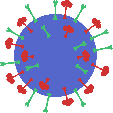
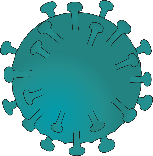
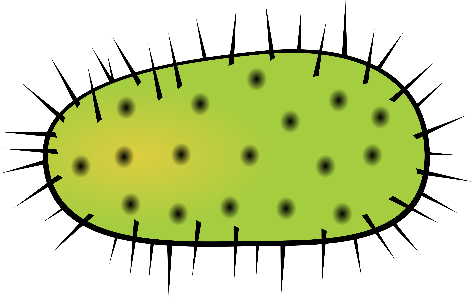
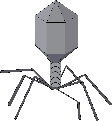
**Attack of the pathogens!**

















Pathogens are on the attack!

Pathogens can cause diseases.

Which statement about pathogens is correct?

|  |  |
| --- | --- |
| **A** | Pathogens can only attack humans. |
| **B** | Pathogens can attack humans and other animals, but not plants. |
| **C** | Pathogens can attack humans, other animals, and plants. |
| **D** | Pathogens can attack all types of organisms. |

*Biology> Big idea BHD: Health and disease > Topic BHD3: Health and infectious disease > Key concept BHD3.1: Pathogens*

|  |
| --- |
| **Diagnostic question** |
| **Attack of the pathogens!** |

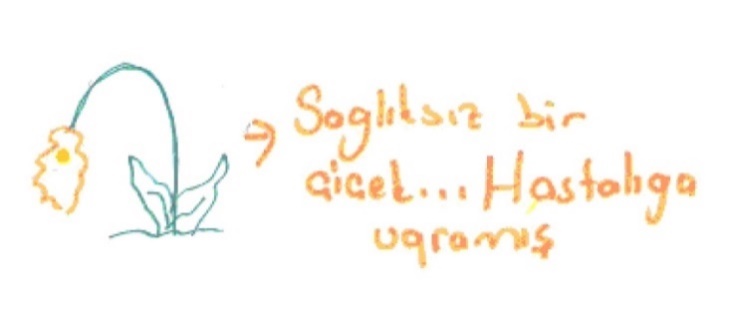
**Overview**

|  |  |
| --- | --- |
| Learning focus: | The health of humans, other animals and plants can be affected by infection with pathogens, including viruses and some bacteria and fungi. |
| Observable learning outcome: | Recall that pathogens cause some but not all diseases in humans, other animals and plants. |
| Question type: | Simple multiple choice |
| Key words: | Health, disease, pathogens, bacteria, viruses, fungi, infection |

|  |  |
| --- | --- |
| **P** | **PRIOR UNDERSTANDING**  This diagnostic question probes understanding of ideas that are usually taught at age 5-11, to aid transition from earlier stages of learning. |

**What does the research say?**

When children aged 14-15 in Turkey were asked to draw and write about disease (Isik, Çetin and Özarslan, 2017), only one student out of 81 made reference to plants – by drawing a “faded flower” that was said to be “sick”; all other answers pertained to humans.



“A faded flower. It is sick.” *(from Isik, Çetin and Özarslan, 2017)*

In England, the current National Curriculum programme of study for science does not explicitly require students to learn about plant diseases until age 14, a requirement that was introduced for the first time in 2014 (Department for Education, 2013b; 2013a; 2014).

Learning about plant diseases is important due to the interdependence of organisms; for example, plant disease has a significant impact on human food security. It has been estimated that plant pests and pathogens are responsible for approximately 12.5% of global crop losses (Oerke, 2006), and for losses of up to 42% of the annual production of the six most important food crops (Guest, 2012). A focus only on disease in humans provides an undesirably restricted view, and could lead to (or reinforce) the misunderstanding that only humans get diseases.

**Ways to use this question**

Students should complete the question individually. This could be a pencil and paper exercise, or you could use the PowerPoint presentation with an electronic voting system or mini white boards.

*Differentiation*

You may choose to read the question and answers to the class, so that everyone can focus on the science. In some situations it may be more appropriate for a teaching assistant to read for one or two students.

**Expected answers**

The best answer is **D** - Pathogens can attack all types of organisms.

Option **C** is correct, however option **D** is the best answer pathogens can attack organisms others than human, other animals and plants – for example, there are even viruses that attack bacteria (the grey bacteriophage depicted in the illustration is an example of this).

**How to respond - what next?**

If there is a range of answers, you may choose to respond through structured class discussion. Ask one student to explain why they gave the answer they did; ask another student to explain why they agree with them; ask another to explain why they disagree, and so on. This sort of discussion gives students the opportunity to explore their thinking and for you to really understand their learning needs. Responses often work best when the activities involve paired or small group discussions, which encourage social construction of new ideas (meaning making) through dialogue.

If students struggle with the idea that pathogens attack plants (or that plants can get diseases), the class could be asked to suggest recent examples of outbreaks of plant disease that they have heard of, such as ash dieback, or to research historical examples, such as potato blight. They could also be taken out to explore the local area around the school for signs of common plant diseases such as bramble rust and powdery mildew; the following BEST ‘response activity’ describes just such an activity, and could be used in follow-up to this diagnostic question:

* Response activity: Plant disease detectives

If students struggle with the idea that pathogens attack organisms other than animals and plants, the following video could be used to challenge their thinking. It presents an engaging, cartoon-like introduction to bacteriophages (viruses that attack bacteria). The first few minutes could be used with students aged 11-14.

* Video: <https://www.youtube.com/watch?v=YI3tsmFsrOg>

**Acknowledgments**

Developed by Alistair Moore (UYSEG).

Images: red, green and blue viruses – pixabay.com/Pixaline (2833622); purple virus – pixabay.com/OpenClipart-Vectors (1294144); green bacterium – pixabay.com/OpenClipart-Vectors (156869); grey bacteriophage – pixabay.com/OpenClipart-Vectors (149183)

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