

ZOONOTIC DISEASES
EDUCATOR RESOURCE



QZ4-003



DISCLAIMER

This resource has been developed as an educational tool for Year 11 students studying zoonotic diseases and is intended to support teaching and learning aligned with the Queensland Certificate of Education (QCE) system and relevant subject syllabi.

Educational purpose

The information contained in this resource is for educational purposes only and should not be considered medical, veterinary or public health advice. Students and teachers should consult qualified healthcare professionals, veterinarians or public health authorities for specific advice regarding disease prevention, diagnosis and treatment.

Currency of information

While every effort has been made to ensure the accuracy of the information at the time of publication, scientific understanding of zoonotic diseases evolves rapidly. Teachers are encouraged to supplement this resource with current information from reputable sources such as Queensland Health, the Australian Department of Health and Aged Care, and the World Health Organization.

Safety considerations

Any practical activities or investigations involving animals, biological specimens or disease vectors must be conducted in accordance with:

- Queensland Department of Education guidelines
- school safety policies and risk assessment procedures
- relevant biosecurity and animal welfare legislation
- appropriate ethical clearances where required.

Cultural sensitivity

This resource acknowledges that different communities may have varying perspectives on animals, disease and health practices. Teachers should approach discussions with cultural sensitivity and respect for diverse viewpoints.

Limitation of liability

Neither the author(s) nor any associated institution accepts responsibility for any outcomes arising from the use of this resource. Teachers remain responsible for adapting content to suit their specific classroom context and student needs.

The background of the entire page is a microscopic view of numerous rod-shaped bacteria. The bacteria are rendered in a vibrant blue and cyan color, with a glowing, almost ethereal quality. They are scattered across the frame, with some in sharp focus in the foreground and others blurred in the background, creating a sense of depth. The lighting highlights the texture of the bacterial cell walls and the internal structures, giving them a three-dimensional appearance.

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BACKGROUND AND RATIONALE

As Queensland's leading collecting institution, Queensland Museum preserves and shares the state's rich natural and cultural heritage, from prehistoric megafauna to contemporary scientific innovation. With four public sites – Queensland Museum Kurilpa, Tropics, Cobb+Co and Rail Workshops – and a dedicated Collections and Research Centre, the museum continues to expand its holdings through the acquisition of objects and specimens that reflect Queensland's diverse environments, histories and communities.

These collections underpin the museum's exhibitions, research and education programs, which explore pressing global issues such as climate change, biodiversity, cultural identity and public health. One such issue – Q fever – became a focal point for institutional change and community education.

Q fever and the Enforceable Undertaking

In early 2019, two Queensland Museum staff members contracted Q fever, a zoonotic disease caused by the bacterium *Coxiella burnetii*. This incident prompted a formal Enforceable Undertaking (EU) with the Office of Industrial Relations.

As part of this agreement, the museum committed to:

- addressing and mitigating workplace health and safety (WHS) risks within its operations
- sharing learnings and best practices with the broader museum and taxidermy sectors
- delivering tangible benefits to workers, industry and the wider Queensland community.

In response, the museum significantly enhanced its WHS systems and developed a suite of educational resources to raise awareness of zoonotic diseases and promote safe practices.

This Zoonotic Disease Educational Resource was developed as part of the museum's commitment to community education under the EU. Designed in consultation with WHS experts, public health professionals, educators and industry stakeholders, the resource provides high-quality, curriculum-aligned materials for Queensland educators.



INTENT AND INQUIRY-BASED DESIGN

This resource has been designed as a specialist focus unit of work and may be used over a school term. It aligns with the [Queensland Curriculum & Assessment Authority's Biology General Senior Syllabus 2025 v1.3](#), based on developing science inquiry skills (see pp. 11–13): identifying and posing questions and working to answer them.

It is concerned with evaluating claims, investigating ideas, solving problems, reasoning, drawing valid conclusions and developing evidence-based arguments. It can easily be summarised as what Mark Hackling (2005) calls the 'work of a scientist' and uses the Launch, Inquire, Act (LIA) instructional model designed by the Australian Academy of Science (2025). The resource is designed to engage and educate students in the subject matter and facilitate their scientific agency. It includes links to resources such as Queensland Museum [loans kits](#) and disease [fact sheets](#).

Launch phase:

Building science identity in Queensland classrooms

The Launch phase is designed to ignite curiosity and build science inquiry skills among secondary students in Queensland by connecting science learning to their lived experiences. Educators use local and global contexts, such as Queensland's unique ecosystems, industries and communities, to present real-world phenomena that prompt students to ask questions, explore concepts and engage with the core concepts outlined in the [Australian Curriculum: Science](#).

Through structured teaching and learning routines, students are supported to:

- experience science through authentic, real-world scenarios and empathise with individuals affected by scientific challenges (e.g. zoonotic diseases, pandemics, deforestation, wild animal trade)
- anchor these experiences to the core concepts they will explore throughout the unit
- share prior knowledge, personal experiences and alternative conceptions that relate to the core concepts
- connect their language, interests and cultural backgrounds to the scientific ideas being introduced.

These routines also serve as opportunities for diagnostic assessment and help students develop representational capabilities, essential for researching, interpreting and communicating scientific ideas.

Professional learning for educators encourages the use of Queensland-specific contexts to foster inclusive, inquiry-rich scenarios that reflect the key ideas of science and support diverse learners.



Inquire phase: Deepening understanding through cycles of exploration

In the Inquire phase, students engage in iterative cycles of inquiry that progressively build their understanding of key science ideas aligned with the curriculum. Each cycle includes three core routines:

- **Questioning:** Students revisit the questions posed during the Launch phase and learn to construct their own. This creative process drives inquiry and helps students interpret new content through the lens of prior learning and curiosity.
- **Investigating:** Students plan and conduct investigations using structured, guided or open inquiry approaches. They gather and analyse data to uncover patterns and trends that relate back to the real-world context introduced earlier. Investigations are scaffolded to build both content knowledge and science inquiry skills.
- **Integrating:** Students evaluate their findings, refine representations (e.g. models, graphs, explanations) and anchor their learning to the core concepts. This phase makes student thinking visible and provides rich opportunities for formative feedback. New questions often emerge, prompting further inquiry cycles.

Through repeated cycles, students deepen their conceptual understanding, strengthen their science practices and begin to see themselves as capable science learners and communicators.

Act phase: Applying science to real-world challenges

The Act phase empowers students to apply their understanding of core concepts and key science ideas to authentic challenges. This phase encourages students to:

- re-anchor their learning to the real-world contexts explored in the Launch phase
- design solutions to local or global problems using scientific knowledge (e.g. One Health approach, systems thinking)
- communicate their ideas effectively to peers, teachers and the wider community, advancing science and influencing change
- build agency and increase their science capital by seeing how science connects to their future pathways and community impact.

Educators provide formative feedback throughout, and the final products offer opportunities for summative assessment aligned with curriculum standards.

By grounding science learning in relevant contexts and supporting students to apply their knowledge meaningfully, this approach fosters scientific literacy and strengthens students' science identity, preparing them to make informed decisions and contribute to Queensland's future.

Note: Please refer to disclaimers at the front of this resource for important information regarding liability and educational use.

References

Australian Academy of Science (2025) *LIA Framework*, Australian Academy of Science, accessed 30 January 2026.

Hackling MW (2005) *Working scientifically: Implementing and assessing open investigation work in science* [PDF], Department of Education and Training, Western Australia, accessed 30 January 2026.

QCAA (Queensland Curriculum & Assessment Authority) (2025) *Biology General senior syllabus 2025 v1.3*, QCAA, accessed 30 January 2026.



EDUCATOR PREPARATION

Thinking like a scientist, acting like a scientist

Zoonotic diseases – diseases that jump from animals to humans – pose significant challenges for global health, ecosystems and societies. Understanding these diseases requires more than memorising facts; it demands scientific thinking and action-oriented inquiry and communication.

This resource integrates the syllabus guidelines for **Year 11 Scientific Inquiry** (see p. 9) with **Launch, Inquire, Act (LIA)** (an evidence-informed approach developed by the Australian Academy of Science) as a suggested pedagogy to create a holistic learning experience.

Launch: Spark curiosity and context

Each lesson/section should begin with a compelling scenario. Suggested prompts could include ‘What are zoonotic diseases?’ or ‘What occupations are higher risk for zoonotic disease exposure?’ We will use real-world examples such as Q fever, Australian bat lyssavirus (ABLV) and Zika virus in Queensland, and COVID-19 globally.

A blank disease table and glossary of terms are provided for students to complete as they go through the course. These can be used to frame a research project and community event at the end of the unit on zoonotic diseases.

Educators should encourage students to brainstorm initial questions and predictions, teach students to **identify credible sources** when conducting research, and introduce them to concepts such as peer review.

Inquire: Investigate like a scientist

Students will:

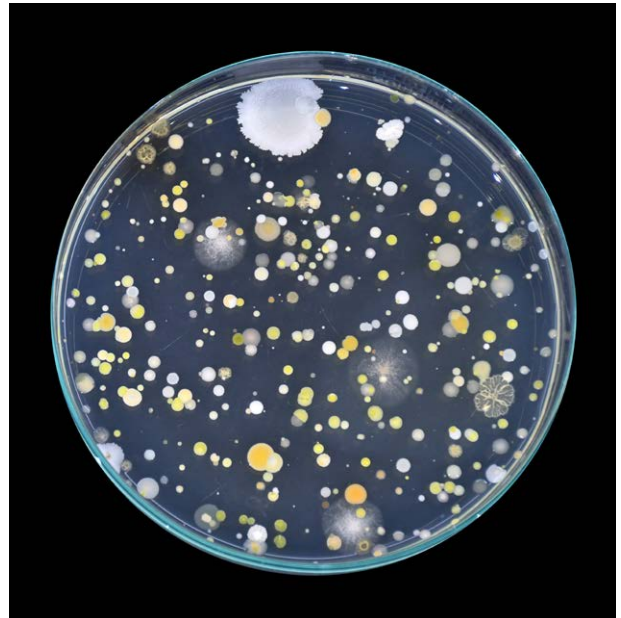
- formulate investigable questions about zoonotic disease
- develop hypotheses and design investigations
- collect and analyse data from credible sources
- draw evidence-based conclusions.

This phase aligns directly with the scientific inquiry process, embedding critical thinking and problem-solving.

Act: Apply and communicate findings (‘act like a scientist’)

Finally, students transition from analysis to application, embodying the spirit of **Science as a Human Endeavour (SHE)** by addressing the social, ethical and political implications of their work. They use their scientific findings to propose tangible solutions or awareness campaigns (such as World Zoonoses Day).

This entire process turns scientific understanding into real-world impact, demonstrating that science is a dynamic, collaborative endeavour shaped by human needs and values, and responsible for informing societal change.



Why this matters

By integrating LIA with scientific inquiry, students experience science as a dynamic, purposeful process. They learn not only *what* zoonotic diseases are but *how* to investigate, *when* to respond to them, and *why* it is important as informed citizens and/or future scientists.

The **Educator materials** (E1 and E2, with E3–E10 to follow later in 2026) and corresponding **Student Activities** for each module are designed to enable a succinct overview of the zoonotic disease focus and to suggest formative and summative activities. It is assumed that educators will use the text *Biology for Queensland Units 1 & 2* (Quinn, Schmidt and Brodbeck, 4th edn, 2025) relating to Unit 2, Modules 12 (Disease) and 13 (Epidemiology).

Each follows the same format:

1. a brief synopsis of the content
2. relevant short video/s
3. repeatable quiz (to check understanding)
4. a 'learn more' and/or 'resources' section with extra information
5. student activity and assessment suggestions.

The **Student Workbook** is for students, with suggested activities to build their scientific inquiry skills, with a suggested final summative activity to apply and communicate their new knowledge, Science as a Human Endeavour (SHE), to a local community group.

Educators may choose to share the videos and quizzes with students as part of the lesson plan, to spark curiosity, interest and identify gaps in knowledge.

Resources for suggested activities include blank disease tables and glossaries for students to complete as they progress through the modules.

Links to Queensland Curriculum & Assessment Authority (QCAA)

[Senior Biology syllabus](#)

[Glossary of cognitive verbs](#) [PDF]

[Aboriginal and Torres Strait Islander perspectives](#)

[21st century skills: Preparing students for a changing world](#)

[Safety and ethics](#)

✔ Quizzes

This resource includes **10 interactive quizzes** that can be completed online or printed for offline use. The last of these is a comprehensive 90-question quiz (all questions from the first 9 quizzes) to check recall and understanding of material in the previous lessons.

Individual links to each online quiz can be found throughout the educator guide, or go to the [printable quiz generator](#) to save a printable version of any of the quizzes.



GLOW AND GROW:

INTRODUCING STUDENTS TO PEER REVIEW

'Feedback should be kind, specific, and helpful. If it isn't all three, it isn't constructive.'

Adapted from Ron Berger, *An ethic of excellence* (2003), p. 93–4.

The golden rule of feedback

Feedback is a vital tool for improving performance in senior secondary schooling. The Glow and Grow model (also known as Stars and Stairs) focuses on celebrating what is working while providing a clear roadmap for improvement. According to Hattie and Timperley (2007), effective feedback must answer three questions: Where am I going? How am I going? and Where to next?

Giving a 'glow'

The goal of a glow is to identify specific strengths. Avoid generic praise and focus on evidence.

- **Be specific:** Pinpoint exactly where the success is. Instead of saying a section is good, identify the specific sentence or data point that worked.
- **Connect to criteria:** Use the marking rubric or syllabus outcomes. The Australian Institute for Teaching and School Leadership (2017) notes that feedback is most effective when it is specific and accurate.
- **Explain the impact:** Explain why a particular choice was effective. For example, explain how a certain transition improved the logical flow of an argument.

Giving a 'grow'

A grow is a suggestion for a specific next step. It should be constructive and focused on movement (Evidence for Learning 2021).

- **Focus on the work:** Use objective language. Focus on the writing or the task rather than the person who created it.
- **Make it actionable:** Give the receiver something they can do immediately. Dylan Wiliam (2011) suggests that feedback should be a recipe for future action rather than a post-mortem of past work.
- **The rule of three:** As Ron Berger (2003) states, feedback should be kind, specific and helpful. If it is not all three, it is not constructive.

Receiving feedback

Receiving feedback requires a growth mindset and professional detachment (NSW Department of Education n.d.).

- **Listen and read:** Process the entire comment before responding.
- **Clarify:** If a suggestion is unclear, ask for an example of how to apply it.
- **Plan:** Write down one specific change to make based on the advice received.



Thinking and acting like a scientist

Here are some example sentences you can use to connect Glow and Grow to peer review and acting like a scientist:

- ‘When scientists submit their research to journals, other experts read their work and provide feedback before it’s published. This process is called peer review, and it’s how the scientific community ensures quality and accuracy.’
- ‘Just like you’re doing with Glow and Grow, scientists give each other specific feedback on what’s working well and what could be strengthened. They might say “Your methodology is rigorous” (a glow) or “Consider testing this hypothesis with a larger sample size” (a grow).’
- ‘Real scientists don’t work in isolation – they share drafts, present findings at conferences and revise their work based on feedback from colleagues. Learning to give and receive constructive feedback (glow/grow) is just as important as learning lab techniques or data analysis.’
- ‘When you receive a “grow” comment from a peer (fellow student), think of it as a scientist would: not as criticism, but as a valuable perspective that could improve your work. Some of the most important scientific breakthroughs happened because researchers were willing to revise their ideas based on feedback.’
- ‘In science, having your work reviewed by multiple people isn’t a sign of weakness – it’s a sign of rigour (high quality). The more perspectives that examine research, the stronger and more reliable it becomes.’
- ‘Today’s peer review practice (Glow and Grow) is preparing you to think and collaborate like a scientist. You’re learning to evaluate evidence critically, communicate your reasoning clearly and approach problems from multiple angles – all essential scientific skills.’

References

- AITSL (Australian Institute for Teaching and School Leadership) (2017) [Feedback](#), AITSL, accessed 30 January 2026.
- Berger R (2003) *An ethic of excellence: building a culture of craftsmanship with students*, Heinemann, Portsmouth, NH.
- Evidence for Learning (2021) [Assessment and feedback in schools](#), Evidence for Learning, accessed 30 January 2026.
- Hattie J and Timperley H (2007) ‘[The power of feedback](#)’, Review of Educational Research, 77(1):81–112, doi:10.3102/003465430298487.
- NSW Department of Education (n.d.) [Feedback practices and strategies](#), NSW Government, accessed 30 January 2026.
- William D (2011) *Embedded formative assessment*, Solution Tree Press, Bloomington, IN.





STUDENT ACTIVITY 0.1

GLOW AND GROW

Task: _____ Date: _____

Student: _____ Reviewer: _____

Glow (strengths)

Observation:

Why it worked:

Grow (targeted improvement)

Suggestion:

Example of how to apply it:

Criteria	Level 3	Level 2	Level 1
Specificity	Identifies exact sentences or techniques used in the work.	Refers to general sections such as the introduction.	Feedback is vague or generic, such as 'good job'.
Actionability	Provides a clear and ready-to-use step for implementation.	Identifies a problem but provides no method to fix it.	Does not provide a path for improvement.
Tone	Professional and focused entirely on the work.	Generally polite, but may use personal 'you' statements.	Tone is critical or lacks professional focus.

E1: WHAT ARE ZOO NOTIC DISEASES?

Concise definition: Diseases caused by pathogens maintained in non-human animal populations that can infect humans.

Zoonotic diseases – also called zoonoses – are infections that originate in non-human animals and naturally transmit to humans. They are caused by various types of pathogens, including bacteria, viruses, fungi, protozoan parasites and prions.

Zoonotic diseases are transmitted through direct contact with animals or their fluids (e.g. bites, scratches, consuming animal products), or indirectly through vectors (e.g. ticks, mosquitoes)(CDC 2025).

The Online Etymology Dictionary notes that the term ‘zoonoses’ is derived from the Greek words zoon (animal) and noson (disease).

Pathogens

The pathogens responsible for zoonotic diseases are diverse, spanning the entire microbiological spectrum. This makes diagnosing, treating and controlling the spread of zoonoses a challenge for public health professionals.

There are five types of pathogens (infectious agents) that cause zoonotic disease:

Bacteria: Pathogens such as *Coxiella burnetii* (the cause of Q fever) and *Leptospira* species (leptospirosis) are common zoonotic threats, often spread through contact with infected animal fluids or aerosols.

Viruses: A major public health challenge, viral zoonoses are exemplified by highly fatal diseases like Australian bat lyssavirus (ABLV) and vector-borne illnesses such as Zika virus, which use animal reservoirs or insect vectors for transmission.

Fungi: Some fungi may cause disease in humans. For example, about 40 types of fungus can cause dermatophytosis (ringworm), which can be transmitted from domesticated animals and livestock to humans via direct contact.

Protozoan parasites: These single-celled organisms move between animal hosts and humans, frequently through ingesting contaminated food or water. *Toxoplasma gondii* (toxoplasmosis) and *Cryptosporidium* (cryptosporidiosis) are examples of protozoan parasites and their corresponding diseases.

Prions: Prions differ from other pathogens in that they contain no genetic material and are primarily composed of protein. Unlike bacteria, fungi and parasites, prions are not living organisms – they are misfolded proteins that cause normal proteins in the brain to misfold as well, leading to cellular dysfunction and disease. Prion diseases are a group of incurable neurodegenerative diseases that affect the brain and nervous system. Bovine spongiform encephalopathy (BSE), also known as ‘mad cow disease’, is an example of a prion disease affecting cattle. Variant Creutzfeldt-Jakob disease (vCJD) is the human form, usually acquired from consuming BSE-infected beef.

Pathogens can also be environmental, found in soil, water or other non-living environments – not directly maintained by animals – and infect humans through exposure. Environmental pathogens can be transmitted via inhalation, ingestion or contact with contaminated surfaces or water.

Examples include:

Legionella pneumophila – a bacterium that causes Legionnaires’ disease via contaminated water systems. Legionnaires’ disease is not considered zoonotic because it is an environmental pathogen and is not transmitted from animals to humans.

Clostridium tetani – causes tetanus from soil exposure. Humans get tetanus from the environment, not directly from animals, and thus it is not considered a zoonotic disease.

Cryptosporidium – a waterborne protozoan causing gastrointestinal illness, considered zoonotic as it can be transmitted from animals to humans and vice versa. Cryptosporidiosis, the infection caused by the parasite, is a significant health issue, due to the ease of transmission through contaminated water and direct contact with infected animals.

Zoonoses in Australia

In the Australian context, the threat of zoonoses is particularly acute due to our unique wildlife and intense livestock industries.

Q fever is endemic, primarily transmitted to people working in certain occupations (e.g. farmers, abattoir workers) by inhaling contaminated aerosols from infected livestock (e.g. sheep, goats, cattle) (Healthdirect 2024). See Queensland Museum's [educational resources](#) for additional material on Q fever.

Australian bat lyssavirus (ABLV) is a rare, rabies-like virus transmitted by bites or scratches from infected bats. It is almost always fatal (ACDC 2026).

Zika virus is an example of an imported, vector-borne zoonosis. The virus is not endemic to Australia, but it can be transmitted by a species of mosquito found in Far North Queensland, as well as through direct contact with a person who has contracted the virus overseas and travelled to Australia. This poses a surveillance challenge for health organisations to prevent outbreaks of the disease (WHO 2025).

In order to respond appropriately to the emergence (or re-emergence) of these infections and provide effective treatments, we need to understand how the human body mounts a targeted defence against a disease. This scientific insight underpins public health responses such as quarantine, treatment and vaccination. For instance, understanding the viral transmission pathways allows scientists and doctors to design more effective quarantine measures to limit the spread of disease. Understanding the immune mechanism in the body directly informs the process of developing and deploying vaccines.

Advances in immunology have had tangible impacts, as we saw during the COVID-19 pandemic. Rapidly identifying immune responses enabled the swift creation and distribution of mRNA vaccines, significantly improving containment and treatment outcomes. In this way, scientific knowledge not only shapes medical strategies but also drives the efficacy and speed of public health interventions against infectious diseases.

The role of quarantine in controlling disease outbreaks

Quarantine is a key tool in managing outbreaks of diseases (both zoonotic and from other origins), in addition to vaccination and other public health measures. However, the effectiveness of quarantine as a containment strategy has historically faced

major challenges. During the COVID-19 pandemic, quarantine measures such as isolating exposed individuals, restricting movement and closing borders were widely implemented to slow the spread of the virus. These efforts were often complicated by global interconnectedness: modern trade, travel and densely populated urban centres allowed the virus to move rapidly between regions, making complete containment extremely difficult.

This challenge is not new. During the era of the plague, especially the Black Death in the 14th century, quarantine was one of the few public health tools available. Cities attempted to isolate the sick and restrict entry of travellers and goods. Despite these efforts, the disease spread relentlessly along trade routes such as the Silk Road and maritime shipping lanes, carried by infected rats and fleas hidden in cargo. The movement of people and goods across continents meant that local quarantine could only delay, not prevent, the arrival of the disease.

Comparing these two pandemics highlights a key lesson: while quarantine can slow transmission, its effectiveness is limited by the speed and scale of human movement. In both the plague and COVID-19, trade routes and travel networks acted as conduits for disease, overwhelming local containment efforts. This underscores the importance of combining quarantine with rapid scientific advances, such as vaccines and diagnostics, to achieve meaningful control over infectious outbreaks.

Reverse zoonosis

Reverse zoonosis, also called anthroponosis or zooanthroponosis, occurs when infectious diseases transmit from humans to animals. While less commonly discussed than traditional zoonoses, reverse zoonosis is an important concern for wildlife conservation, animal welfare and public health. Humans can transmit pathogens to domestic animals, livestock and wildlife through direct contact, contaminated environments or respiratory droplets. Examples include human transmission of tuberculosis to elephants and cattle, influenza to pigs and poultry, and COVID-19 to mink, cats and great apes (WOAH 2022).

Messenger et al. (2014) note that 'As we see a global increase in industrial animal production, the rapid movement of humans and animals and the habitats of humans and wild animals intertwining with great complexity, the future promises more opportunities for humans to cause reverse zoonoses. Scientific research must be conducted in this area to provide a richer understanding of emerging and reemerging

disease threats. As a result, multidisciplinary approaches such as One Health will be needed to mitigate these problems.'

Notifiable diseases

Queensland Health lists a number of zoonoses as notifiable diseases, in addition to other non-zoonotic diseases, meaning that doctors and other health professionals are legally required to report cases to public health authorities. This is necessary for helping to track, prevent and manage outbreaks to protect public health.

In Queensland, these zoonotic diseases are notifiable if they occur in humans (Queensland Health 2020; Queensland Health 2025):

- anthrax
- avian influenza
- brucellosis
- Hendra virus
- leptospirosis
- rabies/lyssavirus (including Australian bat lyssavirus (ABLV))
- potential exposure to rabies/lyssavirus
- ornithosis
- plague
- Q fever
- tularaemia.

The reporting obligations for these zoonotic diseases are based on clinical or provisional diagnosis under the [Public Health Act 2005](#) and [Public Health Regulation 2018](#). Some conditions require immediate notification if there is potential exposure to rabies or lyssavirus.

Zoonotic diseases are not the only notifiable conditions in Queensland. Many non-zoonotic diseases are also notifiable under Queensland legislation, and like zoonotic diseases, these can be caused by a range of pathogens. They can be viral (e.g. COVID-19, influenza, mpox, measles, HIV, hepatitis), bacterial (e.g. legionellosis, syphilis, tuberculosis), or arise from other causes (e.g. acute rheumatic fever (ARF), which is an immune response triggered by a Group A streptococcal infection).

The complete list of notifiable conditions and reporting guidelines is available on the [Queensland Health website](#).

Video 1.1 Demystifying zoonotic diseases (6:55)

Explains what zoonotic diseases are, how they transmit between animals and humans and why they are increasing.

Quiz 1 What is a zoonotic disease? (10 questions)

Learn More






















[Teaching Viruses and Epidemiology Online – BiolInteractive](#)

A playlist of interactive media and videos covering virus biology, zoonotic transmission and outbreak response. Includes activities on Nipah virus, Ebola and viral evolution.

References

- ACDC (Australian Centre for Disease Control) (2026) [Australian bat lyssavirus](#), ACDC website, accessed 30 January 2026.
- CDC (Centers for Disease Control and Prevention (US)) (2025) [About zoonotic diseases](#), CDC website, accessed 30 January 2026.
- Healthdirect (2024) [Q fever](#), Australian Government, accessed 30 January 2026.
- Messenger AM, Barnes AN and Gray GC (2014) 'Reverse zoonotic disease transmission (Zoonothroponosis): a systematic review of seldom-documented human biological threats to animals', *PLoS One* 9(2): e89055. doi:10.1371/journal.pone.0089055
- Queensland Health (2020) [Zoonotic and other diseases](#), Queensland Government, accessed 30 January 2026.
- (2025) [Notifiable conditions](#), Queensland Government, accessed 30 January 2026.
- WHO (World Health Organization) (2025) [Zika virus](#), WHO website, accessed 30 January 2026.
- WOAH (World Organisation for Animal Health) (2022) [Crossing the species barrier: COVID-19, an example of reverse zoonosis](#), WOAH website, accessed 30 January 2026.

DISEASE TABLE EDUCATOR VERSION

Disease	Icon	Cell type/ infectious agent (pathogen)	Pathogen type	Pathogen scientific name	Geographic distribution	Transmission	Prevention	Treatment	Why it occurs	Notes
Q fever		Prokaryotic	Zoonotic (bacterial)	<i>Coxiella burnetii</i>	Australia, global	Inhalation of contaminated dust from infected animals	Avoid exposure to animal birthing fluids; vaccination	Antibiotics (doxycycline)	Close contact with livestock, poor biosecurity (note about marsupials)	
Hendra virus		Virus	Zoonotic (viral)	<i>Henipavirus hendraense</i>	Australia	Contact with infected horse fluids	Avoid contact with sick horses; horse vaccination	Supportive care	Bat-horse-human transmission cycle, habitat overlap	
Rabies		Virus	Zoonotic (viral)	<i>Lyssavirus rabies</i>	Asia, Africa, Americas	Bite from infected animal	Vaccination; animal control	Post-exposure prophylaxis	Poor animal vaccination, stray dog populations	
Australian bat lyssavirus		Virus	Zoonotic (viral)	<i>Lyssavirus australis</i>	Australia	Bite or scratch from infected bat	Avoid handling bats; PPE; post-exposure prophylaxis	Rabies vaccine and immunoglobulin	Wildlife-human interaction, lack of awareness	
Melioidosis		Prokaryotic	Environmental (bacterial)	<i>Burkholderia pseudomallei</i>	Northern Australia, SE Asia	Contact with contaminated soil or water	Protective clothing; avoid exposure during wet season	Antibiotics (ceftazidime, meropenem)	Tropical climate, soil disturbance, diabetes risk	
Ross River virus		Virus	Vector-borne (viral)	<i>Alphavirus</i>	Australia, Pacific Islands	Mosquito bite	Mosquito control; repellents; protective clothing	Supportive care	Wetland habitats, climate conditions	
Dengue fever		Virus	Vector-borne (viral)	<i>Orthoflavivirus denguei</i>	Northern Australia, global tropics	Mosquito bite	Mosquito control; travel precautions	Supportive care, hydration	Urbanisation, climate change, travel	
Plague		Prokaryotic	Zoonotic/vector-borne (bacterial)	<i>Yersinia pestis</i>	Madagascar, Congo, USA	Flea bites from infected rodents	Rodent control; flea treatment; sanitation	Antibiotics (streptomycin, doxycycline)	Poor sanitation, rodent infestations	
Leptospirosis		Prokaryotic	Zoonotic/environmental (bacterial)	<i>Leptospira</i>	Australia, global tropics	Contact with contaminated water/soil	Protective gear; avoid floodwaters; rodent control	Antibiotics (penicillin, doxycycline)	Flooding, poor sanitation, occupational exposure	
Cryptosporidiosis		Eukaryotic	Environmental (protozoan)	<i>Cryptosporidium parvum</i>	Australia, global	Ingestion of contaminated water or food	Water treatment; hygiene	Supportive care, rehydration	Waterborne transmission, poor sanitation	
Lyme disease		Prokaryotic	Vector-borne (bacterial)	<i>Borrelia burgdorferi</i>	USA, Europe	Tick bite	Avoid tick bites; protective clothing	Antibiotics (doxycycline)	Forest fragmentation, tick-host dynamics	
Malaria		Eukaryotic	Vector-borne (protozoan)	<i>Plasmodium</i>	Global tropics, travel-related cases in Australia	Mosquito bite (<i>Anopheles</i> spp.)	Mosquito nets; repellents; prophylactic medication	Antimalarial drugs (artemisinin-based therapies)	Mosquito habitats, travel to endemic regions	
Mammalian meat allergy / alpha-gal syndrome		Allergic reaction	Tick-induced allergy	Alpha-gal (galactose- α -1,3-galactose)	Australia, USA, Europe	Tick bite (e.g. paralysis tick in Australia)	Avoid tick bites; protective clothing; repellents	Avoid mammalian meat; antihistamines, epinephrine for severe cases	Immune response triggered by tick saliva introducing alpha-gal	
Toxoplasmosis		Eukaryotic	Protozoan parasite	<i>Toxoplasma gondii</i>	Global	Ingestion of oocysts from cat feces or undercooked meat	Cook meat thoroughly; wash hands after handling cats or soil	Antiparasitic drugs (pyrimethamine, sulfadiazine)	Cats are definitive hosts; humans infected via contaminated food or soil	
Cat scratch disease		Prokaryotic	Bacterial	<i>Bartonella henselae</i>	Global	Scratch or bite from infected cat	Avoid rough play with cats; wash scratches promptly	Antibiotics (azithromycin)	Bacteria transmitted through cat saliva during scratches	
Mad cow disease		Prion	Prion (infectious protein)	Prion protein (PrPSc)	Europe, UK, global outbreaks	Consumption of contaminated beef products	Strict cattle feed regulations; avoid high-risk beef products	No cure; supportive care	Prions accumulate in nervous tissue; transmitted via food chain	
Avian influenza (bird flu)		Virus	Zoonotic (viral)	Influenza A virus (H5N1, H7N9)	Asia, Europe, global outbreaks	Direct contact with infected birds or contaminated environments	Avoid contact with sick birds; biosecurity measures	Antiviral drugs (oseltamivir), annual flu vaccine	Poultry farming, live bird markets, migratory birds	
Legionnaires' disease		Prokaryotic	Environmental (bacterial)	<i>Legionella pneumophila</i>	Global	Inhalation of aerosolised water droplets from contaminated systems	Regular cleaning and disinfection of water systems	Antibiotics (azithromycin, levofloxacin)	Poor maintenance of cooling towers, plumbing systems	
Swine flu (H1N1)		Virus	Zoonotic (viral)	Influenza A virus (H1N1)	Global	Direct contact with infected pigs or contaminated environments	Avoid contact with sick pigs; biosecurity measures	Antiviral drugs (oseltamivir), annual flu vaccine	Pig farming, live markets	
Japanese encephalitis		Virus	Zoonotic (viral)	<i>Orthoflavivirus japonicum</i>	SE Asia, China, Indonesia, Papua New Guinea, the Torres Strait, Australia	Mosquito bite	Mosquito control; repellents; protective clothing	Supportive care	Mosquito habitats, travel to endemic regions	
Ringworm		Eukaryotic	Fungal	<i>Microsporium canis</i> , <i>Trichophyton mentagrophytes</i> , <i>Trichophyton verrucosum</i>	Global	Direct contact with infected animals or contaminated environments	Avoid contact with sick animals; regular cleaning and disinfection of contaminated environments	Antifungal medication	Poor sanitation, easy spore spread	

GLOSSARY OF TERMS EDUCATOR VERSION

Term	Definition
adaptive immune response	Specific immune response involving lymphocytes and antibodies targeting pathogens.
agent	A substance that causes a reaction.
antibody	A protein produced by B cells that binds to a specific antigen to neutralise pathogens.
antigen	A molecule recognised as foreign by the immune system, triggering an immune response.
aseptic	A condition or technique that is free from contamination by microorganisms. In practice, it means creating and maintaining an environment or performing procedures in a way that prevents the introduction of pathogens, commonly used in medical, laboratory and food processing contexts.
bacteria (singular: bacterium)	Single-celled prokaryotic organisms, some of which cause disease.
carrier	An organism that harbours a pathogen and can transmit it without necessarily showing symptoms.
complement system	Proteins that enhance immune responses such as inflammation and phagocytosis.
direct contact	Transmission mode where pathogens spread through physical contact between hosts.
endemic	An endemic disease is one regularly found among particular people or in a certain area.
epidemic	A sudden increase in the number of cases of a disease in a population.
epidemiology	Study of distribution and determinants of health-related states in populations.
fungi	Eukaryotic organisms that can cause diseases like athlete's foot and ringworm.
herd immunity	Protection of a population from infection when a sufficient proportion is immune.
incidence	Number of new cases of a disease in a population during a specific period.
innate immune response	Non-specific defence mechanisms present in all plants and animals.
lysozyme	Enzyme found in saliva and tears that breaks down bacterial cell walls.
memory cell	Long-lived immune cells that provide faster response upon re-exposure to a pathogen.

Term	Definition
morbidity	Rate of disease in a population.
mortality	Rate of death in a population.
outbreak	Occurrence of disease cases greater than expected in a specific area or group.
pandemic	An epidemic that has spread across countries or continents.
pathogen	An organism or agent that causes disease (e.g. virus, bacteria, prion, fungus, protozoan).
prevalence	Total number of cases of a disease in a population at a given time.
prion	Infectious protein molecules that cause diseases like bovine spongiform encephalopathy (BSE) – mad cow disease – and the human version, variant Creutzfeldt-Jakob disease (vCJD).
protozoan (plural: protozoa)	Single-celled eukaryotic organisms, some of which cause zoonotic diseases like malaria.
quarantine	Isolation of individuals to prevent the spread of disease.
reservoir	In the context of zoonotic diseases, a reservoir refers to any animal species, population, or environment that harbours a pathogen and serves as a long-term source of infection. The reservoir maintains the pathogen in nature, often without showing severe disease symptoms, and can transmit it to other species, including humans, either directly or through intermediate hosts or vectors.
sterile	Completely free of all living microorganisms, including bacteria, viruses, fungi and spores. It describes an absolute state of microbial absence, typically achieved through sterilisation processes such as autoclaving, chemical treatment or irradiation.
transmission	Process by which a pathogen spreads from one host to another.
vector	An organism (often an insect) that transmits pathogens between hosts.
virulence factors	Molecules produced by pathogens that enable them to infect and cause disease.
virus	Non-cellular infectious agent composed of nucleic acid and protein coat that replicates inside host cells.
zoonosis (plural: zoonoses)	A disease that can be transmitted from animals to humans.



ONE-PAGE RESEARCH TEMPLATE

Student name:

Disease selected:

(e.g. Q fever, Hendra virus, leptospirosis, psittacosis)

1 The agent (pathogen)

Pathogen name: (e.g. *Coxiella burnetii*)

Classification:

Bacteria Virus Fungi

Prion Protozoan parasite

Visual description:

(Draw or describe morphology, e.g. rod-shaped, protein coat)

Sketch:

2 The chain of transmission

Reservoir:

(Where does it live naturally? e.g. bandicoots, cattle)

Vector:

(Is there an intermediate carrier? e.g. tick, mosquito, or is it direct?)

Mode of transmission to humans:

(Direct contact, airborne droplets, vector bite?)

3 Epidemiology (the data)

Find one statistic or graph regarding this disease (e.g. '300 cases in QLD in 2023' or a map of distribution).

Data point: _____

Analysis: Is the disease incidence increasing, decreasing, or seasonal?

4 Management strategies

Identify one strategy for each category.

Personal safety (PPE/hygiene): _____

Quarantine/isolation: _____

Public health/vaccination: _____

5 Formative self-assessment checklist

Before handing this to your teacher, check the following:

Criteria	Yes/No
I have correctly identified the type of pathogen (e.g. bacteria vs virus).	<input type="checkbox"/>
I have distinguished between the reservoir (source) and the vector (carrier).	<input type="checkbox"/>
I have explained how it enters the human body (mode of transmission).	<input type="checkbox"/>
I have included at least one specific management strategy.	<input type="checkbox"/>
I have used correct biological terminology (not 'germs' or 'bugs').	<input type="checkbox"/>

6 Peer review feedback

Ask a partner to read your sheet.

One thing learned:

One question asked:

E2: ZOO NOTIC DISEASE TRANSMISSION

Zoonotic diseases are infections that spread from non-human animals to humans, and they account for a significant proportion of emerging health threats worldwide. Transmission can occur through several pathways, each with distinct mechanisms and implications for prevention (CDC 2025). The four main pathways are:

1. **Direct transmission** happens through close contact with animals, such as bites, scratches or handling infected tissues.
2. **Indirect transmission** involves contaminated surfaces, food, air or water, where pathogens persist outside the host.
3. **Vector-borne transmission** relies on organisms like mosquitoes, ticks or fleas that carry pathogens from animals to humans.
4. **Environmental transmission** occurs when pathogens survive in soil, water, air or other environmental reservoirs, creating opportunities for human exposure.

Understanding these routes is essential for managing outbreaks and reducing risk. The following videos explore each transmission type in detail, providing real-world examples and scientific explanations to help students think critically about how diseases move across species barriers and what strategies can mitigate these risks.

Parasitic zoonoses: Aboriginal and Torres Strait Islander perspectives

For many First Nations peoples, the health of the body and the health of Country are inseparable, woven together in a relationship of reciprocal care and deep connection. As Biles et al. (2024) explain, Indigenous cultural health encompasses the interconnectedness of Country, people and culture – separating people from their Country removes their source of strength, health and wellbeing. Fields et al. (2024) describe how, by bringing Country back to a culturally healthy landscape, the health and wellbeing of the people also benefit through a cultural ceremony of reciprocal care and relationship. This profound understanding recognises that healing cannot happen in isolation but must encompass the land, waters and all living things that sustain us (AIHW 2025).

Video 2.1 Gula Guri mayin (Heal the body) (3:42)

This artwork by Bernard Lee Singleton explores themes of parasites and health.

Video 2.2 Parasitology – Art and Science (14:13)

Bernard Lee Singleton describes the creation of his painting of parasite life cycles and how he found a natural connection between science and the traditional symbols of his own work.

Created by artists Bernard Lee Singleton and Tai Inoue, in collaboration with Lisa Jones and Nick Smith of the Australian Society for Parasitology. Animation by Russell Milledge (James Cook University) and Tai Inoue.

Video 2.3 Zoonotic disease transmission pathways (2:18)

Defines zoonoses and outlines transmission pathways including food, water and environmental exposure. Covers direct contact routes such as bites, handling animals and consumption of contaminated food. Explains reservoir hosts and human–wildlife interaction.

Quiz 2 Zoonotic disease transmission (10 questions)

Learn more

Fact sheets

Vector-borne diseases

(World Health Organization, 2024)

Includes examples like malaria, dengue and tick-borne encephalitis. Great for teacher background and student discussion.

Zoonoses (World Health Organization, 2020)

Overview of zoonoses, prevention and control, risk factors, and the role of the World Health Organization.

Articles

Treatment: 5 culturally significant trees used in Aboriginal and Torres Strait Islander Medicine, (WWF-Australia, 2023)

Top 10 Indigenous bush medicines (Australian Geographic, 2011)

10 bush medicines that have been curing people for generations (SBS NITV, 2017)

Three blog posts on culturally significant plants that First Nations people used for health and healing.

Videos

What is zoonotic spillover in viral ecology?

(4:01)

Explains environmental changes, habitat destruction, and indirect exposure through contaminated surfaces or food chains.

Zoonotic disease outbreaks response (3:22)

This introductory video for a free online course highlights One Health principles and environmental contamination routes during outbreaks. The course has been jointly produced by the World Health Organization (WHO), the Food and Agriculture Organization (FAO) of the United Nations, and the World Organisation for Animal Health (WOAH).

How zoonoses spread from animals to humans

(2:32)

A short video on zoonotic transmission from Open University, explaining how mosquitoes become vectors for malaria.

References

- AIHW (Australian Institute of Health and Welfare) (2025) *Health and wellbeing of First Nations people*, AIHW website, accessed 2 February 2026.
- Australian Society for Parasitology (2015) 'Parasitology – Art and Science' [video], Australian Society for Parasitology, YouTube, accessed 2 February 2026.
- (2018) 'Gula Guri mayin (Heal the body) animation' [video], Australian Society for Parasitology, YouTube, accessed 2 February 2026.
- Biles BJ, Serova N, Stanbrook G, Brady B, Kingsley J, Topp SM and Yashadhana A (2024) 'What is Indigenous cultural health and wellbeing? A narrative review', *The Lancet Regional Health – Western Pacific*, 10(52):101220, doi:10.1016/j.lanwpc.2024.101220
- BioTech Whisperer (2023) 'What is zoonotic transmission' [video], *BioTech Whisperer*, YouTube, accessed 2 February 2026.
- CDC (Centers for Disease Control and Prevention (US)) (2025) *About zoonotic diseases*, CDC website, accessed 2 February 2026.
- Ecosystem Essentials (2025) 'What is zoonotic spillover in viral ecology?' [video], *Ecosystem Essentials*, YouTube, accessed 2 February 2026.
- Fields T, Foster W, Biles BJ and Yashadhana A (2024) 'Redefining the gap in Aboriginal health: from deficit to cultural connection', *The Lancet Regional Health – Western Pacific*, 10(52):101176.
- Open University (n.d.) 'Know about zoonosis disease and how it spreads from animals to humans' [video], *Open University*, Britannica, accessed 2 February 2026.
- WHO (World Health Organization) (2020) *Zoonoses*, WHO website, accessed 2 February 2026.
- (2023) 'Zoonotic disease outbreaks response: RePrep – Introduction module' [video], *WHO*, YouTube, accessed 2 February 2026.
- (2024) *Vector-borne diseases*, WHO website, accessed 2 February 2026.



STUDENT ACTIVITY 2.2

PATHOGEN 'SPEED MEET'

Aim

For students to become an 'expert' on their researched disease and share findings with their peers.

(A note on confidentiality: If students choose to share their research around a personal experience with disease or illness in their discussions or assignments, please remind them it is important to protect privacy by not identifying individuals by name or revealing details that could identify them.)

Materials

Completed one-page research summary

Method

Time: 15 mins (after research is done)

Format: Whole class mixing

- i. Set up two concentric circles (or two lines).
- ii. Students have 2 minutes to introduce their pathogen to their partner:
'I am [pathogen name], I usually live in [animal reservoir], and I attack humans by [transmission method].'
- iii. Students move to the next person and repeat the exercise (allow time for 4–5 partner swaps).

Assessment: Students should be able to articulate the pathogen, host and transmission method of their researched disease.

Educator check: Listen for fluency. If they are reading straight off a sheet, they do not understand it yet.

Reflections



STUDENT ACTIVITY 2.3

PARASITIC ZONONOSES

Aim

To connect science with culture and investigate parasitic diseases.

Materials



Video 2.1 *Gula Guri mayin (Heal the body)* (3:42)



Video 2.2 *Parasitology – Art and Science* (14:13)

Method

Part 1: Scientific storyboard (life cycle analysis)

- 1. Research and select:** Individually or in pairs, students select one of the parasitic zoonoses depicted or alluded to in *Gula Guri mayin*. Identify which parasites are regarded as zoonotic and which are not (students include findings in Disease Table).
- 2. Storyboard the cycle:** Students create a detailed, step-by-step storyboard illustrating the parasite's complete life cycle. Each panel must include:
 - **Stage:** A scientific drawing or diagram of the parasite at that stage (e.g. egg, larva, adult worm).
 - **Location:** Where this stage occurs (e.g. soil, intermediate host, definitive host/human).
 - **Transmission event:** The key biological process or environmental event that allows the cycle to continue (e.g. ingestion of contaminated food, penetration of skin, vector bite).
 - **Key terminology:** Correct biological terms (e.g. definitive host, intermediate host, infective stage).
- 3. Peer review:** Students swap storyboards with another group and use a checklist to verify the accuracy and completeness of the life cycle steps and terminology. This provides immediate, non-graded feedback.

Part 2: Artistic interpretation concept map (connecting science and culture)

- 1. View and analyse:** Students view the two videos about *Gula Guri mayin*, which visually represents the cyclical and interconnected nature of parasites and health.
- 2. Concept mapping:** Students choose a parasite and create a concept map, drawing connections between the scientific and cultural/health themes. The map should include:
 - **Central concept:** The parasite's name, whether it is classed as zoonotic or not, and why.
 - **Scientific branches:** Link to concepts from the storyboard, such as:
 - host(s)
 - transmission route
 - infective stage
 - pathology/symptoms.

e.g. *Strongyloides*: human/dog (host) → skin penetration (transmission route) → larvae (infective stage) → diarrhoea, skin rash (pathology/symptoms)

- **Art and culture branches:** Link to themes inspired by the artwork and its meaning ('heal the body'), such as:
 - Indigenous health focus
 - preventative measures (clean water/sanitation)
 - environmental factors (climate change, land use)
 - public awareness/education.

3. Annotation: Students write annotating sentences on the lines connecting concepts to explain the relationship.

e.g. lack of proper sanitation → increases the likelihood of → environmental contamination with parasite eggs

Example formative assessment strategies

During activity: Circulate and listen to student discussions and observe their initial storyboard sketches. Provide on-the-spot feedback regarding missing stages or incorrect terminology.

Confirm understanding: Have students answer a brief question based on their concept map.

For example:

- How does the phrase 'gula guri mayin (heal the body)' relate to your parasite's life cycle and preventing disease transmission?
- How could the cycle be broken? Identify one point of intervention and explain the biological reason why this would be effective.
- Optional: Students may like to research First Nations bush medicine and traditional ways of controlling pathogens.

Reflections

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Cover: Q fever bacteria, illustration (Alamy)

Contents: Illustration of rod-shaped bacteria. Rod-shaped bacteria include *Escherichia coli*, *Salmonella*, *Shigella*, *Klebsiella*, *Citrobacter*, *Enterobacter*, *Yersinia pestis*, *Pseudomonas aeruginosa*, *Legionella pneumophila* and *Mycobacterium tuberculosis* species (Alamy)

Page 2: Q fever antibody blood test. Identifies antibodies to *Coxiella burnetii*, the bacteria that causes Q fever (Alamy)

Page 3: Northern Queensland cattle in market pens (Alamy)

Page 4: Veterinarian holding chicken inspecting for avian flu (Adobe Stock)

Page 5: Exposure plate technique (Adobe Stock)

Page 6: The Pour Plate method where the sample is suspended (Adobe Stock)

Page 7: Veterinarian doing farm work (Alamy)

Page 8: Personal Protection Equipment (Adobe Stock)