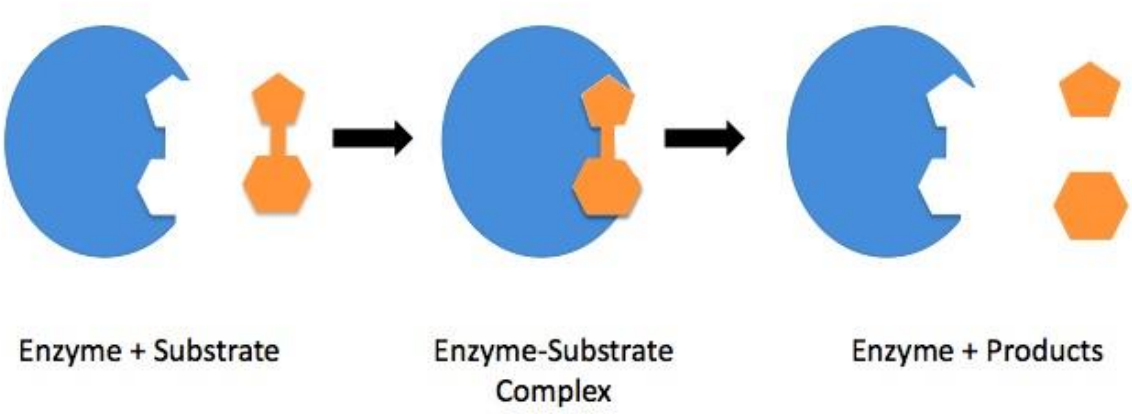
FOR STUDENTS: WHAT ARE ENZYMES AND ENZYMES IN CANCER

What are enzymes?

Enzymes are proteins that are made by our cells to help make reactions happen faster. They are natural catalysts – something that makes a reaction work faster, but isn't changed by the reaction. Enzymes were some of the first catalysts to be discovered.

Generally, each enzyme will only speed up one reaction, because it only fits only one specific substrate (the molecule that it reacts with.) Enzymes and substrates are like keys and locks, with the substrate slotting into the active site.



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One example of an enzyme you might use every day is in washing powder – these biological enzymes help to break down stains that come from your foods - proteins, fats and carbohydrates.

In your body, enzymes speed up the chemical reactions of digestion –they help break down proteins, fats and carbohydrates.

You can experience this for yourself – if you chew a piece of bread for a long time, it will start to taste sweet. That's because the enzymes in your saliva have broken down some of the carbs in the bread into smaller sugar molecules.

Another enzyme that your body makes is catalase. This is an enzyme that helps break down hydrogen peroxide, a bleach that is a poisonous by-product of reactions in our own cells. In fact, almost every living thing that is exposed to oxygen makes catalase – they need it to break down that hydrogen peroxide. Catalase helps to break it down into oxygen and water.

CATALASE

$$2H_2O_2 \longrightarrow 2H_2O + O_2$$

In your experiment, you will be looking at the things that effect this reaction, and how fast it is able to work.

Why are cancer researchers interested in enzymes?

Your whole body is made up of tiny cells. Cells divide to replace old cells and to help you grow, but if they start to divide in an uncontrolled way they can crowd out healthy cells and spread to other parts of the body. Cancer is a disease where cells multiply too much.

We look at how cells use enzymes to grow and multiply. Often in cancer there is a problem with an enzyme - perhaps a mutation that means that it is switched on all the time - which is causing the cells to grown in this way.

Because enzymes are often involved in helping cancers to spread, some cancer scientists develop drugs that can block their active sites, stopping them from working.

For example, one enzyme called a tyrosine kinase helps to send growth signals to cells. In cancer this enzyme may be signalling too much, causing cells to grow out of control. A drug that blocks this enzyme stops the cells growing and dividing.

In the lab, we need experiments to measure how enzymes are working so we can see what is happening in both healthy cells and cancer cells, investigating the pathways that cells use to make the things they need.