- Arteries and veins: endothelium, smooth muscle, and connective tissue
 - Arteries have thicker walls than veins to accommodate the high pressure of blood pumped from the heart

Blood Pressure:

- Blood flows from areas of higher pressure to areas of lower pressure
- Blood pressure is the pressure that blood exerts in all directions, banging against arteries
- Pulse is the rhythmic bulging of artery walls with each heart beat
 - 1. Systolic Pressure:
 - Pressure in the arteries during ventricular systole
 - Highest pressure in the arteries
 - 2. Diastolic Pressure
 - Pressure when the heart is relaxed and filling back up with blood
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Regulation of Blood Presture

- Henricos as mechaniante regulate arterial blood pressure by altering the diameter of arterioles
- <u>Vasoconstriction</u>: contraction of smooth muscle in the arteriole walls, increased blood pressure
- <u>Vasodilation</u>: relaxation of smooth muscles in the arterioles, decreases blood pressure

*Thin endothelial walls of capillaries allows exchange between blood and interstitial fluid

*Blood pressure drives out of capillaries

*Osmotic pressure drives fluids into capillaries at the venule end

Lymphatic System: fluid return

- Returns fluid that leaks out from capillary beds
- <u>Lymph</u>: fluid lost by capillaries
 - Drains into veins in the neck

 $_{\odot}~$ Usually specific proteins, polysaccharides or polymers Innate immunity:

- All animals have it
- A defense active immediately upon infection
- Present before any exposure to pathogens and is effective from the time of birth
- Responds to a broad range of pathogens

Innate Immunity of Invertebrates:

- Digestive system is protected by <u>lysozyme</u>
- Lysozyme: an enzyme that breaks down bacterial walls
- Hemocytes:
 - o Circulate within hemolymph and carry out phagocytosis
 - <u>Phagocytosis:</u> the ingestion and digestion of foreign substances including bacteria
 - Secrete antimicrobial peptides that discort the plasma membranes of fungi and batteria

Innate immunity of verteo

• Inside Earlier defenses phagocytosis, and antimicrobial peptides Also include defenses unique to vertebrates: natural killer cells, interferon's, and the inflammatory response

1. Barrier Defenses

- Include skin and mucus membranes of the respiratory, urinary, and reproductive tracts
 - Mucus traps and allows for the removal of microbes
 - Many body fluids including saliva, mucus, and tears are hostile to many microbes (lysozymes)
 - The low pH of skin (<5) and the digestive system (~2) prevents growth of many bacteria
- 2. Cellular Innate Defenses
 - <u>Phagocytosis</u> cells recognize groups of pathogens using TLR's (Toll-like Receptors), pathogens entering the mammalian body are subject to phagocytosis
 - TLRs recognize fragments of molecules characteristic of a set of pathogens

Excretory System

- Removal of metabolic waste AND osmoregulation
- Controls solute concentrations and balances water gain and loss
- Renal or urinary system
- Animals nitrogenous wastes reflect its phylogeny and habitat
 - The type of quantity of an animal's waste products can greatly affect water balance
 - Nitrogenous breakdown products of proteins and nucleic acids often results in toxic ammonia (NH3)
 - NH3: interferes with mitochondrial ATP formation
 - Some animals convert ammonia to less toxic compounds prior to excretion

Forms of Nitrogenous Waste:

- ;0. Animals excrete nitrogenous wastes in diffe at torms
- Differ in toxicity and the energy states producing them
- Depend on an animal evolutionary bistory and habitat, especially water availabilit
- - Animals that excete nitrogenous wastes as ammonia need access to lots of water
 - The release ammonia across the whole body surface
 - Most aquatic animals, including most bony fishes
- b. Uric Acid
 - Insects, snails, birds, and many reptiles
 - Relatively nontoxic
 - Secreted as a paste \rightarrow little water loss
 - Really energetically expensive to produce 0
- c. Urea
 - Most terrestrial mammals and many marine species
 - Less toxic
 - In vertebrates, urea is produced in the liver
 - The circulatory system carries urea to kidneys, where it's 0 excreted

*local communities are a subset of the species pool

Species Sorting

- local communities are composed of those species that can arrive and coexist due to:
 - o dispersal
 - movement of individuals or gametes away from centers of high population density or from their area of origin
 - adaptation to local conditions
 - interactions with competitors, consumers, pathogens
 - Priority affects
- Abiotic Factors: factors affecting the distribution of organisms

 - Soil Soil N from Notesale.co.uk
 Soil N from 22 of 24
 Predation 29
 Herbivory
 Com

 - Competition
 - Mutualism
 - Parasitism

Niche: a set of requirements and constraints a species has to exist

- Fundamental Niche:
 - Where it CAN persist
 - Determined by abiotic environment
- Realized Niche
 - Where it DOES persist
 - Determined by biotic environment
- *G. Evelyn Hutchinson
 - niches are "n-dimensional hypervolumes"
 - Robert MacArthur

*Species interactions are defined by the effects on the species involved