The most important factor in salting fish is the quality of the fish being salted. Use only fresh fish: fish which have been lying around for hours are not good for salting. Also, use only clean equipment and clean fish. Salt elements will lower the water content below the point where bacteria or microorganisms can no longer live and grow. In the time that water passes out from the tissues of the fish, the salt will going to penetrate the fish tissues until the salt solutions filled it in. This is called as the “ osmosis” absorption process.

Two types of Salting Fish: 1. Brine Salting – the fish are soaked in a saturated brine solution for a few hours prior to drying under the heat of the sun. 2.

Salt Drying – is the method of drying fish where the fish are sprinkled and blended thoroughly with dry salt before drying under the heat of the sun.

Pickling and spicing Pickling and spicing is a method in fish preservation used vinegar and other spices. The growth of bacteria and other organisms is prevented by the acetic acid of the vinegar; the vinegar will preserve the fish as well as improves its taste.

Fish fermentation Fish Fermentation can also preserve fish. It is the process of breaking down the protein in the fish caused by an enzymatic action. It is called as hydroxylation. In this process of fermentation, the flesh of the fish is allowed to get “ripe”; this is the state where the flesh of the fish will start to disintegrate before it is going to undergo “aging”. In normal process, fermentation takes up to 8 months. It will take less than a onto that if pure salt is used and the temperature is increased from 37 degree Celsius up to 45 degree Celsius.

In the later fermentation process, the activity is faster. Spoilage to Special Kinds to Fish Salt fish are spoiled by salt-tolerant or halophilic bacteria of the genera *Seriata*, *Microcosmic*, *Bacillus*. *Corroborate*, *Pseudonymous*, and others, which often cause discoloration, a red color being common. Molds are the chief spoilage organisms on smoked fish. Marinated (sour pickled) fish should present no spoilage problems unless the acid content is low enough to permit growth of lactic acid bacteria, or the entrance of air permits mold growth.