



The Excretory System: The Kidneys and Bladder



We use the word **'renal'** when we refer to diseases and parts associated with the kidney. The kidneys have two main jobs in the human body.

The first is the removal of wastes from the blood. You might ask "why is there waste in my blood to start with; that sounds kind of gross". Well, the blood carries nutrients such as oxygen and glucose around your body. Inside the cells of the different organs and tissues, a range of different chemical reactions occur involving the breaking down of the nutrients provided by your blood. This allows the cells to build new tissues, secrete different substances and release energy for all other processes to occur. Just like a chemical reaction that you would do in your science class there are products of the reaction and some of these products aren't needed by the body or they are actually harmful to the body. These are called waste products (waste because they aren't needed).

Many of these waste products have to be removed and some, such as urea and ammonia, are taken out by the kidneys. The kidneys also remove wanted nutrients like water, glucose and proteins and return them to the heart to be sent around the body again. During the filtering process, 'dirty' blood is carried into the kidneys by the **renal artery** (this blood is also oxygenated and supplies oxygen to the kidney cells) from the **aorta**. Your kidneys can filter your entire blood supply up to 400 times per day. Inside each kidney are tiny looped tubes and cells that act as filters (these are called **nephrons**; pronounced *nef-ronz*) removing the unwanted chemicals. The waste that they collect is combined with water to make urine.

Once the blood is 'cleaned' (and has become deoxygenated) it is returned to the heart from the kidneys through the **renal vein** to the **vena cava**. The kidneys get the water from the blood to make the urine liquid. The kidneys make the urine and pass it down a tube called the **ureter** into the **bladder**. Each kidney has its own ureter. The bladder is a muscular sac that is around the size of a pear when completely empty but much like a balloon can expand when filled with urine. When the bladder is around half full the urge to go to the toilet strikes and you relax the muscular ring called a **sphincter** that keeps the bladder closed. This allows the urine to move out through another tube called the **urethra** and into the toilet.

The other important thing your kidneys do is help to maintain a balance of water and minerals (such as salts) through a process called **homeostasis**. This is why your urine appears different colours depending on how well **hydrated** you are. Often when you are exercising or sweating a lot and don't replenish your fluids by drinking water then your urine will be a darker colour. If you drink lots of water, it will be paler. The brain gives the kidneys instructions (using **hormones**) to hold back more water (making the urine more concentrated) if your body is low in water. If you drink more, the hormone decreases and the kidneys let out more water. Your

body needs to have balance in the amount of water it contains as it is vital for our cells and organs to function properly. Humans are composed of over half water and we can't survive more than three days without water, which goes to show you how important it is. We are losing water all the time through our breath, sweat, urine and faeces, so it is important that we replenish this by drinking and eating (many foods such as fruit and vegetables contain relatively high amounts of water, for example a cucumber is 96% water).

