Interactions among Organisms

Organisms can react with each other and the environment in many different ways. In this chapter, we will focus on symbiotic relationships between species, how diseases spread, and the major types of infections.

# Symbiotic Relationships:

**Symbiosis** is a close interaction between two species. Just like we depend on our friends to help us out sometimes and return the favor, animals and organisms rely on each other to do the same. The three types of symbiotic relationships that we will dive into are mutualism, parasitism, and commensalism.

Your teacher has just assigned your class to do a project and says that you can pick a partner. You immediately look to your best friend in the class. You know that they are really good at writing and you enjoy doing research and making models. You know that you will both make a solid contribution to the project. **Mutualism** occurs when both members in the interaction benefit from the relationship. **Some major ways that organisms are able to help each other is by helping each other with cleaning, pollination, and reproduction.** One example of mutualism is between clownfish and sea anemones. Clownfish clean the anemones by taking off the algae and other food that gets left on them. They also help scare away polyp eating fish and provide better circulation of water for the anemone. The sea anemone also helps the clownfish. Clownfish have a protective covering that guards them from being stung by the tentacles of the anemone. The anemones provide the fish with homes and also protect them from ocean predators. Another example of a mutualistic relationship is between pollinators and plants. **Pollinators** are agents that transmit pollen to or deposit pollen on a flower or plant to allow fertilization. For simplicity in this example, a bee will serve as the pollinator, and a pink daisy will serve as the plant. The bee feeds on the pink daisy to obtain nectar. Some pollen from the daisy rubs off on the bee while it is feeding. When the bee moves on to a faraway purple daisy, it takes the pollen with it. This could possibly end up successfully fertilizing the purple daisy. The bee was able to get food, and the daisy got help from the bee for reproduction. Pollination is crucial to our everyday lives because it leads to seeds to create more plants and the production of fruits we can eat. Mutualism is the most common symbiotic relationship in nature.

You got assigned to complete the study questions at the end of the chapter in class. When you open up the book, you find a paper with the answers from the person who had your book last year still in the book. You’re excited because now you just have to check their work instead of starting from scratch. **Commensalism** occurs when one member of the interaction benefits, and the other member is not benefited or harmed. A **commensal** is the species that benefits from the interaction. **The commensal seeks a host in order to gain nutrients, support, movement, or shelter from it.** Different types of commensalism include phoresy, inquilinism, and metabiosis. **Phoresy** occurs when one organism travels on the body of another. For example, some sea anemones attach to hermit crab shells. The anemones protect the hermit crabs against predators with their stinging tentacles. **Iniquilinism** occurs when one organism uses another as their shelter, like a bird living in a tree hole. **Metabiosis** occurs when one organism depends on another to prepare a dwelling place for it. Examples are maggots living on dead animals or hermit crabs using the shells of dead mollusks for protection. **In summary, phoresy involves a commensal gaining transport, while iniquilinism and metabiosis involve the commensal gaining a suitable living place.** In contrast to commensalism, **amensalism** is a relationship where one organism is harmed and the other is unaffected. For example, a tall, leafy plant shades a smaller plant, thus blocking the smaller plant from the sun it needs.

Practice just ended. You’re all sweaty, and you go to the locker room to change into dry clothes before your mom picks you up. When you open your gym bag, you realize that someone stole your favorite pair of tennis shoes during practice. **Parasitism** occurs when one member of the interaction benefits, and the other one is harmed. **Ectoparasites** are parasites that live on or in the skin of humans and other animals. A classic example is the relationship between a tick and a deer. The tick bites the deer in order to get a blood meal. In doing this, the tick could expose the deer to various diseases such as Lyme disease, Colorado tick fever, and Rocky Mountain spotted fever. **The host is harmed, while the parasite is benefited.** There are several different ways that parasitism can occur. Ectoparasitism is one way that we just discussed. Other forms of parasitisms include brood parasitism and social parasitism. **Brood parasitism** occurs when an animal, a bird for instance, lays its eggs in a different birds nest in the hopes of the other bird raising their young for them. **Social parasitism** occurs when two or more ant species live in a single colony or nest. The parasitic species depends on the work done by the host ant species. **Parasitioidism** is a specific type of parasitism where the parasite eventually kills the host. Parasitoids typically spend their early stages of life on or inside the host. For example, a wasp lays its eggs on a spider. After the eggs hatch, they feed on the body of the spider and kill it. In this example, the wasp is the parasitoid and the spider is the host.

# How diseases spread:

**Diseases** are illnesses that can be attributed to a disorder in structure or function in a person, animal, or plant. As we discussed earlier when discussing ectoparasites, disease can be spread from one host to another. The example we used earlier was the relationship between a tick and a deer. If the tick were to spread a disease to the deer, it would be considered a communicable disease. **Communicable diseases** are diseases that are transmissible by direct contact with an affected organism or its discharges or by indirect contact. Examples of communicable diseases include HIV, measles, malaria, and tetanus. **Some common ways that communicable disease are spread is through insect and contact with bodily fluids, but they can also be airborne.** In humans, affected people might not know have a disease because they show no symptoms. Sexually transmitted diseases like HPV, Chlamydia, and herpes are some examples of diseases that might not show symptoms. It is important to get tested for diseases regularly when you become sexually active.

In contrast to communicable diseases, **non-communicable diseases** are not spread from one host to another. Some non-communicable diseases include asthma, diabetes, cancer, hypertension, and Alzheimer’s. They are generally caused by lifestyle or genetic factors. **Lifestyle factors that impact the chances of someone getting a non-communicable disease include poor diet, substance abuse, and physical inactivity.** Although you are unable to control the genetic factors that you are born with, you can decrease your chances of disease by living a healthy lifestyle. The number of calories people should eat and the amount of activity people should do varies from person to person. It is important to develop an individualized plan for yourself to maintain a healthy lifestyle by eating healthy foods and exercising regularly.

# Major types of Infections:

**Infections** are diseases that are caused by microorganisms that invade tissue. Infection is often the first step of a disease. Infection occurs when microbes, bacteria, or viruses enter the body and multiply. When cells become damage as a result of the infection, it becomes a disease. The three major types of infections are bacterial, viral, and fungal infections. **Some good ways to help prevent infection include washing your hands and getting vaccines.** To treat infections, consult with your doctor, medication may be available.

Bacterial infections are caused by bacteria. **Bacteria** are single celled organisms that lack a nucleus. Bacteria are an example of prokaryotes. **Prokaryotes** are cells that do not have a nucleus or other membrane bound organelles. The 3 main shapes of bacterial are spherical, rod, and spiral. Spherical, round bacteria are called cocci. Rod shaped bacteria are called bacilli, and spiral or curved bacteria are called spirilla. Bacterial cells can form in many different arrangements. They can exist by themselves, in pairs, in tetrads, in chains, in clusters, or in cubes. Not all bacteria are harmful, but some can cause infections like tuberculosis, pneumonia, and food poisoning. **Helpful bacteria can provide nutrients, help in food digestion, and destroy disease causing agents.** Antibiotics that are made for bacteria do not have an effect on viruses.

Viral infections are caused by a virus. A **virus** is an organism that cannot reproduce or grow apart from a living cell. They hijack the chemical machinery in cells to live and replicate. This often destroys the host cells. Some illnesses that result from viruses are the common cold, meningitis, and gastroenteritis. Viruses can be host specific, meaning that they might only infect humans or specific animals. Viruses can have either DNA or RNA in their genetic material. **The basic structure of a virus is made of a genetic information molecule (the DNA or RNA) that is protected by a protein layer.**

Fungal infections occur when tissues are invaded by fungi. **Fungi** are spore producing organisms that feed on organic matter. Fungi are eukaryotic organisms. **Eukaryotes** are organisms with cells that contain nuclei and other membrane bound organelles. Fungi are generally made up of hyphae, mycelium, a fruiting body, and spores. Some examples of fungi include mold, yeast, mildew, and mushrooms. Yeast is an important ingredient that we use to make bread and beer. Some mushrooms can provide us with nutrition but some can be poisonous. A couple of unpleasant fungal infections that fungi can cause are ringworm and athletes foot. These infections can cause symptoms of irritation, itching, redness, and scaly skin.

# Chapter Summary:

Symbiosis is a close interaction between two species. The three major types of symbiotic relationships are mutualism, parasitism, and commensalism. Some ways that organisms are able to achieve mutualistic relationships are by helping each other with cleaning, pollination, and reproduction. In commensalism, the commensal organism seeks a host in order to gain nutrients, support, movement, or shelter from it. Phoresy involves a commensal gaining transport, while iniquilinism and metabiosis involve the commensal gaining a suitable living place. In parasitism, the host is harmed and the parasite is benefited.

Diseases prevent the body from working normally. Communicable diseases can be spread through insects and contact with bodily fluids, but they can also be airborne. Non-communicable diseases are generally caused by lifestyle or genetic factors. Lifestyle factors that impact the chances of someone getting a non-communicable disease are poor diet, substance abuse, and physical inactivity.

Infection occurs when microbes, bacteria, or viruses enter the body and multiply. Some good ways to help prevent infection include washing your hands and getting vaccines. The three major types of infections are bacterial, viral, and fungal infections. Helpful bacteria can provide nutrients, help in food digestion, and destroy disease causing agents. The basic structure of a virus is made of a genetic information molecule (the DNA or RNA) that is protected by a protein layer. Fungi help bacteria to break down organic matter and release carbon, oxygen, nitrogen, and phosphorus into the soil and the atmosphere.

# Definitions:

**Amensalism**: a relationship where one organism is harmed and the other is unaffected

**Bacteria**: single celled organisms that lack a nucleus

**Brood parasitism**: occurs when an animal, a bird for instance, lays its eggs in a different birds nest in the hopes of the other bird raising their young for them

**Commensal**: the species that benefits from the interaction

**Commensalism:** occurs when occurs when one member of the interaction benefits, and the other member is not benefited or harmed

**Communicable diseases** are diseases that are transmissible by direct contact with an affected organism or its discharges or by indirect contact

**Diseases**: illnesses that can be attributed to a disorder in structure or function in a person, animal, or plant

**Ectoparasites**: parasites that live on or in the skin of humans and other animals

**Eukaryotes**: organisms with cells that contain nuclei and other membrane bound organelles

**Fungi**: spore producing organisms that feed on organic matter

**Infections**: diseases that are caused by microorganisms that invade tissue

**Iniquilinism:** occurs when one organism uses another as their shelter

**Metabiosis** occurs when one organism depends on another to prepare a dwelling place for it

**Mutualism:** occurs when both members in the interaction benefit from the relationship

**Non-communicable diseases:** diseases that are not spread from one host to another, they are generally caused by lifestyle or genetic factors

**Parasitioidism**: a specific type of parasitism where the parasite eventually kills the host

**Parasitism:** occurs when one member of the interaction benefits, and the other one is harmed

**Phoresy**: occurs when one organism travels on the body of another

**Pollinators**: agents that transmit pollen to or deposit pollen on a flower or plant to allow fertilization.

**Prokaryotes**: cells that do not have a nucleus or other membrane bound organelles

**Social parasitism:** occurs when two or more ant species live in a single colony or nest

**Symbiosis**: a close interaction between two species

**Virus**: an organism that cannot reproduce or grow apart from a living cell

# Sources:

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