

PROFESSIONAL FOOD MANAGER POWERPOINT PRESENTATION

Chapter 3 | Contamination



Overview

After completing this lesson, you should be able to:

- Explain some of the ways in which food can become contaminated.
- List bacteria that can cause foodborne illness.
- Describe the characteristics of viruses.
- Describe the characteristics of parasites and fungi.
- Identify best practices for preventing chemical contamination.
- Identify the natural toxins that can cause foodborne illness.
- List the major food allergens.

Lesson 1: Contamination

- **Contamination** is the presence of physical, chemical, or biological matter in or on food or the food environment.
- **Cross-contamination** can occur by:
 - Direct contact
 - Drip
 - Indirect contact – equipment, hands

CHAPTER 3: Contamination

Lesson 1: Contamination

Ready-to-eat (RTE) foods



Lesson 1: Contamination

- Contamination is generally caused by:
 - Not knowing correct procedures
 - Not following correct procedures
 - Poor facility design
- Because food is susceptible to contamination at any point from farm to fork, it is vital to have controls in place to prevent adulteration.

Lesson 1: Contamination

- **Biological contamination**
 - Food contamination by microorganisms, including bacteria, viruses, parasites, and fungi
 - Most common type of contamination
- **Chemical contamination**
 - The contamination of food by chemical substances such as pesticides and cleaning solutions
 - Includes natural toxins and allergens

CHAPTER 3: Contamination

Lesson 1: Contamination

Physical contamination



CHAPTER 3: Contamination

Lesson 1: Contamination

- Intentional contamination
 - By employees or guests
 - Training
- Food defense
 - People – employees and suppliers
 - Building – entrances and exits



Lesson 2: Bacteria

- **Microorganisms:**

- Bacteria
- Viruses
- Fungi
- Parasites

- **Bacteria:**

- Single-celled
- Binary fission



Lesson 2: Bacteria

- Spoilage bacteria
 - Does not cause foodborne illness
 - Damages the nutrition, texture, and flavor of the food, making it unsuitable to eat
- Pathogenic bacteria
 - Disease-producing
 - Causes foodborne illness
 - Carried by people
 - Already present in food
 - Grows on food during preparation

Lesson 2: Bacteria

- Note that ***Bacillus cereus*** can produce 2 types of toxins:



- **Emetic:** Causing vomiting
 - Starchy foods
- Diarrheal
 - Meat products

Lesson 2: Bacteria

- Other common foodborne bacteria:
 - ***Clostridium botulinum*** (*C. botulinum*): Can contaminate improperly canned foods and smoked and salted fish. A very small amount of *Clostridium botulinum* toxin can cause botulism, a deadly foodborne illness.
 - ***Staphylococcus aureus*** (*S. aureus*): Found in dairy products, deli salads, and custards.
 - ***Listeria monocytogenes*** (*L. monocytogenes*): Found in raw and undercooked meats, unpasteurized milk, soft cheeses, ready-to-eat deli meats, and hot dogs.

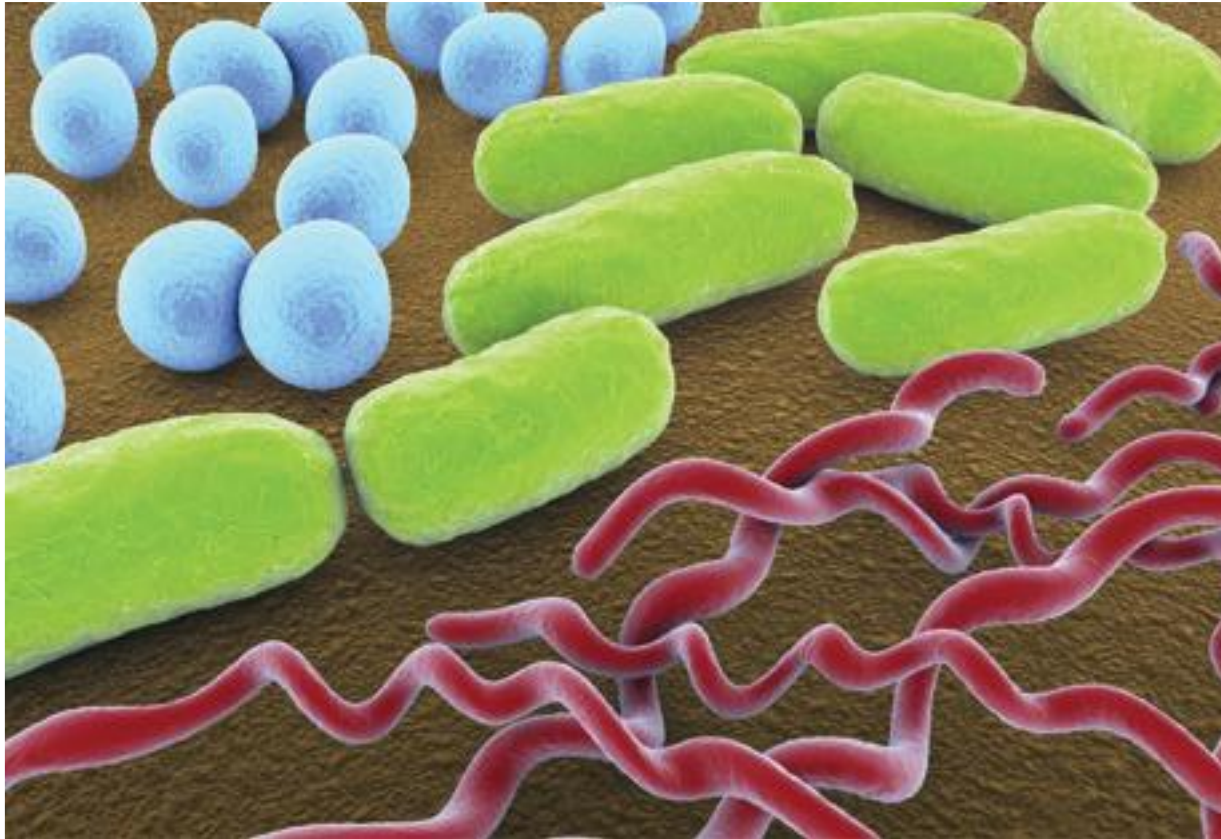
Lesson 2: Bacteria

- **Carrier:** A person who harbors, and may transmit, pathogenic organisms with or without showing any signs of illness.
- **Infectious:** Communicable; tending to spread between people.
- **Pathogen:** Disease-producing organism.



CHAPTER 3: Contamination

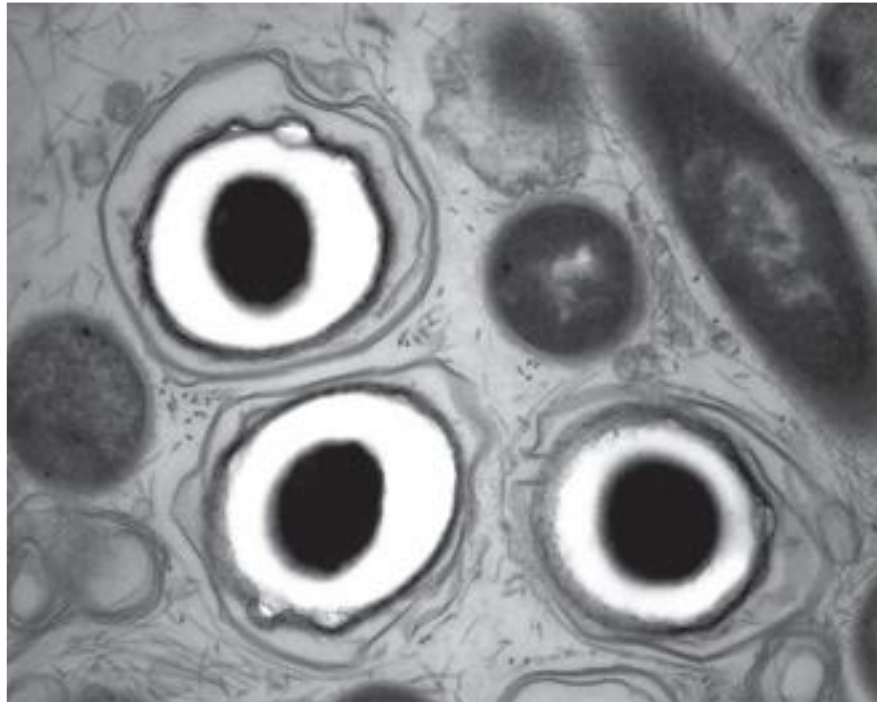
Lesson 2: Bacteria



CHAPTER 3: Contamination

Lesson 2: Bacteria

Bacterial spores



Lesson 2: Bacteria

- Classifications
 - **Intoxication:** An illness caused when bacteria produce exotoxins that are released into food; short onset time.
 - **Exotoxin:** A toxin produced during the multiplication of some bacteria. They are highly toxic proteins and are often produced in food.
 - **Toxic:** Directly poisonous; affected by a toxin, or poison.

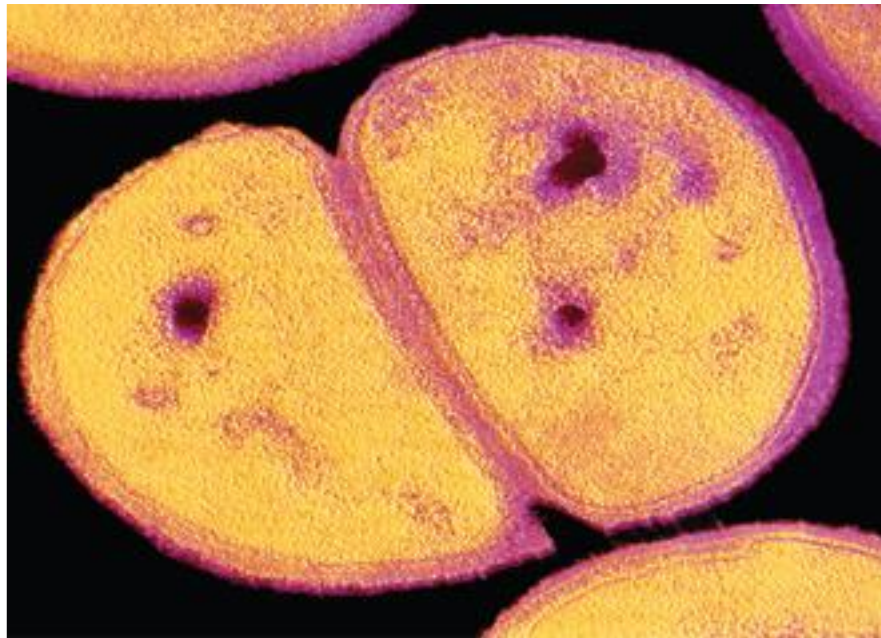
Lesson 2: Bacteria

- Classifications
 - **Infection:** A disease caused by the release of endotoxins in the intestine of the affected person; has a 1-2 day onset time.
 - **Endotoxin:** A toxin present in the cell wall of many bacteria that is released on death of the bacteria.
 - **Onset time:** The period between eating contaminated food and the first signs of illness.

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Lesson 2: Bacteria

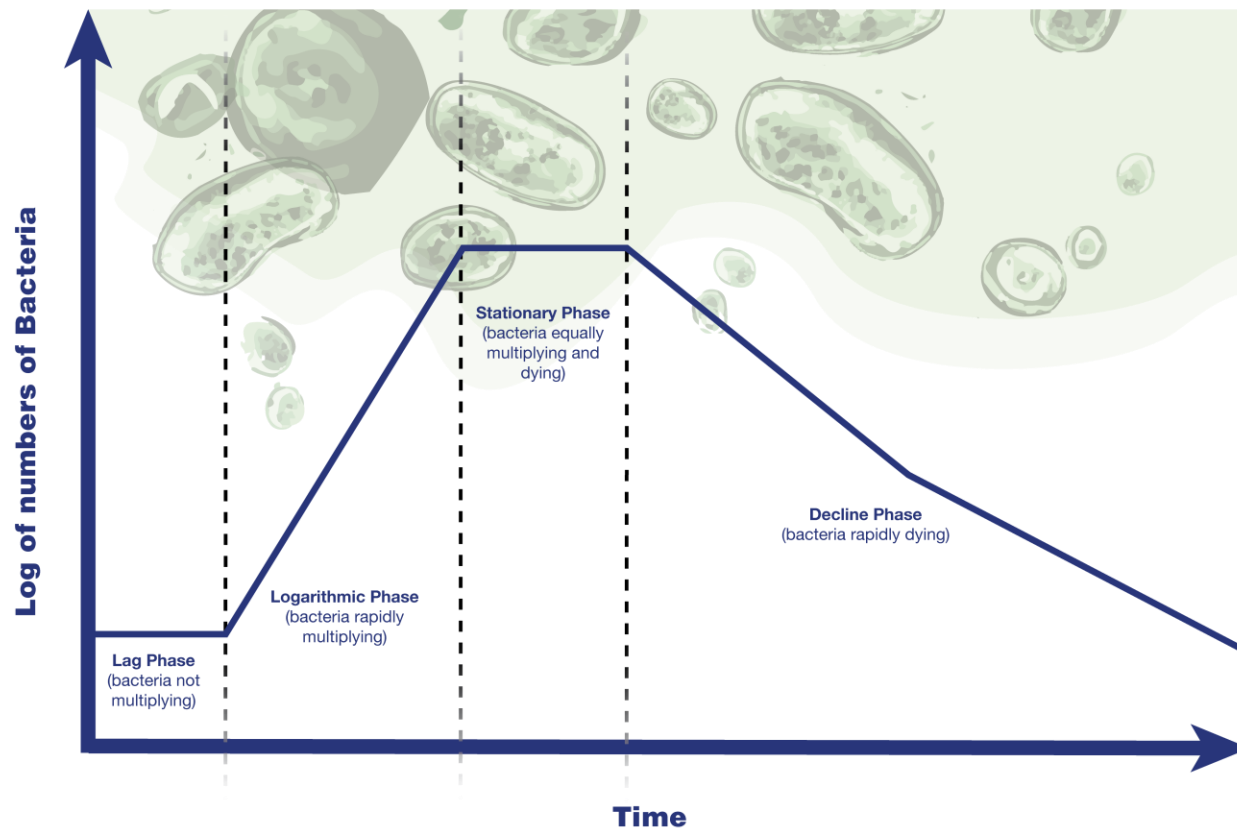
Binary fission



CHAPTER 3: Contamination

Lesson 2: Bacteria

Phases of Bacterial Growth



Lesson 2: Bacteria

- **FAT TOM**: The acronym that lists the conditions that support the rapid growth of bacteria. These conditions are:
 - Food – Protein
 - Acidity – $\text{pH} < 7.0$
 - Time – Around 20 minutes
 - Temperature – 41°F (5°C) and 135°F (57°C)
 - Oxygen – Specific to bacteria
 - Moisture – a_w 0.95 – 0.99

CHAPTER 3: Contamination

Lesson 2: Bacteria

- **Time/temperature control for safety (TCS) foods** : Products that under the right circumstances support the growth of microorganisms that cause foodborne illness.



Lesson 2: Bacteria

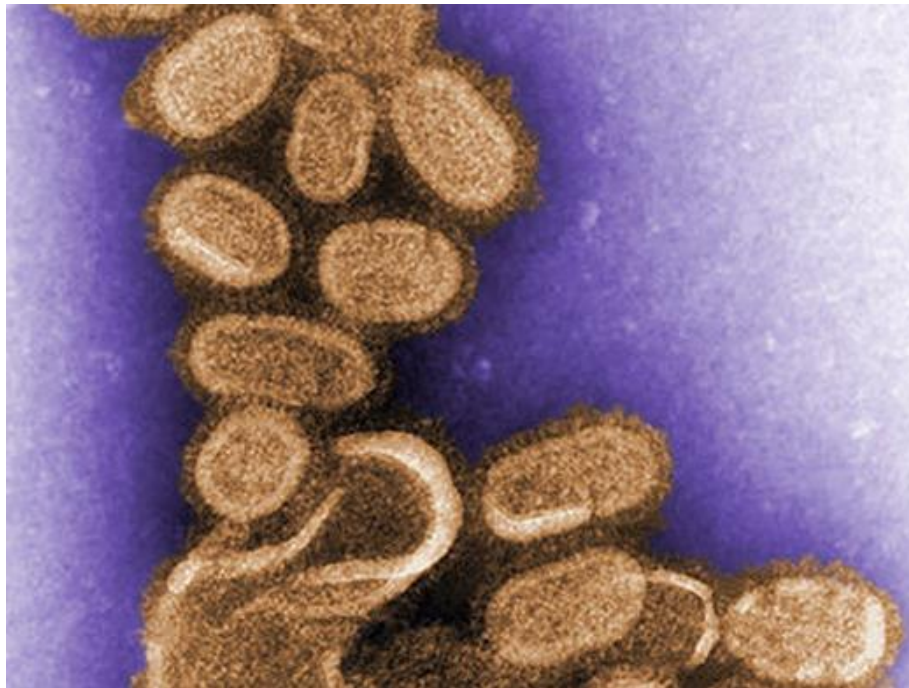
TCS Foods

- Milk and dairy products
- Meat: beef, lamb, pork
- Poultry
- Sliced melons
- Leafy greens
- Cut tomatoes
- Fish and shellfish
- Cooked rice, beans, and vegetables
- Sprouts
- Tofu / soy proteins
- Untreated garlic and oil mixtures

CHAPTER 3: Contamination

Lesson 3: Viruses

- **Viruses:** Submicroscopic pathogens (smaller than bacteria) that multiply in the living cells of their host.



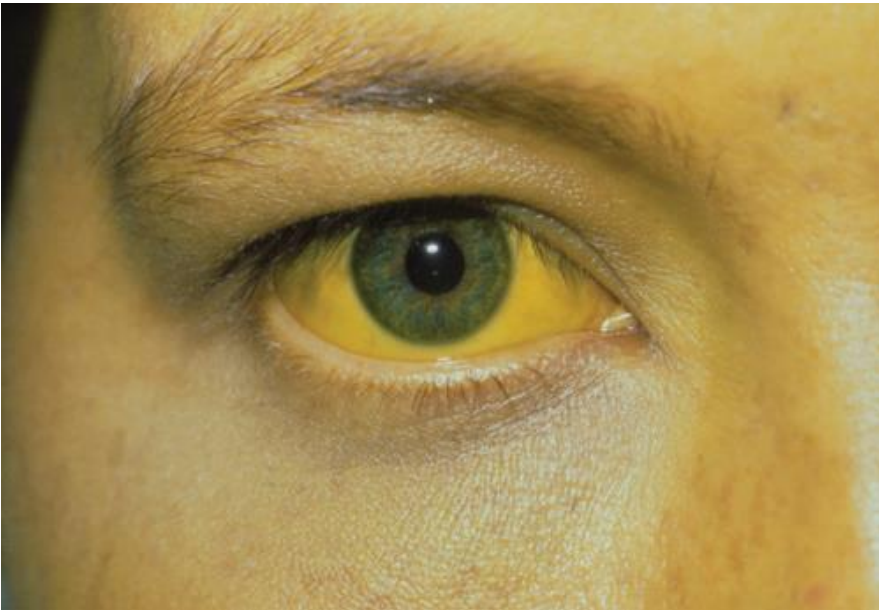
Lesson 3: Viruses

- **Norovirus**
 - Causes viral gastroenteritis
 - Is the most common form of foodborne illness
 - Route of contamination is hands
- **Viral gastroenteritis:** The swelling or inflammation of the stomach and intestines from a virus, leading to diarrhea and vomiting.

Lesson 3: Viruses

Hepatitis A

- Self-limiting disease
- Vaccine is available
- May cause **jaundice**: a yellowish discoloration of the skin and eyes, indicating liver malfunction and illness



Lesson 3: Viruses

- **HIV:** A retrovirus spread through blood and bodily fluids. The CDC has found no evidence that the HIV virus can be transmitted through food.
- **Prions**
 - Pathogenic proteins
 - Best known for BSE – mad cow disease

CHAPTER 3: Contamination

Lesson 4: Parasites & Fungi

Parasite: An organism that lives and feeds in or on another living creature, known as a host, in a way that benefits the parasite and disadvantages the host.

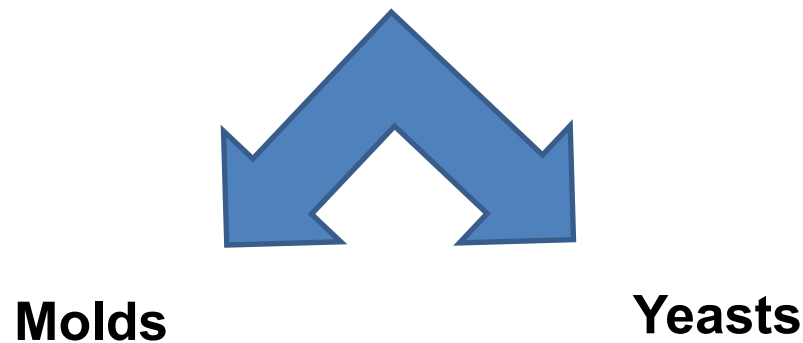


Lesson 4: Parasites & Fungi

- **Trichinosis:** An infection caused by the parasite *Trichinella spiralis*.
- Other common parasites are:
 - *Anisakis simplex*
 - *Giardia lamblia* / *Giardia duodenalis*
 - *Cryptosporidium parvum*
 - *Cyclospora cayetanensis*

Lesson 4: Parasites & Fungi

- **Fungi:** Biological contaminants that can be found naturally in air, plants, soil, and water. Fungi can be small, single-celled organisms or larger multicellular organisms.



Lesson 4: Parasites & Fungi

- **Mold:** A fungus that produces threadlike filaments; it can be black, white, or of various colors.
 - Produces spores
 - Survives freezing and cooking
 - Occurs naturally in certain cheeses
- **Mycotoxins, e.g., aflatoxin**

Lesson 4: Parasites & Fungi

- **Yeast:** Single-celled microscopic fungus that reproduces by budding and grows rapidly on certain foodstuffs, especially those containing sugar.
 - Spoils food quickly
 - Requires oxygen
 - Is destroyed by cooking

Lesson 5: Chemical Contamination

- Chemical contamination is the presence of unwanted chemical components in food or the food environment.
- Preventing chemical contamination
 - Check suppliers
 - Use only food-grade products
 - Train employees
 - Store food in original containers only
 - Store chemicals away from food

Lesson 5: Chemical Contamination



- **Toxic metal poisoning:** The leaching of certain poisonous metals, such as aluminum, copper, or galvanized metal, into acidic food being prepared with pots and/or utensils of those metals.

Lesson 6: Natural Toxins

Natural toxins are classified as a chemical contamination and come from plants, or the fish that feed on plants. The only way to prevent illness from natural toxins is to purchase fish and shellfish from reputable suppliers and cook red kidney and fava beans thoroughly.



Lesson 6: Natural Toxins

- Scombrototoxic fish poisoning
 - Toxins that accumulate in certain fish, known as **scombrottoxins**:
 - Tuna
 - Mackerel
 - Sardines
 - Pilchards
 - Herring
 - Anchovies
 - Salmon
 - Usually occurs when stored above 39.2°F (4°C)

Lesson 6: Natural Toxins

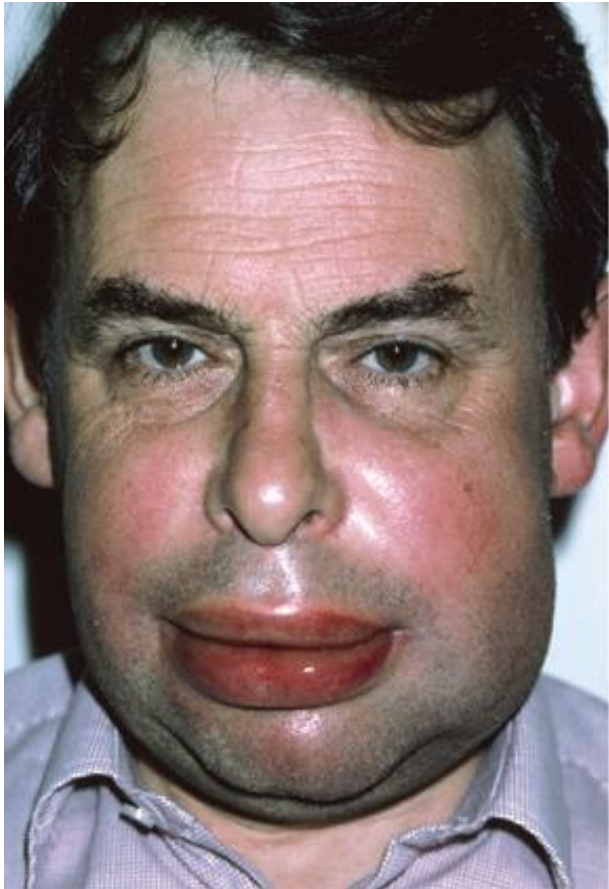
- **Ciguatoxin**
 - A toxin found in tropical coral reef fish
 - Found in gonads, liver, and intestines of south Florida, Bahamian, and Caribbean regions:
 - Snapper
 - Grouper
 - Mackerel

Lesson 6: Natural Toxins

- Shellfish toxins:
 - Paralytic (PST)
 - Diarrhetic (DST)
 - Neurotoxin (NSP)
 - Amnesic (ASP)
- Molluscan shellfish – oysters, clams, mussels, and scallops; PSP and ASP are also formed in lobsters and crabs.



Lesson 7: Allergens



Dr. P. Marazzi/Science Source

- **Allergen:** Any substance that can cause an allergic reaction in some people, when their immune system sees the substance as foreign or dangerous.
- A severe allergic reaction affecting the whole body, often within minutes of eating the food, is called an **anaphylactic reaction**, which may result in death. This is also referred to as anaphylaxis.

Lesson 7: Allergens

- **Allergy symptoms**
 - A tingling sensation in the mouth or throat
 - Itching in and around the mouth, face, and/or scalp
 - Swelling, including swelling of the tongue, throat, face, eyes, hands, and feet
 - Difficulty breathing, including wheezing or shortness of breath
 - Rash or hives
 - Nausea and/or vomiting
 - Abdominal cramps
 - Diarrhea
 - Loss of consciousness

CHAPTER 3: Contamination

Lesson 7: Allergens



CHAPTER 3: Contamination

Questions

