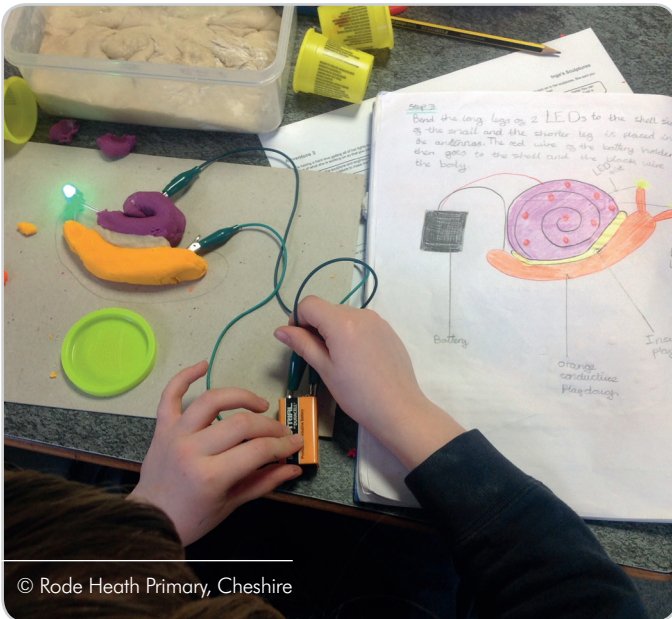


For 7 to 11 year olds

Context

Bacteria called exoelectrogens have been discovered; they make electricity and they could help humans to live on Mars. They connect with one another and grow on rocks by producing very thin wires, called nanowires, through a slimy biofilm.

In this activity the children are introduced to bacteria as microorganisms, use playdough as nanowires to complete a circuit to illuminate light emitting diodes and investigate how changing the ingredients in playdough can affect its ability to conduct electricity.



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National curriculum links

Science:

- Recognise bacteria as living things within the group known as micro-organisms
- Complete a circuit and identify electrical conducting and insulating materials
- Compare and give reasons for variations in how components function in a circuit

Resources

- Activity sheets 1 and 1a
- 9v batteries
- 9v battery holder
- Wires
- Crocodile clips
- Connectors
- LEDs 5mm x 3mm
- Playdough recipe
- Plain flour
- Salt Oil
- Cup
- Food colour (optional)
- Plasticine, modelling clay or insulating dough

Lesson starter

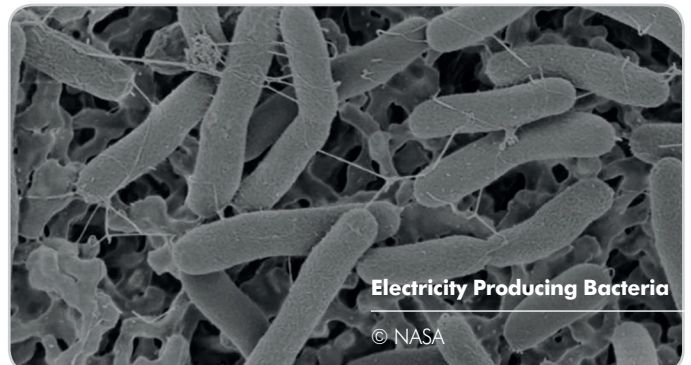
Ask the children to name some living things. Show the images of bacteria on Activity sheet 1.

- Do you know what these are?

They are living things called bacteria. Scientists have discovered that some types of bacteria can produce electricity! They can live on waste material. Here is an image of these electricity producing bacteria:

phys.org/news/2018-06-electricity-producing-bacteria-power-future-space.html

They have very thin hairs on their bodies called nanowires and electricity can pass along them. One day, these bacteria might help astronauts on a mission to Mars. Find out more: www.youtube.com/watch?v=KhsCg7pmv0o&feature=youtu.be



Electricity Producing Bacteria

© NASA

Main activity

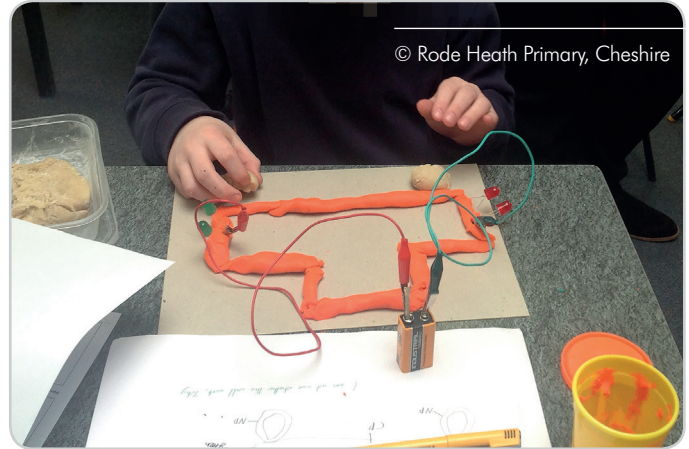
- What can you think of that uses electricity?
- Can you name a material that electricity can travel along?

Show the ingredients from the playdough recipe. Explain that today the children will be scientists, using these ingredients to make nanowires! They will investigate whether their dough wires will carry electricity and light an LED. The children in each group follow the recipe to make a portion of playdough. Once made, they build a circuit using dough wires, add an LED and connect the battery.

- Did the LED light?
- What could they change?

They might investigate changing the length of the doughwires, discovering whether they can make a really long connecting wire or adding another LED to the circuit and noting the effects.

- What happens if they use plasticine rather than the playdough to make the nanowires?



Further activities

- How much salt is needed in the playdough in order for the wires to conduct electricity? Investigate. Make several batches of dough with different amounts of salt. Try replacing salt with sugar. What happens?
- Research types of bacteria. Build models of exoelectrogens and add information labels. Add wires and LEDs! Light up your bacteria.
- Test different materials to complete an electrical circuit. Which conduct electricity?

Plenary

The groups report their findings.

- Did the LEDs light up when dough wires were used?
- What happened when they tried plasticine wires?

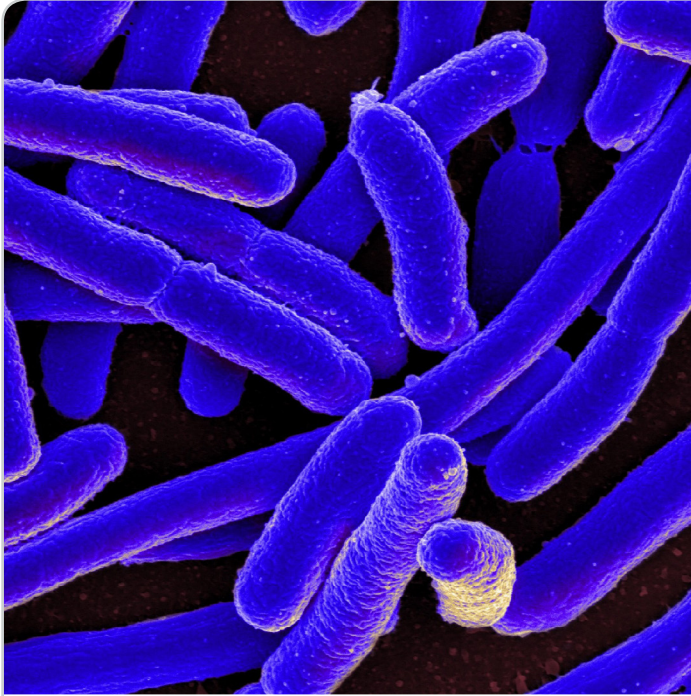
Explain that salt in the playdough dissolved in water conducts electricity, so the LEDs lit. We call materials that let electricity travel 'conductors'. However, plasticine does not contain salt; it is an insulator. Insulators do not carry electricity.

- How might bacteria that make electricity help astronauts in the future?
- How might they be useful if humans want to live on Mars?
- What kind of bacteria might be found on Mars?
- What might they look like?
- What properties would they need to survive?

STEM Vocabulary

| | |
|-------------|-----------------|
| Bacteria | Circuit |
| Electricity | Battery or cell |
| Conductor | Lamp |
| Insulator | |

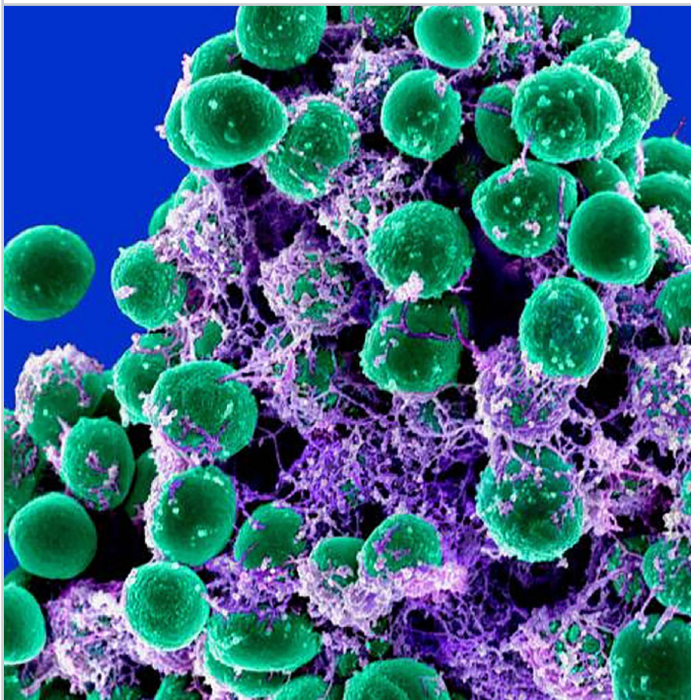




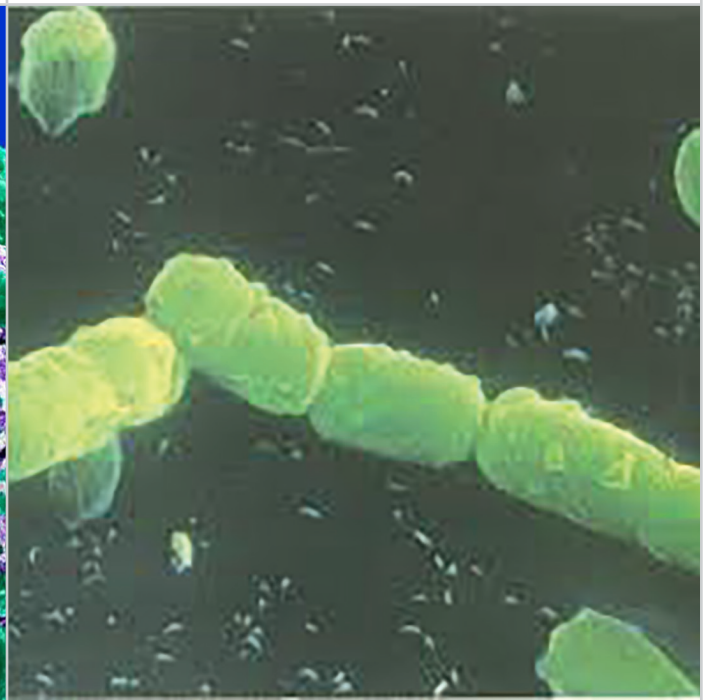
Escherichia coli (E. coli)



Salmonella



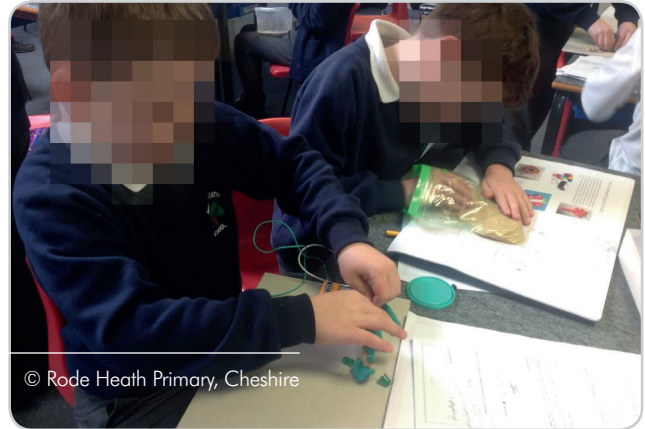
Staphylococcus



Pseudomonas

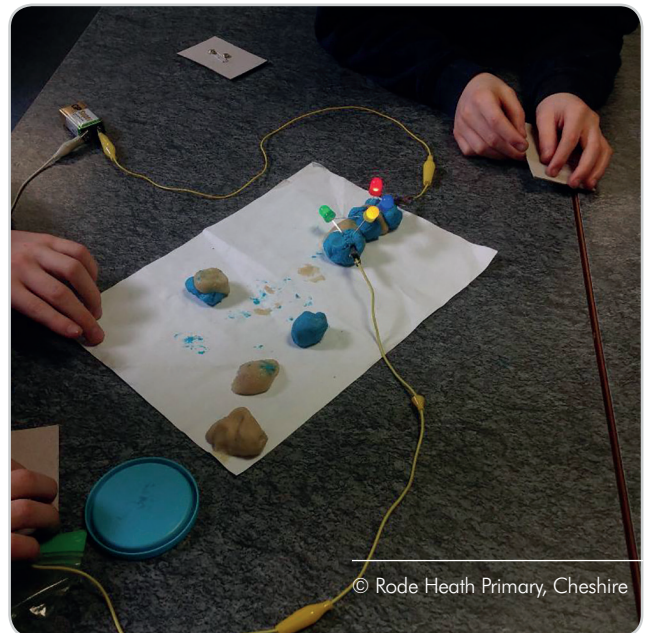
Recipe for playdough

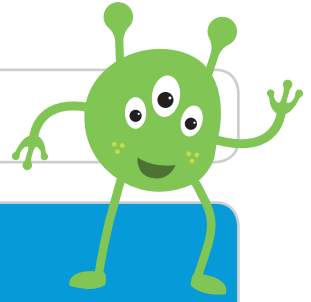
- 2 cups of plain flour
- 1 cup of salt
- 1 tablespoon of oil
- 1/2 to 1 cup cold water
- 2 drops of food colour (optional)



Method

1. Combine the flour and salt.
2. Slowly add 1/2 a cup of water and a tablespoon of oil (plus food colour if adding). Mix.
3. Knead the mixture well.
4. Add more water very gradually if required.
5. Knead again.





Draw where the worms are after five minutes

| wet | start | dry |
|-----|-------|-----|
| | | |

| soil | start | sand |
|------|-------|------|
| | | |