Unit 3: A Level Biology

The loop of Henle

The role of the loop of Henle is to make an increased **salt concentration gradient** in the medulla.

The **filtrate** passes from the proximal convoluted tubule to the **descending limb** of the loop of Henle, which carries it through the medulla towards the pelvis.

The descending limb is **permeable** to water, so water leaves the filtrate by **osmosis** and is carried away by the vasa recta blood vessel.

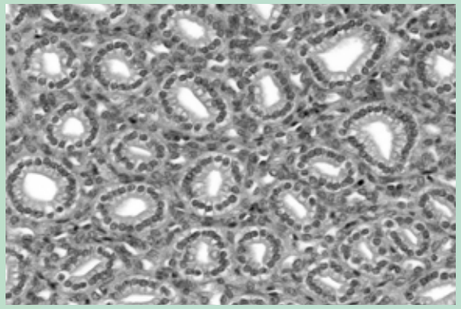
The filtrate gets more concentrated as it descends and the water potential gets lower.

The salt concentration gradient in the medulla means that the water potential is always lower in the medulla than the filtrate.

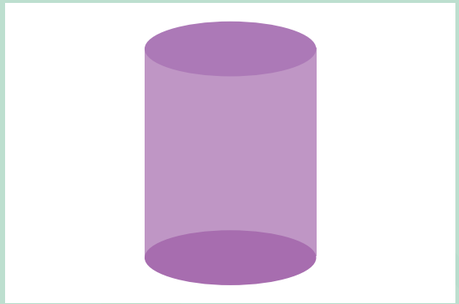
The filtrate passes into the **ascending limb** of the loop of Henle.

The ascending limb is **impermeable** to water.

Salts are **actively transported** into the medulla, creating the salt concentration gradient and raising the water potential of the filtrate.



Micrograph of the medulla



Tubules are cylindrical. They look like circles when cut across and tubes when cut vertically.

The medulla only has tubules – the loop of Henle and collecting duct.

The cortex has the proximal and distal convoluted tubules AND glomeruli and Bowman's capsules.

Adaptations

The loop of Henle is a **counter current multiplier**; the longer the loop the bigger the concentration gradient in the medulla.

This means that more water can be reabsorbed from the descending loop.

Animals adapted to dry environments have longer loops of Henle and reabsorb more water to the blood, e.g. camels. They produce highly concentrated urine and lose less water in excreting it.

Mammals living in fresh water, like otters, have short loops and less concentrated urine.

Adaptations of nitrogenous waste

Amino acids cannot be stored. **Excess amino acids** are converted into nitrogenous waste.

Mammals convert amino acids to **urea** in the **liver**. Urea has a medium toxicity and solubility. Urine can be concentrated or diluted according to the need to conserve or eliminate water.

Fish convert excess amino acids to **ammonia** by deamination only. Ammonia is **highly toxic** and **highly soluble**. Fish live in large volumes of water and ammonia is excreted easily.

Insects, **birds** and **reptiles** use more ATP than it takes to make urea to make **uric acid**. Uric acid is **insoluble** and requires **little water** to excrete. This makes it light (for flight) and is an adaptation for living in a terrestrial environment. It has a **lower toxicity** than urea so young animals can excrete it at the egg stage of the life cycle.