 Module 7: Infectious disease – Responses to pathogens

Year 12 Biology

Duration:

This document references the [Biology Stage 6 Syllabus](https://syllabus.nesa.nsw.edu.au/biology-stage6/) © 2017 [NSW Education Standards Authority (NESA)](http://syllabus.nesa.nsw.edu.au/copyright/) for and on behalf of the Crown in right of the State of New South Wales.

Inquiry Question

How does a plant or animal respond to infection?

Unit description

Students examine the treatment, prevention and control of infectious disease both locally and globally. It includes study of the human immune system and its response to an infectious disease. The value of studying infectious disease and its causes and effects is highlighted by the cost to humans in terms of losses in productivity and production and the impact on overall health. The module also considers medical and agricultural applications that draw on the work of a variety of scientists. Students focus on developing and evaluating questions and hypotheses when planning and conducting investigations to analyse trends, patterns and relationships in data about infectious diseases.

Outcomes

Working scientifically skills

* BIO11/12-1 develops and evaluates questions and hypotheses for scientific investigation
* BIO11/12-2 designs and evaluates investigations in order to obtain primary and secondary data and information
* BIO11/12-3 conducts investigations to collect valid and reliable primary and secondary data and information
* BIO11/12-4 selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media
* BIO11/12-5 analyses and evaluates primary and secondary data and information
* BIO11/12-6 solves scientific problems using primary and secondary data, critical thinking skills and scientific processes
* BIO11/12-7 communicates scientific understanding using suitable language and terminology for a specific audience or purpose

While all Working Scientifically outcomes have been presented in this sample unit of work, teacher judgement should be used about which skill descriptors students will be working towards and engaging with.

Knowledge and understanding

BIO 12-14 analyses infectious disease in terms of cause, transmission, management and the organism’s response, including the human immune system

| Outcomes/content | Learning experiences and instruction | Evidence of learning and assessment |
| --- | --- | --- |
| * Investigate the response of a named Australian plant to a named pathogen through practical and/or secondary-sourced investigation, for example:   + fungal pathogens   + viral pathogens | * Use the website ‘[Overview: Pests, diseases and disorders](https://ausveg.com.au/biosecurity-agrichemical/crop-protection/overview-pests-diseases-disorders/)’ to complete a table of common plant pathogens. In the table:   + briefly describe each pathogen   + identify the part of the plant affected by the pathogen   + list any indications of disease caused by the pathogen. * Gather 4 or 5 plants that show symptoms of disease. Use table previously constructed to identify the type of pathogen/pest present and describe its effects. Construct labelled diagrams of plant samples.   Students should use the following prompts to help identify the pathogen/pest:   * + Look at the whole plant.   + Check for damage to roots, foliage and flowers.   + Observe the distribution of signs within the plant eg is only the new growth affected, or only one stem?   + Observe the pattern of affected plants within a population. * Watch the first segment of the video clip ‘[Plant and Animal Defense Mechanisms](http://www.bozemanscience.com/023-plant-and-animal-defense)’. Students define, describe and write an explanation of how the hypersensitive response defends plants against pathogens.   Discuss the limitations of this response against pathogens. | * Identify common plant pathogens and describe their effects. * Identify Australian plants that are affected by a variety of different pathogens. * Describe how plants use a non-specific response to defend themselves against pathogens. |
| * Analyse responses to the presence of pathogens by assessing the physical and chemical changes that occur in the host animal’s cells and tissues | * As a class brainstorm the different ways that the human body responds to infection. Prompt students by asking how they know they are sick. * Read article ‘[Infection](https://www.sciencelearn.org.nz/resources/179-infection)’. Discuss what infection is and why people cough and sneeze. * Watch video clip ‘[What is snot?](https://www.sciencelearn.org.nz/videos/57-what-is-snot)’ Discuss why snot is a good thing and why there are different types/colours of snot. * Make Snot. Divide students into small groups and give a different type of snot (recipe) to each group. Discuss the texture of each groups fake snot eg is it stringy or stretchy? * Ask students again what snot is and what it is for. Compare with students’ original answers. * Discuss with students what fever is. How is fever different to feeling hot on a warm day? * Watch video clip [‘Fever!](https://www.pbslearningmedia.org/resource/tdc02.sci.life.reg.fevervid/fever/#.WXmgr4pLe34)’ Discuss why having a set point of 37.5˚C is helpful to the cell functions in the body. Discuss the chemical changes (release of pyrogens) that occur in the body in response to pathogens. * Read ‘[Function of Fever](https://www.pbs.org/wgbh/evolution/library/10/4/l_104_04.html)’. Have students construct a table of the advantages and disadvantages of fever. * Students construct a flowchart summary of the physiological responses of the body to damage using the website ‘[The Inflammatory Response](https://www.nottingham.ac.uk/nmp/sonet/rlos/bioproc/inflam/index.html)’. Include labelled diagrams in the flowchart to assist in demonstrating the major steps involved. * Students write an explanation of how the physical and chemical changes caused by the inflammation help to protect the body against pathogens. Student work in groups to evaluate the effectiveness of the inflammatory response. * Students compare the responses of plants and animals. Discuss how the responses are similar and different. | * Identify responses of animals to pathogens. * Identify and describe the chemical changes that occur during the production of snot. Discuss the role of snot. * Identify and describe the chemical changes that occur in the human body due to fever. Discuss the role of fever. * Identify and describe the physical and chemical changes that occur in the human body during the inflammatory response. Discuss the role of the inflammatory response. |

Resources

* Article – [Overview: Pests, diseases and disorders](https://ausveg.com.au/biosecurity-agrichemical/crop-protection/overview-pests-diseases-disorders/)
* Video clip - [Plant and Animal Defense Mechanisms](http://www.bozemanscience.com/023-plant-and-animal-defense)
* [Infection article](https://www.sciencelearn.org.nz/resources/179-infection)
* Video clip – [What is snot?](https://www.sciencelearn.org.nz/videos/57-what-is-snot)
* [Making snot](https://www.sciencelearn.org.nz/resources/196-making-snot)
* Video clip – [Fever!](https://www.pbslearningmedia.org/resource/tdc02.sci.life.reg.fevervid/fever/#.WXmgr4pLe34)
* [Function of Fever](https://www.pbs.org/wgbh/evolution/library/10/4/l_104_04.html)
* [The Inflammatory Response](http://www.nottingham.ac.uk/nmp/sonet/rlos/bioproc/inflam/index.html)