

Making Microbes Work



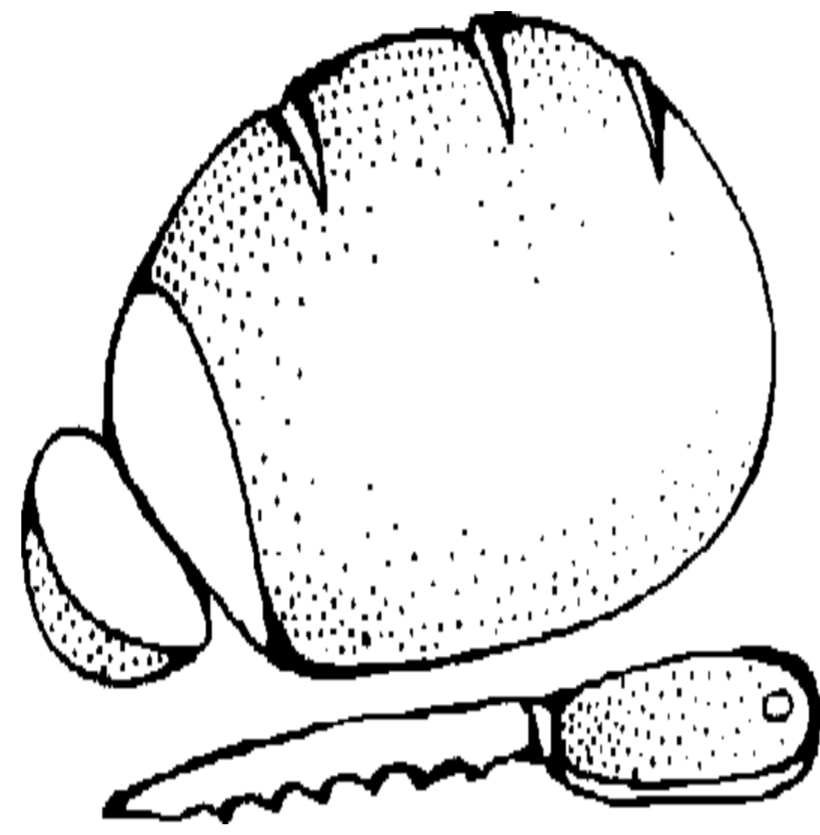
- The aim of this activity is for the children to investigate the roles of microbes in everyday items and products. Note that some are reality and others are future hopes (e.g. the car).
- Print the sheet and give one of the items to an individual or pair of pupils.
- This activity is best used after the children have had a general introduction to microbes and feel happy looking for further information by themselves.
- You could ask them to present their findings in a poster or in oral format to the whole class.

Possible prompts:

How are microbes used to make this product?
What are the names of the microbes involved?
What would life be like without this product?



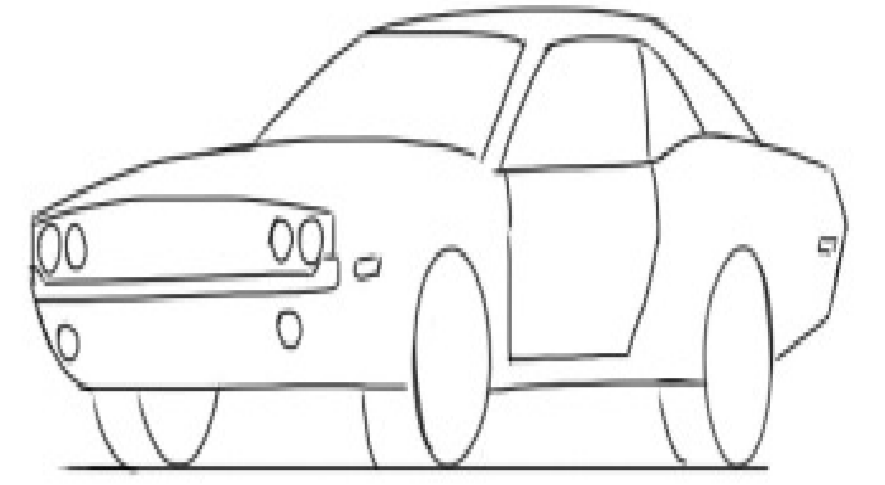
yogurt



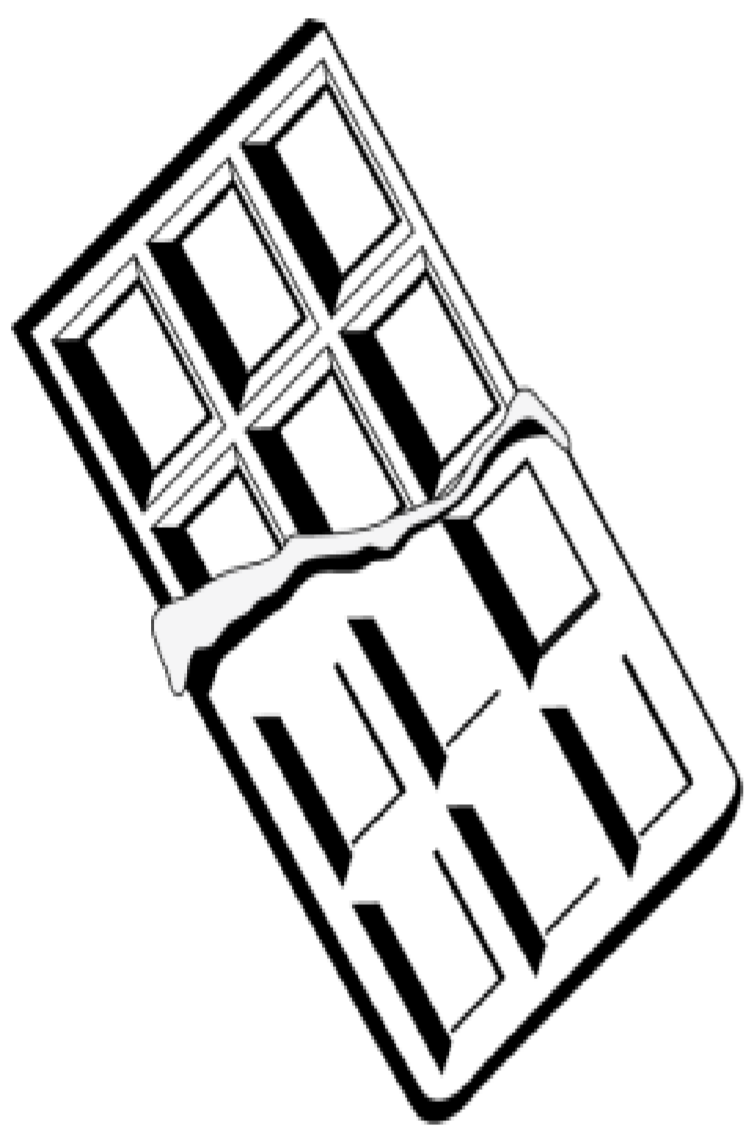
bread



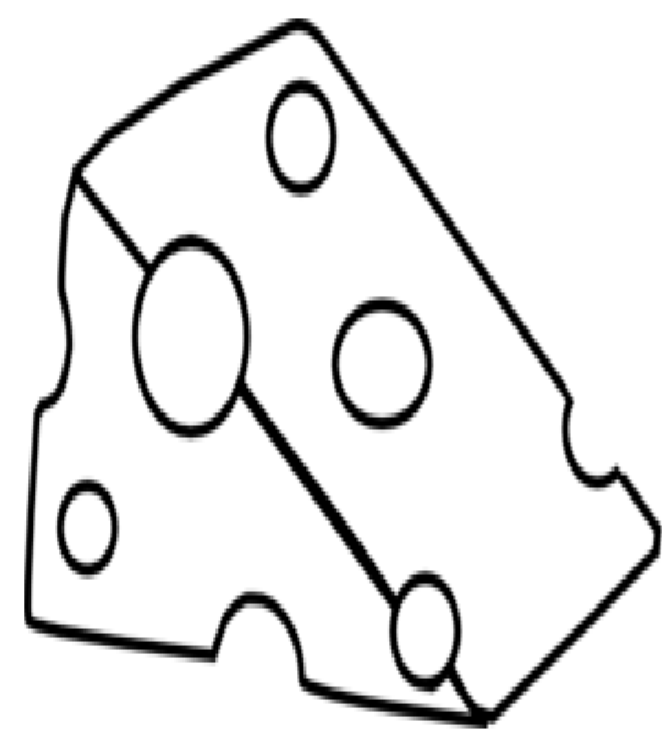
vinegar



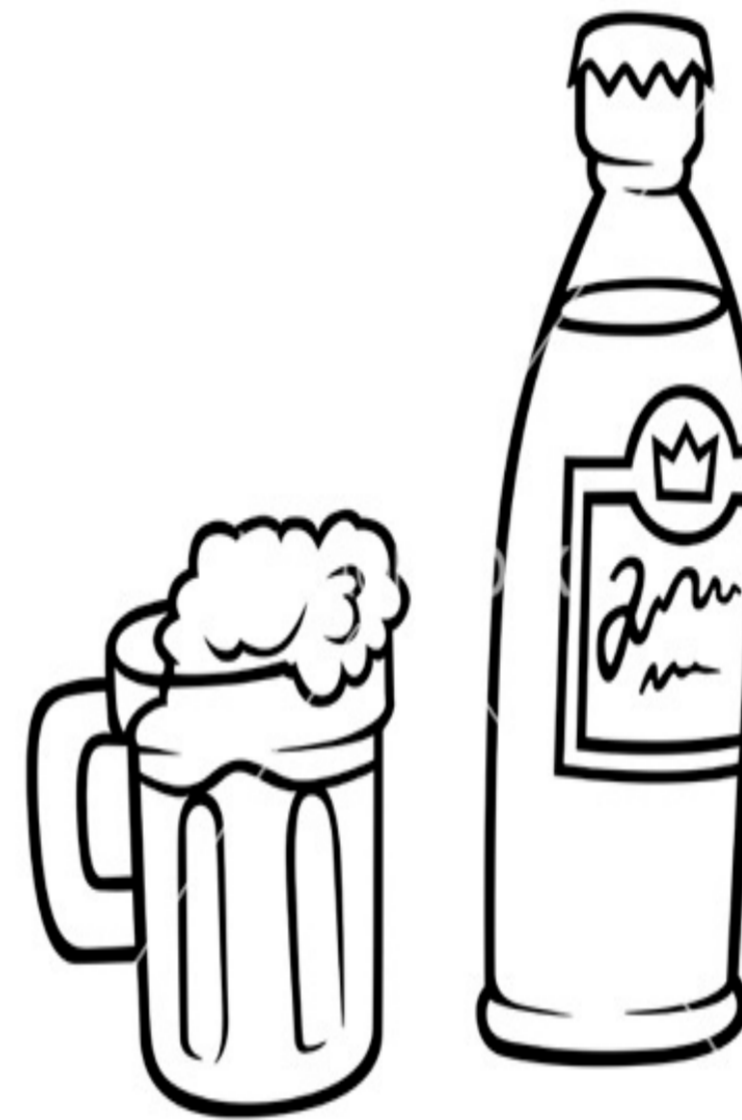
car



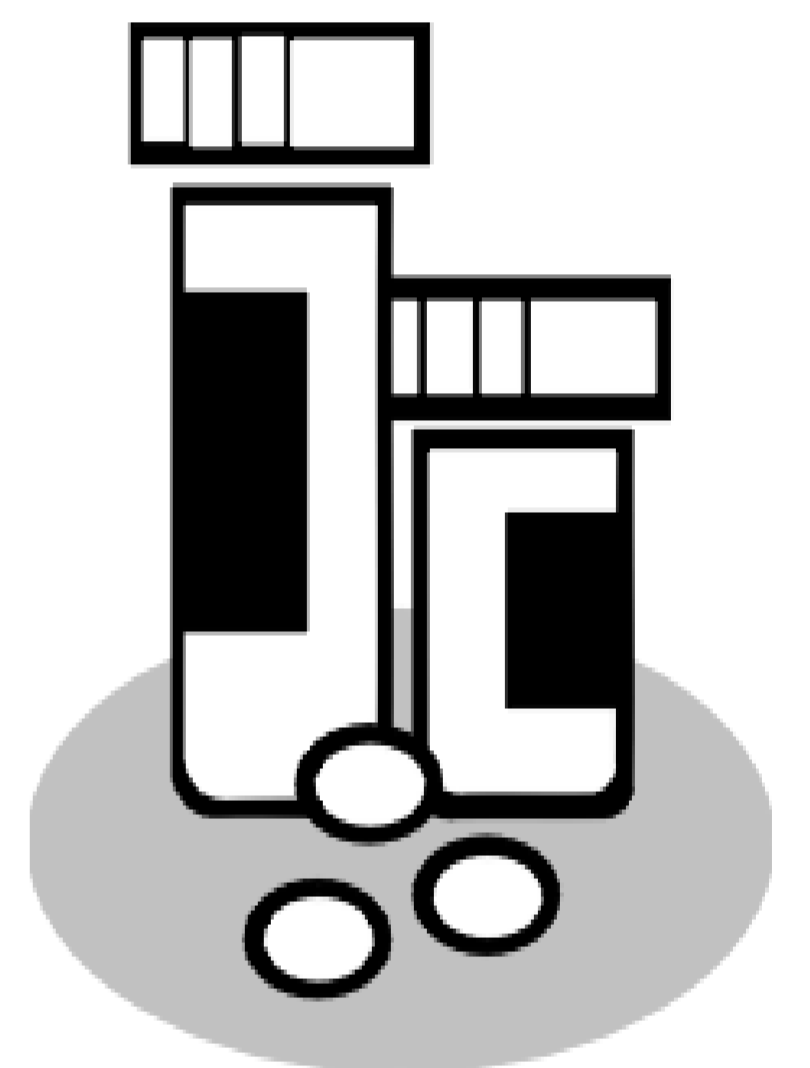
chocolate



cheese



beer



antibiotics



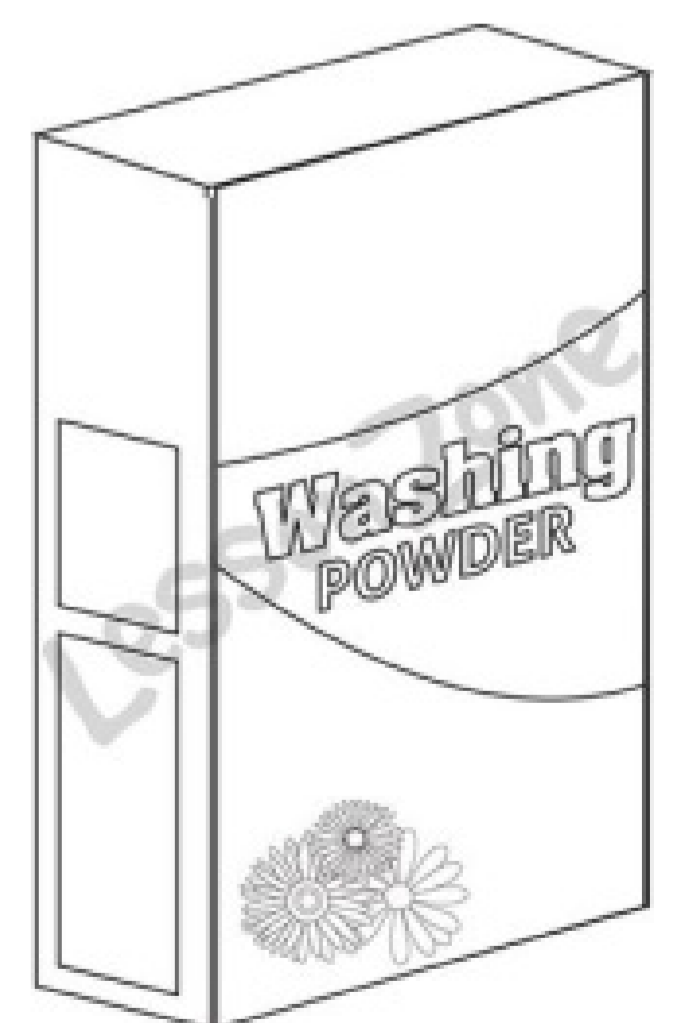
Quorn



pea plants



salami



washing powder

Fermentation

This is a chemical reaction that is critical for the production of many food products by bacteria and other microbes.

Basically it is the conversion of sugar in a substance to gases, acids or alcohol using microbes. Gases that may be produced include hydrogen and methane.

Yogurt

Yoghurt is a fermented milk product. The sugar in the milk (lactose) is converted to lactic acid by lactic acid bacteria which makes the milk thicken. Flavours can then be added. *Lactococcus lactis* and *Bifidobacterium* are common bacteria used in this process.

Bread

Bread is made using baker's yeast. The enzymes made by the yeast break down the large flour molecules into sugars. The sugar is converted to carbon dioxide and alcohol and the carbon dioxide is trapped within the dough allowing it to rise and take on a bubbly structure.

Vinegar

Vinegar is a solution that is mainly acetic acid. This is produced by fermentation of ethanol by acetic acid bacteria. This would happen for cider, wine etc.

Chocolate

Cocoa beans are seeds that form inside pods. They are coated in a sugary material that needs breaking down. Microbes help with this. The beans are "fermented" and this makes the bean taste chocolatey. (A similar process is used for making coffee beans).

Quorn

Quorn is a meat substitute that is made from a fungus called *Fusarium venenatum*. The fungus grows in large tanks and then is collected and dried.

Pea plants

Pea plants are one of a special group of plants called the legumes that can "fix nitrogen" from the air. With the aid of the bacteria that live in "root nodules" they can convert nitrogen into ammonium that can be used to make amino acids needed to allow plants to grow. When the plants die they release the nitrogen into the soil in the form of a fertiliser.

Antibiotics

Antibiotics are a funny one! We use them to kill bacteria (NOT VIRUSES) if we have an infection. But the majority of antibiotics in common use are made by bacteria. They make them to protect themselves from other species of bacteria. We have copied them and used antibiotics to our advantage.

Cheese

Like yoghurt and sour cream, cheese is made from milk that contains the sugar lactose and a protein called casein. During cheese production the lactose is converted to lactic acid and the protein is coagulated. Water is removed, leaving a semi-solid product. This relies on fermentation using lactic acid bacteria.

Cheese also needs ripening to give it flavour. This also uses bacteria and depending on the exact mix of the microbes used the flavour can be very different.

Washing powder

Biological washing powders contain enzymes that are made by bacteria. Bacteria do not have a "stomach" but instead make enzymes that they put into the local environment. Here they break down the food into smaller parts that can be taken up and used. We have adopted this for washing powders where the enzymes help to break down the food on our dirty clothes.

Car

This is in the "for the future" pile! Bacteria can be used to generate hydrogen. This is a clean and renewable energy source. Scientists are looking at how to make a hydrogen powered car using bacteria as the producer.

Beer

Beer needs yeast to convert the maltose (a sugar made during the malting process) into alcohol and carbon dioxide (a fermentation process). Generally after the yeast has done its job it is killed using a high heat.

Salami

Salami is a fermented meat product. The meat of choice is fermented using microbes and then the product is encased into a sausage shape. The lactic acid made during this process helps to coagulate the protein in the meat and also lowers the pH to stop other microbes growing. An edible mould called penicillin is often put onto the casing as it imparts flavour.