

Biology 1306/1406 – Modern Concepts in Bioscience II
Week of April 12th, 2021

Hey everyone, only three more weeks! Summer is in sight, but don't give up now. Keep on powering through so you can be proud when you look at your final grade.

Keywords: Immune System, Immunity, Gas Exchange, Body Plans, Heart, Community Ecology, Interspecific Interactions

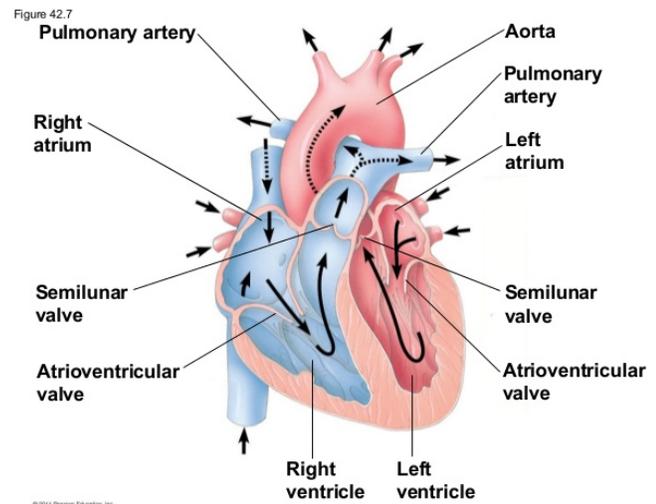
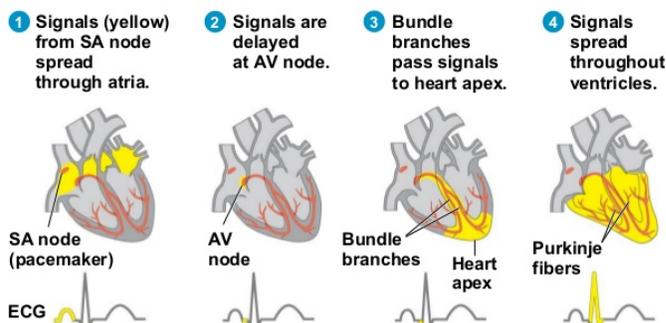
Our Group Tutoring sessions will be every **Thursday from 7:00-8:00 PM**. You can reserve a spot at <https://baylor.edu/tutoring>. I hope to see you there!

This week in Biology 1306, we will be covering Campbell Chapters ch 42, 43, 54

Circulatory and Gas Exchange: Campbell chapter 42

Every cell in an organism must be able to exchange gases with the environment. For this to be possible, organisms must either have a **simple body plan** which places many or all of the cells in direct contact with the environment or must have a **circulatory system** which moves fluid between each cell's surrounding tissues.

Check out this video to learn more about the Cardiac Cycle: https://www.youtube.com/watch?v=7XaftdE_h60



Structure of Blood Vessels:

Endothelium- minimizes resistance to fluid flow

Capillaries- smallest vessels, thin walls for diffusion; low pressure to allow for gas exchange
Made of only endothelium and basal lamina, **no smooth muscle**

- Arteries feeding into capillaries are like a hose connected to a sprinkler system: There is very high velocity and pressure in the hose, but lowered pressure in the capillaries as blood is sent into many different vessels
- **Pre-capillary sphincters** regulate blood flow into capillaries

Arteries- thick, strong and elastic; high blood pressure to pump blood throughout the body; made of endothelium, smooth muscle, and connective tissue

Veins- thinner walls and lower pressure than arteries, uses valves to ensure unidirectional flow; made of endothelium, thin smooth muscle and connective tissue

It is impossible to cover everything in chapter 42 given the length of this resource, but here are links to videos that explain concepts I did not cover above:

Clot Formation: <https://www.youtube.com/watch?v=RQpBj8ebbNY>

Positive and Negative Feedback: <https://www.youtube.com/watch?v=Iz0Q9nTZCw4>

Countercurrent Exchange (shown in fish): <https://www.youtube.com/watch?v=cVFqME-NW9s>

Amphibian Breathing: <https://www.youtube.com/watch?v=uYoEIFVvL5U>

Bird Breathing: <https://www.youtube.com/watch?v=yDvWIDmCKcU>

Transportation of CO₂: https://www.youtube.com/watch?v=BShB8_1oCGk

Immune System: Campbell chapter 43

In this chapter, we will look at two different types of immunity, **innate immunity and adaptive immunity**.

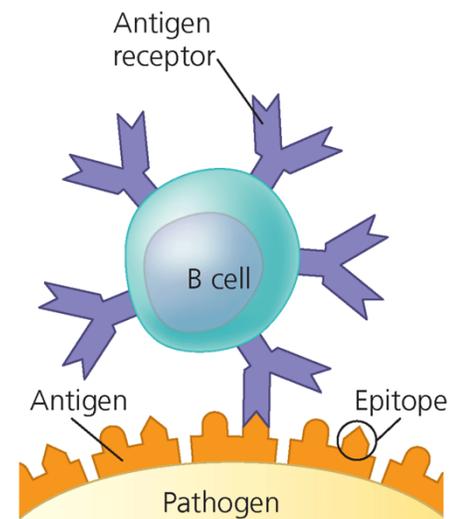
Innate immunity involves the recognition of proteins and other traits that are held by broad groups of pathogens. In vertebrates, we see many cellular defenses against pathogens including **macrophages, dendritic cells, natural killer cells** that induce the exocytosis of cells that have been infected by viruses, **Complement System** proteins, **interferons** and **antimicrobial peptides**.

During an **inflammatory response**, animals release many different chemicals at an injury site to create conditions that are favorable for immune cell actions, and even enhance these actions. One of these chemicals is the frequently referenced **Histamine**, that causes allergic responses to allergens. However, sometimes pathogens have developed defenses of their own that help them avoid or “survive” an immune system attack. These can include thick outer capsules which protect the pathogen from breaking down in the lysosome or prevent recognition by the immune system.

In **adaptive immunity**, the immune system “learns” about a pathogen to be more effective in fighting it. An adaptive immune response involves the recognition of a specific pathogen by two **lymphocytes, B cells** and **T cells**. These lymphocytes have receptors in their surfaces called **antigen receptors** which recognize **antigens** on invading molecules. All of the antigen receptor proteins are the same for a specific B cell or T cell, meaning that each B cell and T cell recognize a specific pathogen. However, throughout an animal’s body, there are millions of different T cells and B cells, giving an animal immune system the ability to recognize many different individual pathogens.

T Cells- help other lymphocytes and kill infected host cells; “helper T Cells”

B Cells- plasma cells which produce antibodies (soluble proteins) which bind to foreign cells



Both B Cells and T Cells have “memory” and defend against future infections that involve the same invading pathogen.

Some Definitions to be Familiar With:

Humoral Immune Response: antibodies initiate phagocytosis and complement system-mediated cell lysis.

Cell Mediated Immune Response: cytotoxic T cells cause infected cells to die

Active Immunity: the immunity which follows an immunization or infection

Passive Immunity: immunity due to the transfer of antibodies

Autoimmune Disease: loss of immune self-tolerance; immune cells begin to attack uninfected host cells causing damage to the host

Inborn Immunodeficiencies: immune system defects which interfere with either the innate immune defenses, humoral immune defenses or cell-mediated defenses

Community Ecology – Campbell Ch. 54

This chapter focuses on interactions within a **Biological Community**, or a group of populations of different species living in close enough proximity to interact. We call these interactions

Interspecific Interactions.

There are 5 types of interspecific (between species) interactions:

Competition- hurts both organisms

Exploitation- helps one organism and harms the other

Parasitism- parasite derives its nourishment from another organism, the host, which is harmed in the process

Herbivory- *helps the animal, hurts the plant*; animal eating a plant

Mutualism- *both species benefit*; the benefits to each partner must exceed the costs

Commensalism- *helps one organism and does not affect the other*; turns into mutualism

Symbiosis- *helps both organisms*, direct intimate contact between species

Facilitation- *has a positive effect without being in direct contact* with another organism; can either help both partners, or help one and not affect the other

Some Terms to understand:

Competitive Exclusion- the theory that even a slight reproductive advantage will eventually lead to local elimination of the inferior competitor;

<https://www.youtube.com/watch?v=Ddq5tXVZ2HA>

Ecological Niche- the organism’s ecological role or how they fit into the ecosystem; the specific set of biotic and abiotic resources and organism uses in its environment. Two species cannot coexist forever in the same community if their niches are identical. They can only coexist if a significant difference in their niches occurs over time

Resource Partitioning- the differentiation of niches that enable similar species to coexist in a community, ex. Lizards living in different levels of a canopy

Fundamental Niche- niche potentially occupied by a species

Realized Niche- portion of the fundamental niche that a species occupies

Character Displacement- the tendency of characteristics to diverge more between sympatric populations than between allopatric populations of two species

Allopatric populations- similar resources and niches with geographic isolation

Sympatric populations- differences in body structure and resources they use; geographically overlapping

Predation- interaction between species where *one species eats the other*

Predator- acute senses, claws, fangs, poison to hunt and catch prey

Prey- behavioral defenses (hiding, fleeing, forming herds)

Aposematic Coloring- coloring that warns the prey has chemical defenses (poison dart frog, skunk)

Cryptic Coloration- camouflage

Batesian Mimicry- when a harmless species mimics a harmful species in behavior or appearance

Mullerian Mimicry- harmful species that resemble each other (ex. Bee and yellow jacket)

Endoparasites- live in the body

Ectoparasites- feed on the external surface of the body (tick, larva)

Obligate mutualism- host needs the other to survive

Facultative mutualism- both host and parasite live independently

Study Tips:

*** Review all vocabulary in each chapter and make sure you understand what the terms mean***

That's all folks.

If you have any questions, feel free to reach out to the tutoring center or use the link at the top of the resource to make a Microsoft Teams appointment.

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