

Learning Intention:

- To learn about emergence and re-emergence of the pathogens that cause disease
- To learn about the impact of European arrival on Indigenous Australians.

Success Criteria:

- I can explain the emergence and re-emergence of pathogens in globally connected world
- I can explain the impact of European arrival on Indigenous Australians.

Europeans when they landed in the New World



That'll do it

Study design dot point

- the emergence of new pathogens and re-emergence of known pathogens in a globally connected world, including the impact of European arrival on Aboriginal and Torres Strait Islander peoples

Warm up

<https://www.youtube.com/watch?v=9eBjQhV2MWM>

Diseases

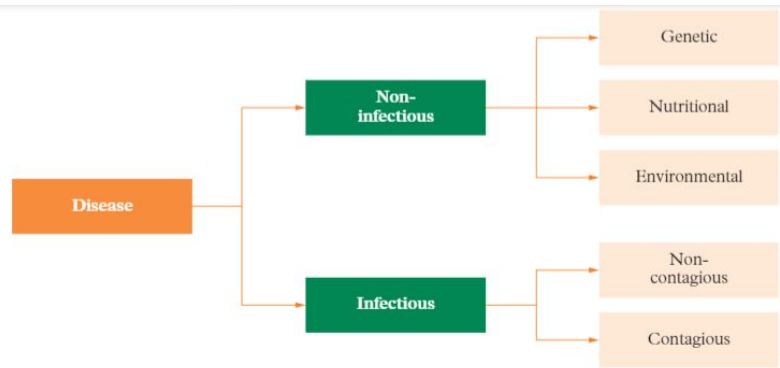


FIGURE 2 Diseases are classified as either infectious or non-infectious.

	Types of disease	Pathogen	Examples
Infectious	Disease caused by non-living organic particles	Prion or virus	Creutzfeldt-Jakob disease (CJD) Measles Rabies Influenza
	Diseases caused by microorganisms	Bacterium or protozoan	Cholera Tuberculosis Malaria Trypanosomiasis
	Diseases caused by multicellular organisms	Fungus, roundworm or flatworm	Ringworm Athlete's foot Acariasis Snail fever Tapeworm
Non-infectious	Nutritional deficiency diseases Metabolic disorders Degenerative diseases Cancer Inherited diseases Occupational or industrial diseases Mental health disorders	<i>Not caused by pathogens</i>	Diabetes Coronary heart disease Arthritis Cancer Sickle-cell anaemia Lung disease Depression Alcoholism

Emerging and re-emerging pathogens

There are always different pathogens threatening to infect us and cause emerging or re-emerging diseases:

Emerging diseases: Diseases that have not occurred in humans before, have occurred previously but only affected particular populations in isolated places, or have occurred throughout history but have only recently been recognised as being caused by pathogens.

- **Re-emerging diseases:** Diseases that were once major public health problems and then declined dramatically in incidence, but are again becoming health problems for a large number of people.

Emergence of diseases

Infectious diseases can be caused by a range of cellular and non-cellular pathogens (agents that cause disease).

Emerging infectious diseases may be defined as:

- new or previously unrecognised pathogens and diseases
- diseases that have increased in incidence, prevalence or geographic range over the past 20 years
- diseases that may increase in the near future

New diseases may emerge due to genetic mutations that increase the pathogen's **virulence** (the disease-producing power or severity of a pathogen) or ability to infect a wider range of host organisms, including humans.

Zoonotic diseases are infectious diseases that are transmitted from different species of animals to humans.

Examples of emerging diseases of human population

Prevalence of disease	Example
new or previously unrecognised	<ul style="list-style-type: none">• HIV: other primate → human• SARS-CoV: bat → civet cats → human• SARS-CoV-2: bat → currently unknown, possibly pangolins or snakes → human• MERS: camel → human• Hendra virus: bat → horse → human• Zika virus: mosquito → human• vCJD prion BSE: cattle → human
increased in incidence, virulence or range over past 20 years	<ul style="list-style-type: none">• Ebola: bat → human• dengue virus• West Nile virus• cholera• MRSA• <i>Clostridium difficile</i>
may increase in the near future	<ul style="list-style-type: none">• influenza• antibiotic-resistant bacteria• cholera• dengue virus• prion diseases• non-infectious diseases: diabetes, obesity, Alzheimer's

Factors contributing to the emergence and re-emergence of diseases

Factor	Contribution
Evolution of causative organism	The pathogens causing disease can evolve to either infect humans or, if previously capable of infecting humans, evolve to evade treatments by acquiring resistance.
Globalisation and travel	Due to our ability to quickly travel around the world, diseases that would otherwise have remained localised to a specific area can quickly spread to multiple countries (Figure 1).
Increased exposure of humans to animals	As the human population grows and climate change alters the environment, humans are more likely to come into contact with animals. A zoonosis is a disease caused by a pathogen that has been transmitted to humans from another species. An estimated 70% of all emerging diseases originate from some type of animal reservoir (Figure 2).
Increasing human population	Larger populations lead to increased population densities in cities, increasing the likelihood of a disease spreading and causing large scale health problems for a population.
Changing technology	Sometimes new technology can be responsible for the emergence or re-emergence of a disease. For example, Legionnaires' disease is caused by a pathogen that inhabits air conditioning systems.
Insufficient vaccination of the population	Previously managed diseases can re-emerge if the proportion of a population that is vaccinated against the disease decreases. This stems from the loss of herd immunity, with an increase in the number of susceptible individuals allowing the pathogen to more easily spread between individuals.

Some examples of emerging and re-emerging diseases, as well as contributing factors that have led to their ability to cause widespread disease.

Disease	Pathogen	Emerging/re-emerging	Contributing factors
Ebola haemorrhagic fever	Ebola virus	Re-emerging	Zoonosis – it is currently believed that bats are a natural reservoir of the virus and are responsible for many instances of human infection
Measles	Morbillivirus	Re-emerging	Reduction in vaccination coverage leading to outbreaks
Cholera	<i>Vibrio cholerae</i>	Re-emerging	Evolution of a new strain leading to increased virulence and survival in environment
Malaria	<i>Plasmodium</i>	Re-emerging	Evolution of drug resistance – changes in environmental conditions leading to an increase in mosquitoes that can transmit disease
Coronavirus disease 2019 (COVID-19)	SARS-CoV-2	Emerging	Suspected zoonosis – with global travel allowing it to quickly spread throughout the world
2009 Pandemic influenza	Swine-origin H1N1 influenza virus	Emerging	Zoonosis – transmission of the virus from pigs to humans
Acquired immunodeficiency syndrome (AIDS)	Human immunodeficiency virus (HIV)	Emerging	Zoonosis – believed to have originated in non-human primates, increased populations in cities, global travel, medical treatments including organ transplants and blood transfusions, drug use, and multiple sexual partners

Disease outbreaks

Disease outbreaks can be classified into one of two categories based on the geographic spread of the disease:

- **Epidemics:** A sudden, widespread increase in the occurrence of an infectious disease among a specific population in a specific location at a particular time. Example: SARS – 2002, Cholera – 2010, Ebola – 2013, Yellow fever – 2016, Zika Virus: 2016

- **Pandemics:** Epidemics that have spread to different countries and/or continents in different regions of the world. Pandemics typically affect a greater number of people when compared to epidemics and are much more difficult to control. Example: Influenza A (mutagens): 1918 - Spanish flu, 1951 – Asian flu, 1968 – Hong Kong flu
HIV/AIDS: 1981

Note:

Outbreak is a sudden and unexpected increase in the occurrence of a disease.

CORONAVIRUS LOCKDOWN

How introverts think it will be



How the media thinks it will be



How extroverts think it will be

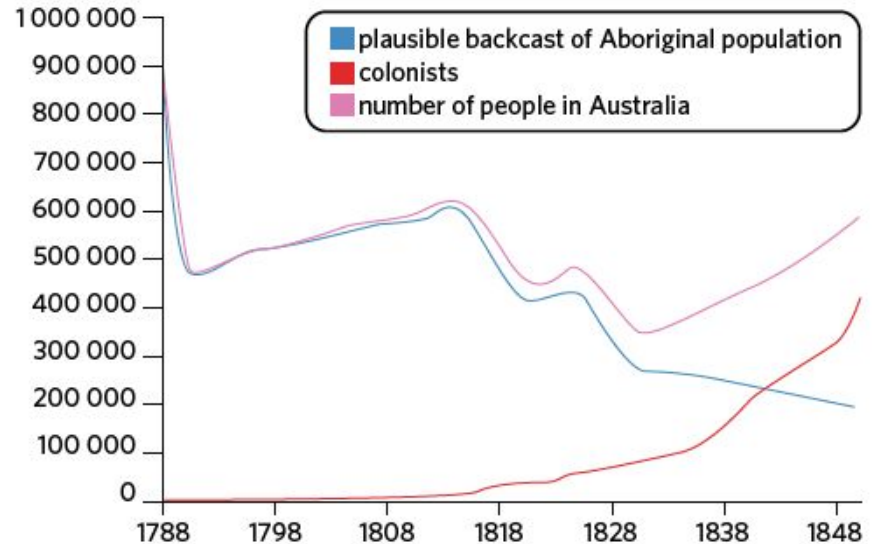


How it actually is



Pathogens introduced by European arrival to Australia

- The original inhabitants of Australia i.e. The Indigenous people, had been isolated from other populations for 60,000 years, so their immune systems were vulnerable.
- They used traditional medicines to treat infections and health concerns.
- In 1788 when Europeans arrived to Australia, they brought with them infectious diseases.
- The arrival of a colonising nation in a land occupied by an Indigenous population resulted in the introduction of disease and mortality to that population.
- Major epidemic diseases in the early stages of European habitation of Australia were influenza, tuberculosis, measles and smallpox, as well as sexually transmitted infections such as syphilis that reached epidemic proportions due to the sexual abuse and exploitation of Indigenous women and children.



Factors contributed to Australia's Indigenous population being particularly susceptible to the diseases

- 1. A lack of immunity in the Indigenous population:** The European arrivals to Australia would have encountered the diseases in childhood and, having survived them, had some form of natural active immunity to them. For Indigenous Australian population, no such immunity for these diseases existed, so they were more likely to contract and experience severe symptoms from them. E.g, measles, influenza, small pox.
- 2. A lack of knowledge and experience with European diseases:** Indigenous people had no knowledge about how to avoid or treat infections brought by Europeans. Furthermore, their ability to practice Indigenous medicine was often prevented, meaning Indigenous people were left without any form of medical treatment to help them when infected.
- 3. The disruption caused by colonisation:** After European arrival, access to food and water was restricted and denied for Indigenous people, medicine practices were disrupted, and their relationship with Country and culture was irrevocably changed. They were also forced into camps at the edges of towns, where the opportunities for infection was heightened due to increased population densities

Worked example

Q. Compare the terms 'endemic', 'epidemic' and 'pandemic'.

Ans. If a disease is endemic, it is restricted to a certain place or community at low levels. An epidemic is the rapid spread of an infectious disease in a community. A pandemic is an outbreak of an infectious disease that crosses international borders.

Reflection

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