

Unit 8: Biodiversity

Content Outline: Excretory Systems (8.13)

I. Osmoregulation

- A. This is the continuous control of water and solute concentrations within an organism. (A part of **homeostasis**)
- B. Regulation occurs across a **transport epithelium** (membrane).
 - 1. Nephridia (mammals, birds, reptiles, amphibians, fish); Metanephridia (annelids); Malpighian tubules (Insects); Green glands (Crustaceans), flame cells (Platyhelminthes) are all examples.
- D. They help in *the removal of nitrogenous waste*. (Ammonia is created from using amino acids for Energy production.)
 - 1. **Ammonia** – This form requires *lots* of water to dispose. (Fish and other aquatic invertebrates)
 - 2. **Urea** – This form requires *moderate* amounts of water in disposal – Good for dry land. (Evolution of Mammals & Amphibians.)
 - a. This form combines ammonia and carbon dioxide together. (Two waste products as one.)
 - 3. **Uric Acid** – This form requires *very little* water. – Good for desert climates. (Evolution of Birds and reptiles.)
 - a. Ammonia and carbon dioxide in a paste like state. (Car paints? It is an acid... so it destroys them.)

II. Adaptations for Water Conservation

- A. Keratinized skin (Seen in reptiles, birds, and mammals.)(Related to the formation of PANGEA.)
- B. Exoskeleton (Seen by insects – These were the first animals on land.)
- C. Being nocturnal. (Animals move around at night to avoid possible dehydration by the sun.)(Desert animals.)
- D. Storage cells or vacuoles to store extra water. (Desert animals- camels: plants – central vacuole.)
- E. Waxy Cuticle –Seen on plant leaf surfaces.

III. Urine Production Basics for all animals.

- A. It is a basically a two step process:
 - 1. **Filtration** (This is achieved by the “liquid” portion of blood being separated from the blood cells and platelets.)
 - b. The liquid portion now becomes “filtrate” upon leaving the blood vessel.
 - c. The collected filtrate is then filtered, to remove nitrogenous waste and other excess molecules.
 - 2. **Tubular reabsorption** (This is the reabsorbing of “good materials” from the filtrate – leaving “bad” behind.)
 - a. Reabsorption collects all or most of the “good materials” and puts them back in the blood.
 - b. This leaves behind the “bad materials” to be collected and disposed of in the form of Urine.

IV. Osmoregulation in Mammals – This occurs in the Kidneys. (Your kidneys are a collection of *1 million* nephrons per kidney.)

A. Structures of the Urinary system:

- 1. **Renal Artery** – This blood vessel brings “polluted” blood into the kidneys.
- 2. **Renal Vein** – This blood vessel takes “purified” blood away from the kidneys.
- 3. **Renal Cortex** –This is the outer part of the kidney where the nephrons are located. (Site of *urine production*.)
- 4. **Renal Medulla** – This is the middle part of the kidney. (Site of *urine collection* from the nephrons.)
- 5. **Nephrons** – These are the structures where blood is actually “purified”.
- 6. **Collection Tubules** – These are where urine is collected from the nephrons.
 - a. Tubules converge to create the **Renal Pyramids** (These are triangular shaped structures in the medulla.)
 - b. All tubules lead to the **Renal Pelvis**.
- 7. **Renal Pelvis** – This is the main collection area (in the center of the kidney) for the collection tubes.
 - a. **Calyx** – These are the extensions (inlets) off the central pelvis that connect to the pyramids.
- 8. **Ureter** – These two tubes take the urine from the kidneys to the bladder for storage until release.
- 9. **Bladder** – This is the expandable urine storage organ. (It is composed of transitional epithelium.)
- 10. **Urethra** – This is the tube leading from the bladder to outside of body. (It is the urinating tube.)
(Urine should be yellowish to clear... it depends on the amount of water to be released.)

V. Diseases associated with Kidney function:

- A. **Diabetes** (means “Sweet Urine”) – There is *too* much sugar in the blood; the body is trying to get rid of it in the urine.
- B. **Cirrhosis of Liver** – Condition leads to *too* much ammonia and bile in the blood causing Jaundice (yellowing) of skin.
 - 1. Most common causes is alcoholism.