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Seafood Spoilage and Sickness

By

Tony Chamberlain
and
Gabriel Titili

Community Fisheries Training Pacific Series 4

USP Marine Studies Programme / SPC Coastal Fisheries Programme:

Training Materials for Pacific Community Fisheries



The University of the South Pacific



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Preface to the Series

The majority of Pacific Island countries rely on the sea as a major source of food. While women are not involved in offshore deep sea fishing, they are active in collecting and gleaning shellfish and other edible sea species from the nearshore areas and inside the reef. Women also prepare fish either for sale or home consumption. In this preparation process, women are involved in cleaning, gutting, cooking and selling various seafoods. In many atoll countries, women are also involved in the preservation of seafood by drying or smoking. In view of women's role in fisheries activities and the importance of seafood in the region, it is vital that women learn not only the correct handling methods for seafood, but also how to use marine resources wisely for the future.

This manual is part of the Community Fisheries Training Series, and is designed to meet the wide need for community fisheries training in the Pacific, particularly for women. The series was originally developed for the SPC Community Education Training Centre (CETC). The fisheries course at CETC began in 1999 as a joint effort with the USP Marine Studies Programme. It was a response by the Centre to meet the needs of women in the region to improve their skills in small-scale fisheries activities. The USP Post Harvest Fisheries Project was also working to provide post harvest fisheries training for men and women in the region; hence the joint venture between the two institutions in 1999. The two groups of women who have since been through the course have found the training interesting and useful.

Since its inception in 1999, the course has been taught jointly by the USP Marine Studies Programme staff in Fiji Islands and the SPC Community Fisheries Section staff based in New Caledonia. Funding has come from Canada, New Zealand, Australia and the International Ocean Institute - Pacific Islands.

I wish to acknowledge the assistance and major contribution by Tony Chamberlain, Lecturer of the USP Marine Studies Programme/Post Harvest Fisheries Project; Patricia Tuara, previous SPC Community Fisheries Adviser; Lyn Lambeth, SPC Community Fisheries Officer and other trainers in previous years.

I am grateful to the Marine Studies Programme technical staff who have given their time to training women and also the USP for facilities and equipment used during the course. I acknowledge Dr Jimmie Rodgers, Senior Deputy Director-General of SPC in Suva and the SPC Management for supporting CETC, by providing facilities and resources towards the implementation of the Fisheries course. We hope you enjoy this manual in the series.

Best wishes for a successful fisheries training programme.

Nu'ufou Petaia
Principal
SPC Community Education Training Centre (CETC) Narere, Fiji Islands
March 2001

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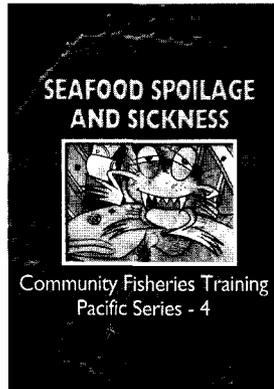
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Spoilage and Sickness:

Community Fisheries Training - Pacific Series 4



An introduction to how seafood spoils and how eating spoiled seafood can make you sick.

How to use this book

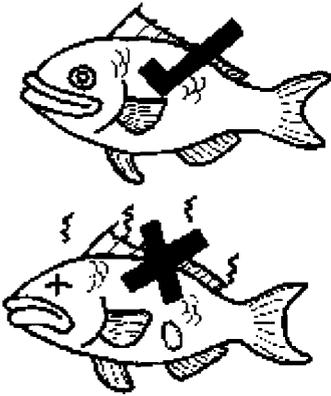
This book is structured into two chapters: Chapter One looks at the agents of spoilage and what to look for when selecting seafood; Chapter Two provides an overview of the various seafood related sicknesses that occur naturally or are introduced.

Objectives

After reading this book and completing the exercises you should be able to:

1. explain what is meant by spoilage;
2. describe the two main agents of spoilage;
3. describe the three stages of spoilage;
4. know the fresh fish test;
5. explain what causes spoilage in dried fish; and
6. describe some of the types of seafood sickness.

Chapter One - Spoilage



Introduction

After a fish dies, its flesh begins to break down (or rot). This is called **spoilage**. After some time, the fish gets softer, smellier, loses its bright colours, and begins to produce harmful substances that can make people sick.

Seafood spoils quickly; when it does:

- it goes to waste;
- it is not healthy because there are fewer nutrients;
- it can make you, your family or your customers sick; and
- those selling lose money as people do not want to buy it.

Activity

Answer these questions:

1. Where have you found bad fish?
2. What made these fish go bad?

Agents of spoilage

Fish go bad, or spoil, when agents of spoilage attack the flesh after the fish is dead. The two main agents of spoilage are:

- bacteria
- enzymes

Bacteria and **enzymes** are the enemies in the battle to preserve food products.



Bacteria.

Bacteria

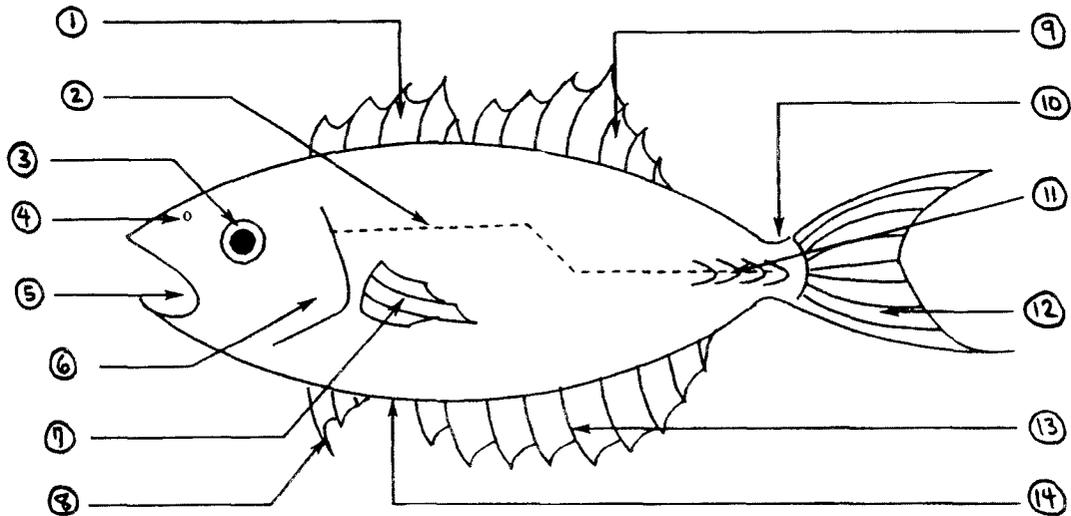
Bacteria are simple - and very tiny - organisms. They live almost everywhere, including:

- in the air;
- on land;
- in the sea (and on the ocean floor);
- on plants and animals; and
- on the skin, gills and guts of fish.

One place bacteria do NOT normally grow is in the flesh of a live, healthy fish. Bacteria are found only on exposed surfaces such as the skin (and **body slime**), gills and gut.

Activity

1. Label parts of a fish using local names.

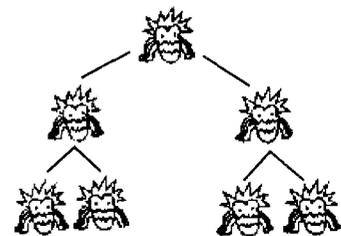


2. Which parts of the fish have the most bacteria?

Bacteria on the skin, the guts and the gills cause no harm to a living fish. However, when the fish dies, these bacteria grow quickly in number, especially in warm and wet or humid conditions. If there is a tear or a hole in the skin, the bacteria can enter the flesh - an ideal place for bacteria to grow - and make the flesh smell and taste bad, look awful and possibly make those eating it sick.

Bacteria are greater in number if the seafood:

- comes from polluted waters (i.e. **sewage**);
- touches dirty hands, boats, boxes, etc;
- is handled or gutted without care;
- is stored at high temperatures; or
- has fed just before capture (more bacteria in the gut).



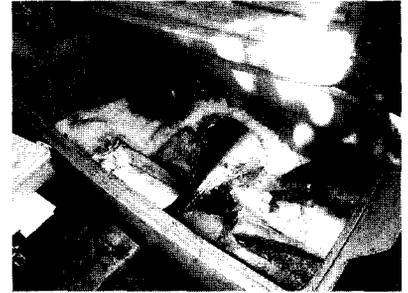
Bacteria can multiply quickly.



In Pacific Island countries, fish can go bad within 12 to 20 hours, depending on the species and method of capture. Some types of fish go bad more quickly than others. For example, white reef fish meat keeps longer in ice than red tuna meat. This is because tuna have a higher body temperature compared to reef fish, making it easier for bacteria to grow. Their thicker body shape also makes them slower to chill.

Fish caught using nets, traps or set-lines sometimes stay in the water for hours before they are harvested and so may go bad quickly. Fish caught from trolling are taken out of the water within two to three

Moses: Why are you doing that?
 Fisheries Officer: To find out their temperature to see how fresh your fish are.
 Moses: Are they fresh?
 Fisheries Officer: Most of them are bad.
 Moses: But I just caught them this morning.
 Fisheries Officer: You see, Moses, your fish were kept in the sun all day, making them very hot and causing 'belly burst'.
 Moses: No! I think the sea spirit made the fish explode.



Funafuti, Tuvalu: Store fish on ice.

The Fisheries Officer tried to explain to Moses that he had to keep the fish cool. He also told Moses that he had to keep spoiled fish away from fresh fish. The Fisheries Officer explained to Moses that enzymes found in the guts of the fish keep working after the fish dies and break through the gut wall. 'Belly burst' happens when fish are stored ungutted in warm temperature, especially fish that have eaten a lot.

Activity

Answer these questions:

1. Which parts of the fish are likely to have high amounts of bacteria?
2. Enzymes are not a problem when the fish is living. Why are they a problem when the fish is dead?
3. What causes 'belly burst'?
4. How can you stop 'belly burst'?

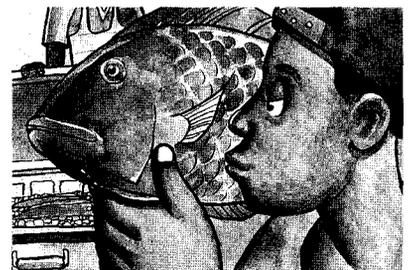
The fresh fish test

If a fish is kept in conditions allowing bacteria or enzymes to attack the flesh, it will quickly lose its freshness and quality. However, a person who buys or eats fish would like it to be fresh.

A fresh fish:

- has bright colours;
- has clear, bright eyes;
- has bright red gills;
- smells like fresh seaweed;
- feels firm and springy;
- does not have overly slimy skin or gills; and
- tastes yummy.

A fresh fish is more nutritious and is less likely to make you sick.



Fresh fish.

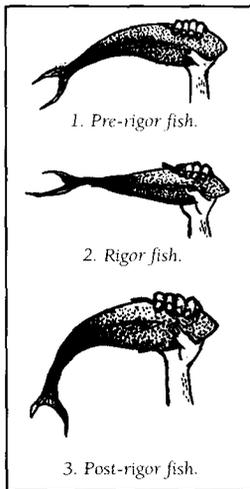


Spoiled fish.

Activity

1. Look at the fish on display. Some fish are fresher than others.
2. Can you tell how fresh are they? Give each fish a score according to the table below:

	😊 5	😐 4	😞 3	😡 2	😱 1
GILLS	Bright Red	Red	Pink	Brown	Dark Brown
SMELL	Sea weed	None	Fishy	Stale	Off
LOOKS	Colours Shiny	Dull Colours	Grey	Dull	Bruise very dull
FIRM	Firm Springy	Firm Springy	leaves dent	soft	very soft
EYES	clear	clear blood	cloudy blood	cloudy sunken	very cloud sunken
COLOUR	very Bright	Bright	Faded	Dull	Brown spots
TOTAL	30-25	24-19	18-13	12-7	6-1



Stages of rigor.



Ponhpei, FSM: Tuna in rigor.

Stiff fish and spoilage

Just after you land a fish inside your canoe or put it into your fish basket after spearing it on the reef top, it quickly dies. A dead fish goes through three stages, known as the stages of rigor.

- Stage 1. The fish is soft immediately after it dies.
- Stage 2. The fish becomes stiff within several minutes to several hours after death, depending on the temperature it is kept at - the quicker it is chilled the longer it will take to reach this stage. The fish will also be stiff longer if it is bigger and is kept cool.
- Stage 3. The fish becomes soft again after some time. If you push your finger into the side of the fish, it is not as springy as it was in the first stage.

Bacteria and enzymes are more active in Stage 3 and fish will then go bad very quickly. Fishers should try to keep fish in Stage 1 and Stage 2 for as long as possible.

The cooler a fish, the longer it will take to reach Stage 3. Cover it with a wet bag or palm leaf, or even better, put the fish on ice.

Dried fish and spoilage

Mould

Mould can also spoil seafood. It grows in wet places. Salted dried fish that are not salty and dry enough, or have been stored in a wet place, may be attacked by mould. Mould produces poisons in dried fish.

Some people scrape the surface mould off and put the fish back out to dry. This is **DANGEROUS** because most of the mould is growing deep in the flesh where you cannot see it. Once a fish has been attacked by mould, it contains poisons and you should throw it away. Remember to dry the fish properly; a solar drier can help. Store it in an air-tight container in a cool dry place.

Insects

Insects such as beetles like to eat dried food. Make sure that the food is stored in an airtight container. Also, if the fish takes a long time to dry, flies may lay eggs that grow into maggots. Not only do flies spread bacteria, the maggots eat much of the fish protein. Once again a solar drier can help dry the fish quickly.



Tarawa, Kiribati: Dried fish.



Tarawa, Kiribati: Solar dryer.

Chapter Two - Sickness

Introduction

Seafood is normally a healthy food choice. Unfortunately, food from the sea sometimes contains germs or poisons that make people sick.

Because Pacific Islanders eat so much seafood, many people get sick every year. You probably know somebody who has been sick after eating seafood. You may have even been sick yourself.

Activity

1. Can you remember someone from your village or island getting sick from eating spoiled (or rotten) fish?
2. Who? When?
3. Do you know anyone who got sick from eating poisonous fish? Who? When?



When someone gets sick, they not only feel bad, but they may need costly medicine, cannot go to work, cannot cook and cannot look after the baby.

If people get sick, they don't buy seafood from the same place again.

This means that local people will not eat as much fresh seafood and may buy more tinned foods, which are more expensive and may not be as healthy.

Overseas customers do not want to buy seafood that may be poisonous. If an area becomes known for its poisonous seafood, then overseas customers will refuse to buy from that area, or they will want the seafood tested to see if it is safe. Tests cost money and the exporter may have to pay fishers less for their fish in order to stay in business.

In the next section we mention many types of sicknesses. This is not to scare you from eating seafood but to help you understand what agents can cause **poisoning** and ways to avoid seafood poisoning.

Types of sickness

Sickness occurs for a number of reasons:

- poisons may be present naturally in parts of a fish, for example **pufferfish poisoning**;
- poisons can build up when a fish is allowed to spoil, for example **histamine poisoning**;
- poison can occur when fish eat too many poisonous **plankton**,

Causes of Food-Borne Diseases

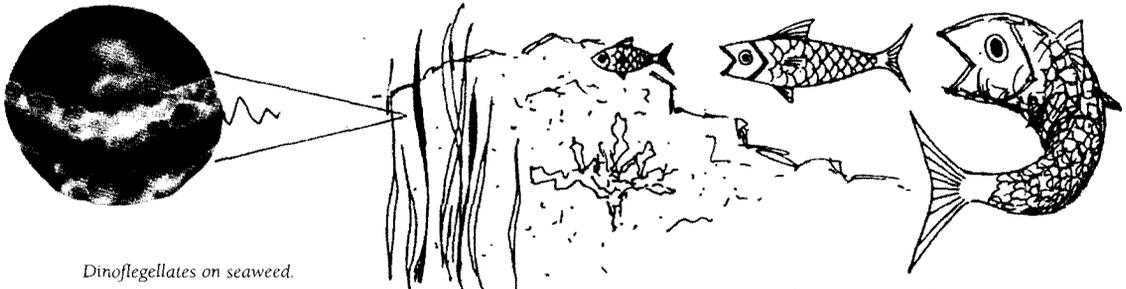
CONTAMINANT	WHERE FOUND	SOURCES
Microbial Contaminants: Viruses (a wide range of pathogens)	Shellfish, raw fruit and vegetables.	Poor hygiene, untreated sewerage, animal and plant refuse.
Bacteria (<i>Bacilli, Escherichia coli, Clostridia, Staphylococcus, Salmonella, Shigella, Vibrio</i>)	Raw and processed fish and seafood cereals, vegetables, dried food and raw food of animal origin.	Poor hygiene, rodents, birds, human secretions.
Helminths (parasitic worms: <i>Ascaris, Fasciola, Taenia, Trichuris</i>)	Raw fish, uncooked or undercooked meat, vegetables.	Contaminated water and soil.
Moulds (fungi: <i>Aspergillus flavis</i>)	Nuts and cereals.	Products stored in high humidity and temperature.
Protozoans (<i>Amoeba and Sporidia</i>)	Vegetables fruit and raw milk.	Contaminated production areas and water supplies.
Environmental Contaminant: Heavy Metals (mercury, cadmium, zinc)	Especially in fish and seafoods.	Production areas contaminated with industrial wastes.
Chemicals (insecticides, fungicides, animal health products)	All foods from products treated with such chemicals,	Use of prohibited chemicals or excessive use of approved chemicals.
Radionuclides (radioactive materials)	All foods exposed to excessive radioactivity.	Nuclear bomb testing, contaminated fallout.

for example **ciguatera** or **paralytic shellfish poisoning**;

- poisons build up during certain times of the year, for example **hallucinogenic fish poisoning**;
- some poisons are passed to the fish through bad handling or from sewage, for example **typhoid**, **cholera** and **hepatitis**; and
- some poisons are caused when wastes are carelessly dumped into the water, for example industrial wastes containing heavy metals, or wastes from military activity.

By knowing more about each type of sickness we can reduce the number of times people get sick from eating seafood in the Pacific.

Ciguatera

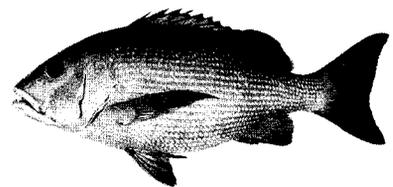


Ciguatera is caused by one type of very small marine plant (a **dinoflagellate**) that lives among the seaweed in some areas. When fish eat the seaweed, or eat other fish that have fed on the seaweed, they also eat the poisonous dinoflagellates. Humans are poisoned when they eat fish containing this poison. Problem fish can include snappers, moray eels, groupers, wrasses, jacks (trevallies), parrot fish, trigger fish and red bass. The potentially poisonous species vary from country to country.

Ciguatera sometimes occurs where the reef has been damaged in some way, for example by blasting (to build a causeway or jetty), dumping of rubbish, boat anchoring, damage from nuclear testing or by natural causes such as cyclone damage. When the coral dies, seaweed grows in its place, providing more homes for the dinoflagellates.

Little fish now eat more dinoflagellates and take in the poison. Big fish accumulate the poison by eating the little fish. When a person eats a big reef fish, they get a dose of poison large enough to make them sick.

Ciguatera makes many Pacific Islanders sick each year. It can take a long time for someone with ciguatera poisoning to get better. The poison is accumulated in humans so each time a person eats a poisonous fish it affects them more and it will take them longer to get over the sickness. Fortunately, less than 1% of cases of poisoning are fatal.



Red Snapper sometimes causes ciguatera.

Spoilage and Sickness

Category	Symptoms of Ciguatera Fish Poisoning
General	Joint pains, muscle pains (especially legs), headache, chills, sweating and dizziness. It is hard to walk.
Stomach	Upset stomach, watery diarrhoea and stomach cramps. Sometimes vomiting for up to 24 hours. Dehydration (loss of fluids) is a danger.
Nerves	Feelings of burning, tingling, itching or limb numbness. Cold may feel hot, and hot feel cold. Sometimes parts of the body shake and can not move. These problems may last weeks or months.
Heart	Heart beat speeds up or slows down. It is often irregular and softer. Lower blood pressure. Lasts 2 to 3 days.

Poisonous fish look, smell and taste normal. Cooking, freezing, salting, or drying does not get rid of the poison. The only prevention is to avoid eating potentially poisonous species, especially the organs where the poison collects. Fisheries Departments often broadcast warnings about ciguatera outbreaks - which tend to occur in certain areas and at certain times of the year. It is the local villagers who know best where the bad areas are. Unfortunately, they only find out when one of them gets sick from eating a poisonous fish.

A story

Kintoba had a very successful business selling live reef fish overseas. The fish came mostly from three outer islands, and many village fishers earned extra money selling live fish to Kintoba. A large boat would come and take the fish to Hong Kong where they were put in tanks in the restaurant. People in Hong Kong would pay a lot of money to choose a live fish from a tank and have it freshly prepared for their meal. One day, however, 16 people in Hong Kong got very sick from eating the fish from the Pacific Islands and nobody wanted to buy Kintoba's fish anymore. Kintoba's business failed and the village fishers could no longer earn extra money selling him their fish.

Kintoba wanted to find out why the people got sick from eating his fish. He found that some of the village fishers had been catching fish from areas known to be poisonous. They were finding it difficult to find fish in the other areas, so they took a chance and sold Kintoba fish from the bad area. This led to the failure of both Kintoba's business and the fishers extra source of income.

Kintoba came to realise how much he relied on the fishers to use their local knowledge of poisoning to supply safe fish. If he and the fishers wanted the business to continue, they would have to ensure no fish were taken from the poisonous areas.

Histamine

Histamine is a poison found in tunas, mackerels, sardines, herrings, bonito and mahi mahi. When improper handling exposes the catch to high temperatures and the fish begin to spoil, bacteria causes a naturally-occurring (and otherwise harmless) substance inside the fish to change into poisonous histamine. As spoilage continues, more histamine is produced.

The cooked meat of a fish affected by histamine poisoning has a honeycomb appearance and a bitter, burning taste. This kind of fish meat should not be thrown to pigs, dogs, cats or chickens (or even into the sea or fresh water) because it is so poisonous. To prevent histamine being produced, chill fish quickly after it is caught.

Symptoms of histamine poisoning include hives (a type of rash), flushing of the face, intense headache, nausea, vomiting, diarrhoea and stomach pain. To prevent poisoning, avoid eating fish that are not fresh (i.e. those with soft flesh, sunken cloudy eyes, brown slimy gills and a strong fishy smell).

A story

One day Dako went to buy a tuna for his son's birthday party. He went to the Fishing Village and found a large skipjack for only \$5 — a good price! Dako's wife, Miriama, cooked the fish and many of the extended family ate it as the main course at the birthday party.

Soon after eating the fish, everybody became sick and got bad headaches and tummy cramps. Everyone went down to the Outpatients at Central Hospital.

The doctor asked, "What have you eaten?"

Dako told him about the tuna.

"Oh," said the doctor, "I have treated a lot of people after eating tuna from the Fishing Village".

The doctor went on to explain that the big transshipment vessels sometimes receive poor quality fish unsuitable for export or local sale. They can not legally dump low-grade catch into the harbour so they let the people from the Fishing Village take it in their dugout canoes for free - they are only too happy to get rid of the fish.

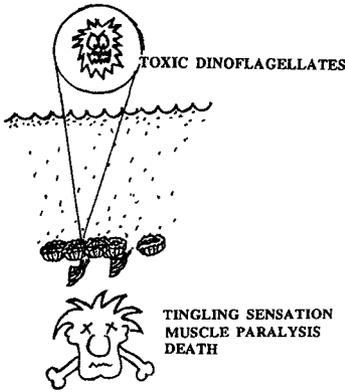
The trouble is that when tuna is not kept chilled properly it can build up a poison in its flesh - this is known as histamine poisoning. If you eat that fish then you will get a big dose of histamine and that is what makes you sick. The doctor told them they had to take anti-histamine tablets and not to eat any more rotten tuna from the Fishing Village.



Spoiled tuna can cause histamine poisoning.



Fishing Village: Poor quality tuna for sale.



Paralytic shellfish poisoning.

Paralytic shellfish poisoning

Paralytic shellfish poisoning (PSP) is caused by a poison produced by a **phytoplankton**. Under certain conditions, these phytoplankton undergo a period of rapid growth (a bloom), causing a **red tide** that turns the sea shades of red.

Shellfish such as mussels, clams, scallops and snails are common carriers of the poison, which enters their digestive glands when they feed on the phytoplankton. Surprisingly, the shellfish are not made sick from the poison, only the humans who eat them.

This poison affects the nerves - causing headache, dizziness, nausea, and numbness around the lips, face and neck. In severe cases, paralysis, breathing difficulties and death can occur within 24 hours. To control the sickness, shellfish should not be harvested from 'red tides' areas.



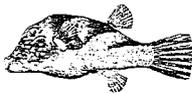
Canning aims to overcome botulism.

Botulism

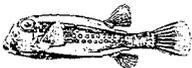
Botulism is an illness caused by eating foods containing a toxin made by a bacteria (*Clostridium botulinum*) found in soil, marine mud or water. This germ is tough and can resist high temperatures and live without air. Controlling botulism is a big challenge when processing seafood, especially canned fish. Symptoms of botulism include nausea, vomiting, weakness, dry mouth, throat pain, blurred or double vision, slurred speech, and difficulty in swallowing and breathing. In severe cases botulism can cause death.



Spiny puffer



Sharp-backed puffer



Box fish

Some pufferfish carry poison.

Pufferfish poisoning

Members of the pufferfish family carry a very strong poison, which is found only in certain organs. In Japan there are special chefs who know how to cut out the poisonous organs and pufferfish is eaten in some restaurants. Up to 20 people a year still die from improperly prepared pufferfish in Japan.

Symptoms may appear within a few minutes of eating pufferfish: sweating, plus tingling of the lips, tongue and finger tips. Later, numbness may spread throughout the body, along with weakness, tummy upset, vomiting and headache. In severe cases, muscles become paralysed, breathing fails and death occurs.

Shark and ray poisoning

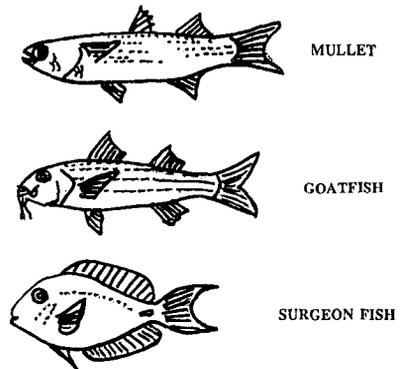
Eating the livers of some tropical sharks and rays can cause severe poisoning, and even death (e.g. black-tipped reef shark, hammerhead). Poisoning has been reported in Samoa, the Line Islands, the Society Islands, New Caledonia and the southern Marshall Islands.

Within three minutes of eating shark liver, a person may have tummy upset, vomiting, tummy pain, diarrhoea and headache. Weakness, muscle cramps and breathing difficulties may also develop. Heart and breathing troubles usually lead to coma and death.

Hallucinogenic fish poisoning

Hallucinogenic fish poisoning is associated with mullets, goatfish, surgeonfish, rudderfish, unicorn fish, damselfish, drummers and rockcod. The fish appear to be toxic only during certain times of the year - usually June, July and August in the Pacific - and in specific areas.

Symptoms include hallucinations, insomnia, intense dreaming, weakness, general malaise, dizziness, chest pains, itching, and burning of the throat. Terrifying nightmares have been reported at the time when symptoms first occur. For this reason, some of these fish are known locally as 'dreamfish'.



These fish can cause hallucinogenic poisoning.

Clupeotoxism

Clupeotoxism is poisoning caused by eating sardines and herrings whose food source contain toxins. (The name for this type of poisoning comes from the family name for sardines and herrings, Clupeidae). The first symptom is a sharp metallic (or bitter) taste, followed by nausea and tingling of the tongue and lips. Vomiting, tummy pain and severe diarrhoea may also occur.

Local villagers know a lot about which seafoods are poisonous and when not to eat them, but there are many cases of poisoning in the region every year.

It is helpful to tell a local health worker, outpatients nurse or doctor, or other suitable person about someone who has been poisoned or become ill from eating. Tell them what symptoms the person has, what sort of seafood was eaten, where it came from, how clean and fresh it was and how was it prepared and cooked.

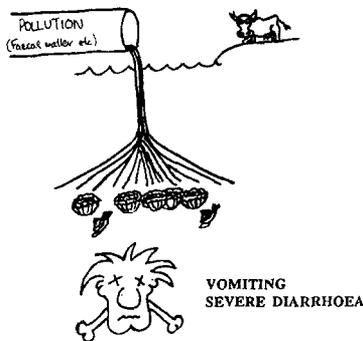
Health Departments will record this information and keep an up-to-date list of places where poisonous fish come from. They can then keep the public informed about recent outbreaks and ways to reduce the chances of poisoning. By doing this, fewer people will get sick in the future.



Poor handling practices.

Contamination from sewage and poor handling practices introduce bacteria and **viruses** into seafood. Viruses are a living thing, similar to bacteria, and can make people sick. They are also found in sewage. Remember, bacteria are found almost everywhere, and sewage is a place where many harmful bacteria are found. Bacteria not only spoil seafood, but they produce many of the poisons found in seafood.

One type of poisoning comes from a bacteria called *Staphylococcus aureus*. Fifty percent of people carry this germ on their skin and in their noses, where it is not usually harmful. However, poor seafood handling (e.g. not washing your hands, not cleaning equipment) spreads *S. aureus* onto the seafood, and incorrect storage (i.e. storing seafood in damp, warm conditions) allows the germs to grow in number and produce poison. After cooking, the germ is killed, but the poison remains.



Typhoid poisoning.

Typhoid

Bacteria (*Salmonella typhi*) found in contaminated food and water cause typhoid. The bacteria attack the gut and also reduce the number of white blood cells that help the body fight off sickness. Symptoms of typhoid are fever, tummy pain, skin rash and light-headedness.

Hepatitis

This sickness is caused by a virus that attacks the liver. It is spread by faeces in water or food. The virus may be passed between people (i.e. it is **infectious**), making it harder to stop. Symptoms are weakness, fever, poor appetite, upset tummy, and yellow eyes and skin. There are several different types of hepatitis (hepatitis A, hepatitis B, hepatitis C); some can cause death.



Flies carry harmful bacteria.

Cholera

Cholera, caused by the bacteria (*Vibrio cholerae*), is spread by faeces in water or food. People can pass this germ on to other people. Symptoms of cholera are severe tummy cramps and diarrhoea that can lead to dehydration. This may cause shock, kidney failure and death.

There are many other bacteria in dirty water and on dirty hands that can make us sick. Faecal coliforms such as *Escherichia coli* from our toilets cause runny tummies throughout the Pacific Islands every year.

A story

Malama suffered from upset tummy, diarrhoea, vomiting and fever. Her family decided to visit the village clinic.

The health worker asked Malama some questions so he could work out possible causes for her sickness.

Health worker: "Before you had your dinner, did you visit the toilet?"

Malama: "Yes."

Health worker: "Did you wash your hands after that?"

Malama: "Yes"

Health worker: "With soap?"

Malama: "No, just water."

After the conversation, the health worker advised Malama to wash her hands with soap after visiting the toilet and before having meals.

"You see," the health worker told Malama, "Even though we cannot see them, our skin is full of bacteria, millions and millions of them. Some of them, like *Staphylococcus* or *Salmonella*, may be harmful.

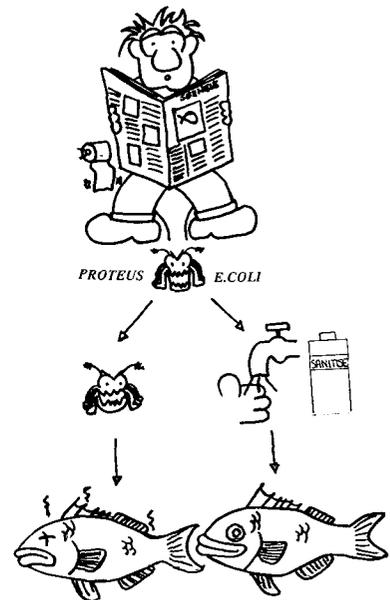
The germs from your hands were passed on to your food while you were eating. Your body took in many harmful germs and you got sick - but only you, not the rest of your family."

Washing our hands with soap and clean water reduces the amount of bacteria there, and lowers the chance of spreading harmful bacteria. Remember, don't use dirty water to wash your hands or rinse the fish.

Malama thanked the village health worker for the helpful information, took her tablets and went home to rest.

Activity

1. What are the most common types of fish poisoning in your country?
2. What traditional methods are used to stop fish poisoning in your country?



Faecal contamination.

Waste material from industry may contain heavy metals from mining and factories, pesticides used in growing crops, and radiation from power plants and military activities.

Heavy metal poisoning

Heavy metals such as mercury, lead and cadmium, occur naturally, but are more likely to cause problems for people when they have been dumped in large amounts from industrial activity. Dumping wastes such as old batteries also causes heavy metal problems because of the lead contained in batteries. They can stay in the water, land and air for a long time. Eating seafood that contains a lot of mercury is one of the more common types of heavy metal poisonings. **Mercury poisoning** affects the growth of unborn or young children, and can lead to nerve and brain damage.

Most ocean fish contain mercury. They take it in through their gills or in the food they eat. More mercury usually settles in organs like the liver and kidneys than in the flesh. Once mercury is eaten, it does not leave the body. Plankton are eaten by little fish, little fish are eaten by big fish, and big fish are eaten by even bigger fish - and mercury is collected at every step along the way. This means that lots of mercury is collected in bigger fish, i.e. fish that are higher up in the food chain. This means that people can be more at risk of mercury poisoning when they eat large fish (like tuna, swordfish, marlin, bonito, shark, Spanish mackerel and wahoo). Governments have regulations in place to protect people from dangerous mercury levels. Fish with more than 1 part mercury/million cannot be sold.



Pesticide poisoning

Pesticides are powders and sprays used to kill pests on crops or around the home. Pesticides don't stay put, they leak into the surrounding water. Pesticides are meant to kill, so it is not surprising that they are harmful to fish or to the people that eat fish. Some sicknesses caused by pesticides are birth defects, nerve damage, cancer and lowered ability to fight off sicknesses.

Radiation poisoning

Radiation is a type of energy given off by some types of rocks. Radiation is used for power, bombs, X-rays, treating sickness and preserving food. Unfortunately, developed countries have tested their nuclear bombs in the Pacific: at Eniwetok, Bikini and the Kwajalein missile range in the Republic of Marshall Islands; and at Moruroa and Fangataufa in French Polynesia.

The problem is that radiation lasts for thousands of years and can not be easily cleaned up or made safe. Radiation collects in body organs

like the lungs, liver and the thyroid, and causes birth defects and sicknesses such as cancer.

A story

A man told me he had just returned from Las Vegas and that he goes there every year. I asked him how he could afford to do this. He said that he used to live at Eniwetok, and now the US Government pays him a lot of money in compensation every year because of the bomb tests.

I told him he was very lucky. He said, 'Not really, the money doesn't make me happy because some of my grandchildren have suffered a lot from radiation sickness.'

Activity

Answer the following questions:

1. Why is it bad to throw old torch and radio batteries into the harbour or lagoon?
2. Do you know of places where pesticides from growing crops have caused fish kills?
3. Do you know of a family that has suffered from, or has received compensation for, sickness caused by exposure to radiation?

Words & Their Meanings

- Bacteria** - microscopic, one-celled organisms found in the environment, some of which cause illness and disease.
- Belly burst** - bursting of the belly wall of fish after death, causing holes in the gut wall and accelerating spoilage. Belly burst is caused by the action of enzymes when fish are stored ungutted at high temperature.
- Body slime** - a soft, slippery, protective coating on the body of a fish. Bacteria are found naturally in body slime and contribute to spoilage after death.
- Botulism** - a severe food poisoning, caused by bacteria in improperly sterilised food.
- Cholera** - an infectious and often fatal sickness causing severe diarrhoea and vomiting. Cholera is common in warmer climates.
- Ciguatera poisoning** - a sickness caused by eating fish infected with poisonous dinoflagellates.
- Clupeotoxism** - a sickness associated with eating certain fish species such as sardines and herrings, caused by toxins in the food source of the fish.
- Dinoflagellate** - microscopic, one-celled, plant-like organisms, usually with two tails (flagella).
- Enzyme** - protein substances present in the muscle and gut which start or speed up chemical reactions.
- Escherichia coli** - a type of bacteria found naturally in the gut of humans and animals. Some strains cause sickness when consumed in food or water. The bacteria are spread through poor food handling practices or contamination with sewage.
- Hallucinogenic fish poisoning** - a sickness associated with eating certain fish species such as mullet or goatfish, usually occurring at certain times of the year and in specific areas.
- Hepatitis** - a sickness caused by a virus, sometimes caused by eating shellfish collected from waters contaminated with sewage.
- Histamine poisoning** - a sickness associated with eating certain fish species such as tunas and mackerels, caused by histamine, a substance produced by bacteria during fish spoilage.
- Infectious** - passed from one person or animal to another, especially through the air they breathe, food they eat, or water they drink.

Mercury poisoning	- a poisoning caused by eating food contaminated with the heavy metal, mercury. Fish high in the food chain such as tuna, swordfish and marlin, or fish from heavily contaminated waters, can accumulate large amounts of mercury.
Mould	- a furry growth that forms on food or objects in moist, warm conditions.
Paralytic shellfish poisoning	- a sickness caused by eating shellfish that have accumulated large numbers of poisonous phytoplankton. Under the right conditions phytoplankton multiplies quickly causing the water to appear red, called a red tide.
Phytoplankton	- plankton that captures energy from the sun, much like plants on land.
Plankton	- tiny forms of animal and plant life that drift or float in water.
Poisoning	- taking or absorbing into the body a substance that can cause death or harm.
Pufferfish poisoning	- a sickness caused by eating certain species of pufferfish, blowfish, balloonfish and porcupinefish that contain a strong poison.
Red tide	- red discolouration of seawater caused by a population explosion of toxic red dinoflagellates.
Sewage	- waste water and material carried in sewers.
Sickness	- illness or bad health.
Spoilage	- when food goes bad or rotten.
Staphylococcus aureus	- a type of bacteria found in and on the bodies of roughly half the human population. Food handlers can pass <i>S. aureus</i> on to food and, under poor food handling conditions, the bacteria multiplies and causes illness in those eating the food.
Typhoid	- a sickness caused by eating food contaminated with the bacteria <i>Salmonella typhi</i> . Typhoid is often caused by eating shellfish grown in waters contaminated with the faeces of infected people.
Virus	- a simple living organism, smaller than a bacteria, that causes infectious diseases.

Related Resources

Chamberlain, T. and S. Langi. 2000. Smart Shopper.
Marine Studies Programme, University of the South Pacific, Suva, Fiji Islands.

Chamberlain, T. 2000. On The Other Hand.
Marine Studies Programme, University of the South Pacific, Suva, Fiji Islands.

Chamberlain, T. 2001. Introduction to Seafood Science.
Marine Studies Programme, University of the South Pacific, Suva, Fiji Islands.