

Biology Section 3.3: Homeostasis

What is Homeostasis?

- That water and ions enter the body via food and drink, and that if the water and ion content of the body is not carefully controlled then too much water could move into or out of cells and damage them.
 - That the carbon dioxide produced as a waste product of respiration is removed from the body via the lungs when you breathe out.
 - That urea is a waste product produced when amino acids are broken down in the liver, and that it is removed via the kidneys in the urine. The urine is stored in the bladder before it leaves the body.
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The Kidneys and Homeostasis

- That the body loses more water when it is hot, and that this needs to be replaced via food or drink in order to balance the water content of the body.
 - That to produce urine, the kidneys filter the blood and then reabsorb all of the sugar and the required amounts of ions and water. The remaining urea, excess ions and water are lost as urine.
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Kidney Failure

- That treatments for kidney failure include kidney dialysis or having a kidney transplant.
 - That patients with kidney failure must have regular dialysis sessions in order to try to maintain normal levels of dissolved substances in the blood.
 - That dialysis fluid contains the same concentration of dissolved ions and glucose as healthy blood, so that when the patient's blood flows alongside partially permeable membranes in a kidney dialysis machine, glucose and useful ions are not lost.
 - That urea leaves the blood during dialysis, preventing it from accumulating in the body.
 - That a kidney transplant involves replacing a damaged kidney with a healthy donor kidney.
 - That without precautions, donor kidneys can be rejected — and that this happens when white blood cells do not recognise the antigens (unique proteins on a cell's surface) on the donor kidney cells. As a result, they produce antibodies to attack the donor cells.
 - That precautions to prevent the rejection of donor organs include using a donor organ that matches the recipient's tissue-type, and the recipient taking drugs which suppress their immune system.
 - How to evaluate the use of kidney dialysis and kidney transplants as treatments for kidney failure.
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Controlling Body Temperature

- That an area of the brain called the thermoregulatory centre monitors and controls body temperature.
 - That receptors in the thermoregulatory centre detect the temperature of the blood in the brain, and that the thermoregulatory centre receives information about skin temperature from receptors in the skin, sent via nervous impulses.
 - That sweating helps to decrease body temperature.
 - That blood flow to the skin increases when you're too hot. This may make the skin appear red.
 - H That when core body temperature is too high, dilation of the blood vessels supplying the skin capillaries causes increased blood flow to the skin, increasing heat loss to the environment. The sweat glands also produce more sweat, which has a cooling effect on the body as it evaporates.
 - H That when core body temperature is too low, constriction of the blood vessels supplying the skin capillaries causes decreased blood flow to the skin, decreasing heat loss to the environment. The muscles also shiver (they contract automatically), which requires respiration and so releases some energy, helping to raise body temperature.
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Controlling Blood Glucose Level

- That the pancreas is responsible for monitoring and controlling a person's blood glucose level.
- That the hormone insulin is produced and secreted by the pancreas in response to an increase in blood glucose level, and that insulin causes the body's cells to take up more glucose from the blood.
- H That the hormone glucagon is produced and secreted by the pancreas in response to a decrease in blood glucose level, and that glucagon causes the body's cells to convert glycogen back into glucose.
- That type 1 diabetes is a condition where the pancreas produces little or no insulin, which means blood glucose can rise to a dangerous level.
- That type 1 diabetes must be controlled by carefully controlling diet, taking regular exercise and insulin therapy.
- How to evaluate modern methods for the treatment of type 1 diabetes.