

Biology Knowledge Organiser

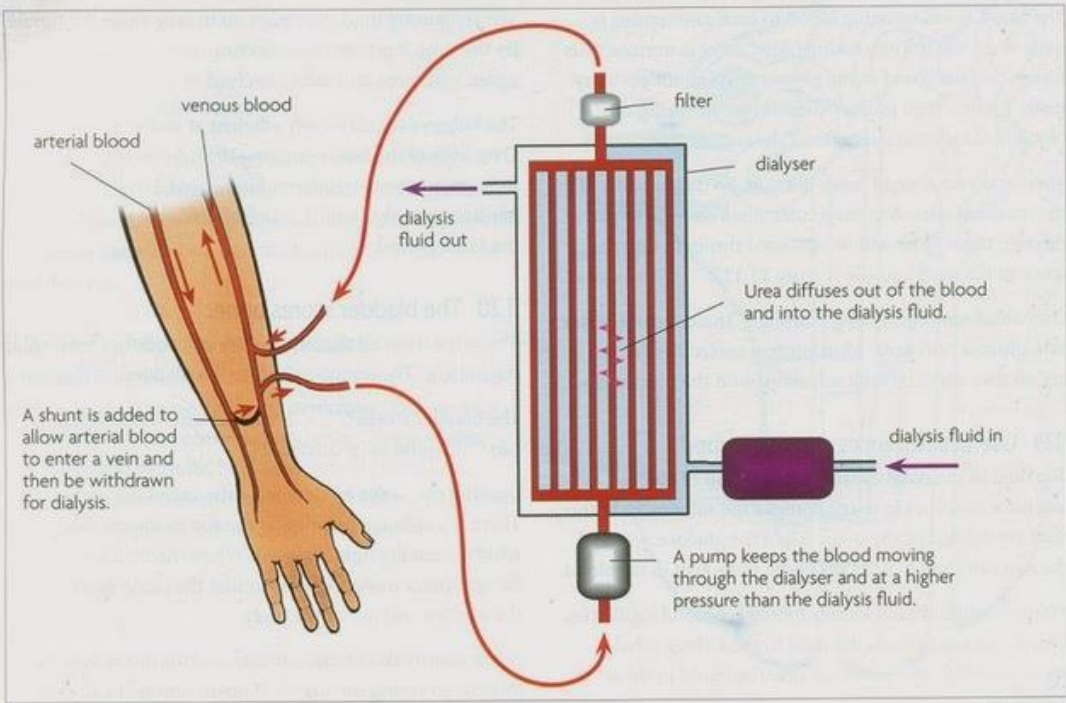
B7 - Non-communicable diseases

Kidney failure

If they kidneys fail, it is extremely dangerous. Kidney failure can be treated by a kidney **transplant** or using kidney **dialysis**. A transplant has the benefit for the patient of not needing to spend lots of time on a dialysis machine. However, they need to take **immunosuppressant drugs** to prevent rejection of the transplanted kidney. These leave them more susceptible to infections.

Dialysis machines keep people with kidney failure alive because they filter the blood for them. However, the patient would need to spend many hours a week connected to the machine to prevent urea reaching unsafe levels in the bloodstream.

The dialysis machine works as shown in the diagram. Notice that inside the machine, there is a large surface area to increase the rate of diffusion of urea out of the bloodstream.



Key Terms	Definitions
Dialysis	Treatment for kidney failure, in which a machine filters toxic substances from the blood instead of the kidneys.
Diabetes	Condition where blood glucose concentration is not controlled properly by the body.
Insulin	The hormone, produced in the pancreas, that reduces blood glucose concentration by making cells absorb glucose from the blood.
Immunosuppressant	Type of drug that reduces the responses of the immune system. This makes sure that 'foreign' organs (like a transplanted kidney) are not fought by the immune system – a situation called rejection.

Diabetes – a non-communicable disease

Diabetes is a group of disorders where blood glucose cannot be properly regulated by the body, which is potentially very dangerous. There are two types, with different causes and treatments.

Type 1 diabetes	Type 2 diabetes
Caused by a defect in the pancreas, where the cells that produce insulin don't work.	There is no problem with the pancreas – it produces insulin as usual. BUT, body cells no longer respond to the insulin.
The effect: Blood glucose concentration cannot be controlled by the body.	The effect: Blood glucose concentration cannot be controlled by the body.
Treatment is injections of insulin. The insulin is produced by genetically engineered bacteria.	Insulin injections will have no effect, so the treatment is a carbohydrate-controlled diet and exercise.
The cause is unknown, but we do know it involves the insulin-producing cells getting destroyed.	Obesity is a major risk factor for type 2 diabetes. There is also a genetic risk factor.

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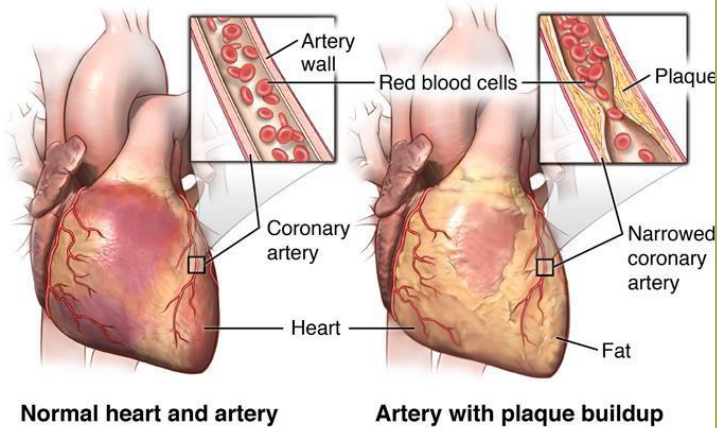
B7 - Non-communicable diseases

Coronary heart disease: a non-communicable disease

Recall that **coronary** arteries are the arteries that provide the heart muscle with blood, so they get oxygen and glucose (and to take away waste products). Coronary heart disease involves the narrowing of these arteries, due to the build up fatty material (called a **plaque** – see diagram) in there. This reduces the blood flow through the coronary arteries, so the heart muscle receives insufficient oxygen. When serious, this leads to a heart attack (where part of the heart muscle dies due to lack of oxygen).

Treatments for coronary heart disease:

- Insert a **stent** into the narrowed artery to widen it again. This is a kind of wire mesh that pushes the artery walls out and keeps the artery open.
- Take **statins**. These drugs reduce blood cholesterol levels, which is linked to the fatty material deposits. Lowering cholesterol reduces the rate of fatty material build up.



Heart transplants



If the heart fails (called **heart failure**) and cannot be repaired, the heart can be transplanted. In fact, the heart and lungs can be transplanted together if required. The replacement heart has to come from a **donor** – many people agree to donate their organs after they die to save the lives of others.

However, there is a shortage of donor organs, like hearts. So people with heart failure may have to wait a while. In this case, **artificial hearts** can be used to keep someone alive while they wait. These are pretty amazing – have a look at the photo.

Key Terms	Definitions
Coronary	To do with the heart, especially the blood vessels that supply the heart muscle with blood.
Stent	A mesh or cage-like structure that keeps coronary arteries open so blood can flow through.
Statins	Medicinal drugs used to lower blood cholesterol. High blood cholesterol is a risk factor for coronary heart disease.
Valve	Structures in the heart that prevent blood flowing the wrong way.
Heart failure	Where the heart cannot pump blood around the body properly.

Other heart diseases

The valves in the heart are vital to prevent blood flowing in the wrong direction. In some people there is fault in the heart valves. The valve may get a leak, or might not open fully – see diagram.

- If one or more of the valves **leaks**, blood flows backwards in the heart. This means the blood does not transport oxygen as efficiently and also increases the risk of infection in the heart.
- If a valve **doesn't open fully**, the heart has to work harder to pump the blood as your body requires. This increases strain on the heart, making other heart problems more likely.

These valve problems can be treated by replacing the valves. Replacement valves can be **biological** – from a living organism (including pigs! Their heart is the same size as ours so their valves fit) or **mechanical** – a synthetic version. See the photos – mechanical on the right.

