**Causes of disease**



1. Which statement about **germs** do you agree with?

|  |  |
| --- | --- |
| **A** | Germs cause **all** diseases. |
| **B** | Germs cause **some** diseases. |
| **C** | Germs do **not** cause any diseases. |
| **D** | I’m not sure. |

1. Which statement about **microorganisms** do you agree with?

|  |  |
| --- | --- |
| **A** | Microorganisms cause **all** diseases. |
| **B** | Microorganisms cause **some** diseases. |
| **C** | Microorganisms do **not** cause any diseases. |
| **D** | I’m not sure. |

1. Which statement about **pathogens** do you agree with?

|  |  |
| --- | --- |
| **A** | Pathogens cause **all** diseases. |
| **B** | Pathogens cause **some** diseases. |
| **C** | Pathogens do **not** cause any diseases. |
| **D** | I’m not sure. |

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

|  |
| --- |
| **Diagnostic question** |
| **Causes of disease** |

**Overview**

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| --- | --- |
| 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, microorganisms |

|  |  |
| --- | --- |
| **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 asked about “healthiness”, children up to age 12 primarily equated the term with eating a healthy diet and being physically active (Hesketh et al., 2005; Protudjer et al., 2010). When children aged 5-9 in Australia (Brindal et al., 2012), 9-11 in the US (Reeve and Bell, 2009) and 14-15 in Turkey (Çetin et al., 2013) were asked to draw and write about healthy and unhealthy things, most of the students’ answers related to food and drink (over 60% in the US study) and physical activity.

When asked to draw and write about “disease” (Isik, Çetin and Özarslan, 2017), children aged 14-15 in Turkey referenced the following as causes of disease: microbes [58% of answers in which a cause was mentioned], malnutrition [15%], cigarettes and alcohol [11%], and dirty environment [9%]. Similar results were observed when children aged 8-11 in Hungary were asked to draw and write about causes of disease (Piko and Bak, 2006).

In a study of students aged 12-13 in England, the terms ‘microorganism’ and ‘microbe’ were not used spontaneously to describe organisms such as bacteria that are too small to see with the unaided eye; the term ‘germ’ was most commonly used, followed by ‘bug’ (Maxted, 1984).

**Ways to use this question**

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

*Differentiation*

You may choose to read the questions 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**

1. “Germs”: **B** – They cause some diseases
2. “Microorganisms”: **B** – They cause some diseases
3. “Pathogens”: **B** – They cause some diseases

**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.

Students should be familiar with the term ‘germs’ from primary school. Although answer **B** is the best answer for each question, if students select either **A** or **B** for Q1 this indicates that they do know that germs cause disease

If students select answers **C** or **D** for Q2, this may indicate that they do not appreciate that germs are microorganisms. If students select answers **C** or **D** for Q3, this may indicate that they do not appreciate that the scientific term ‘pathogens’ (akin to the everyday term ‘germs’) refers to entities (microorganisms) that cause disease.

If students select answer **A** (“They cause all diseases”) for Q1, Q2 or Q3, they may not understand that some diseases are not caused by pathogens but result from other environmental factors, lifestyle choices, or inherited information in the genome. The following BEST ‘response activity’ encourages students to explore their thoughts about other possible causes of disease through small group discussion, and could be used in follow-up to this diagnostic question:

* Response activity: Pathogens

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Developed by Alistair Moore (UYSEG).

Images: pixabay.com/mohamed\_hassan (3590869)

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