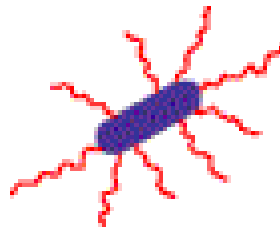


Create a Bug



Dr Kay Yeoman



Create a Bug

Microorganisms are everywhere, in the air, in soil and water, as well as living inside you and on you! We need microorganisms to keep ourselves and our environment healthy. Although some microorganisms can make us sick, many are also used to make medicines, such as antibiotics, and of course we use them to make food, such as yoghurt, bread, vinegar and cheese.

In this activity, you are going to create your own bacterium, firstly, you need to think about a name, then think of what it's going to look like, how its going to grow, and what it's going to do. When you have decided on answers to all the questions, fill in the sheet provided, then think about drawing a picture of the bacterium, or making a model using modrock or papier mache.

Give your bacterium a name

All bacteria have two names, a bit like your christian name and surname. For example, the bacterium which lives in your intestine and helps to digest your food is called *Escherichia coli*.

Note that all bacterial names are in italic, if we can't use italic, then we underline them. The first name always starts with a capital letter, the second name always starts with a lower case letter.

Where is it going to live?

Microorganisms can live anywhere from deep in the sea, to the arctic, in airplane fuel lines and even in soil contaminated with radiation. The place that your bug is going to live, will have a temperature associated with it, for example if your bacterium is going to live in the arctic, then it has to withstand very cold temperatures.

At what temperature can it grow?

Microorganisms can live in any temperatures, from -20 to 300°C!!
Bacteria which cause human diseases often like living at 37°C, can you think why this might be?



The picture on the left is of a black smoker, on the sea floor, where temperatures can exceed 300°C. Bacteria can live in these vents and use sulphur instead of oxygen.

Bacteria which grow in very cold conditions are called psychrophiles, those which grow at normal temperatures are called mesophiles, and those which grow in very high temperatures are called thermophiles

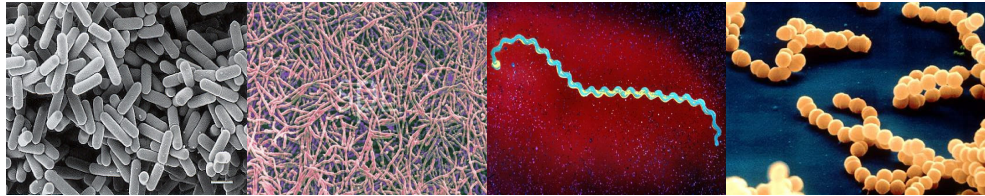
Is your bacterium going to live with or without oxygen?

Bacteria can live with or without oxygen. Living with oxygen is called aerobic (we are aerobic), living without oxygen is called anaerobic. Some bacteria can do both! These are called facultative anaerobes! (facultative means optional).

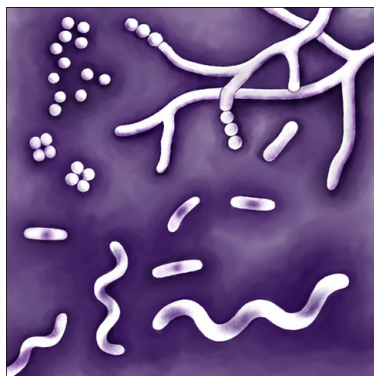
Instead of using oxygen, some microorganisms can ferment. An example of this is *Lactobacillus*, which turns milk into yoghurt. Other bacteria can use metals, such as iron instead of oxygen.

What shape is it going to be?

Bacteria can come in all different shapes, they can be circles (cocci), rods, spirilla or filamentous, which means that they look like threads. Some bacteria like to group together in chains or pairs. What is your bacterium going to look like?



The pictures above from left to right, are rods, filaments, spirilla and cocci. The picture below shows how you can draw them.




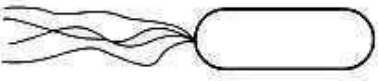

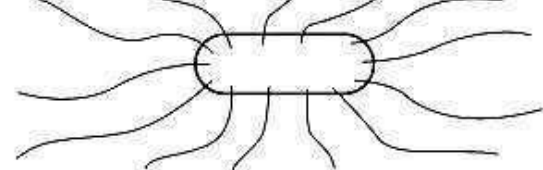
What colour is it going to be?

Individual bacteria can live together in a colony, these colonies of bacteria, which can be seen with the naked eye can be beautifully coloured, for example *Rhodobacter capsulatus* is a bright red colour. What colour is yours going to be?

Is your bacterium going to be able to move around?

Some bacteria, but not all bacteria can move. If you decide that your bacterium is going to move, then it's going to need flagella. Flagella are very fine hair-like structures, these flagella can be at one end, and each end, or all over the organism. They beat around, a bit like a paddle and help the bacteria move within its environment. Decide on the arrangement of the flagella on your bacterium, the next picture will show

you the different types of arrangement and what they are called. (Remember, it doesn't need to have them, it can be non-motile).

Structure	Flagella Type	Example
	Monotrichous	<i>Vibrio cholerae</i>
	Lophotrichous	<i>Bartonella bacilliformis</i>
	Amphitrichous	<i>Spirillum serpens</i>
	Peritrichous	<i>Escherichia coli</i>

Is your bacterium going to produce slime?

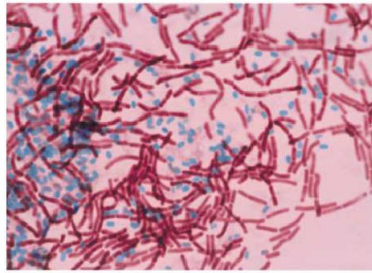
Many bacteria can produce slime, which makes the bacterial colony look shiny. This is called exopolysaccharide, we can use these slimes for all sorts of things, paints, in food and also as lubricants or oil drills! Is your bacterium going to make lots of slime?



This picture is of *Xanthomonas campestris*

Can your bacterium produce spores?

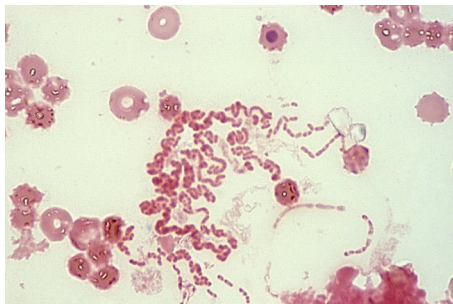
Spores are used as a means of survival, when conditions become really bad, they produce spores, which are very hardy (it's a bit like hibernating), when conditions become better the spores can germinate again. If you decide to have spores for your bacterium, they can be produced internally (inside) or externally (outside).



The picture on the left is *Streptomyces coelicolor*, which produces external spores, which give it a powdery appearance. The picture on the right is *Bacillus megaterium*, which produces endospores (internal spores), these are stained green.

Can your bacterium photosynthesise?

Some bacteria contain pigments similar to the chlorophyll of plants, this enables them to photosynthesise, a process which lets them convert carbon dioxide into sugar. These types of bacteria are called phototrophs. An example, is *Rhodobacter capsulatus*, which is a beautiful red colour.



Is your bacterium going to produce anything?

Many bacteria produce a wide range of different things, we can use, and example of this is antibiotics, which we use to treat infections. For example a bacterium called *Streptomyces griseus* (which is filamentous can produce the antibiotic streptomycin). Other bacteria produce enzymes such as proteases, which break up proteins, and lipases which break up fats, these are often used in biological washing powders.

Is your bacterium going to help make a product?

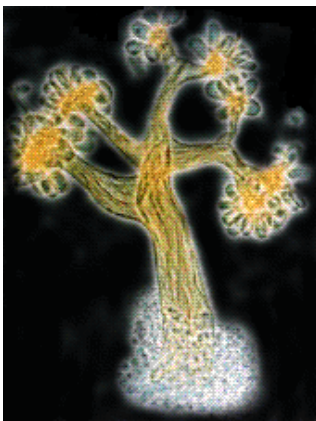
Many bacteria are used to make different kinds of food, an example of this is *Lactobacillus* which converts milk to yoghurt, and *Brevibacterium* which makes vinegar.

Can your bacterium cause disease?

Some bacteria can cause diseases in plants, animals and humans, these are called pathogens. Is your bacterium going to cause a disease? If so, what are you going to call the illness? And will it affect a plant, an animal or a human?

Is your bacterium going to help with nutrient cycling?

Many bacteria are important in helping to cycle nutrients around our environment; an example of this is the myxobacteria, which look very peculiar, see picture below, but help degrade the complex cellulose (which plant cell walls are made from) into simple sugars such as glucose. Bacteria are also very important in the nitrogen cycle, some of these bacteria can make nodules on the roots of certain plants, they then take the nitrogen from the air and convert it to ammonia, then nitrate, which the plant can then use to grow. Decide if your bacterium is going to help in nutrient cycling.



Myxobacteria