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Program Support Notes

Senior Secondary

29 mins

Emerging Diseases
Prions and Viruses

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Suitable for:

Biology

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For Teachers:

Introduction

An emerging disease is one which suddenly appears in a population for the first time. In some instances such diseases have existed previously but make a rapid re-emergence in terms of incidence or geographic range. This program examines how such diseases might arise and four specific examples of emerging diseases are discussed in detail: Creutzfeld-Jacob disease (CJD), zoonotic diseases such as Rift Valley Fever, avian influenza and severe acute respiratory syndrome (SARS). In each case the program investigates the causative agent, mode of transmission, and clinical features of the disease as well as examining treatments and measures taken to prevent or control each disease. Throughout the program Dr Jennifer Mckimm-Breschkin, virology project leader at CSIRO, discusses the science behind each of these diseases and current efforts to combat them.

Program Timeline

00:00:00	What is an emerging disease?
00:04:02	Creutzfeld-Jacob disease (CJD)
00:10:13	Zoonotic diseases eg Rift Valley Fever (RVF)
00:14:57	Avian influenza
00:20:58	Severe acute respiratory syndrome (SARS)
00:26:11	Conclusion
00:27:27	Credits
00:28:27	End

Website References

www.virology.net/ATVemerinf.html

www.who.int/topics/creutzfeldtjakob_syndrome/en/

www.who.int/topics/avian_influenza/en/

www.who.int/zoonoses/diseases/haemorrhagic_fevers/en/

www.who.int/topics/sars/en/

Other Relevant Programs available from VEA

- Introducing the Pathogens
- Confronting Epidemics – Three Case Studies: SARS, AIDS, Influenza
- Beating Bacteria – A User's Guide

Student Worksheet:

Before Viewing the Program

1. How would you define an emerging disease?
2. Identify and discuss two examples of emerging diseases that you have recently heard about.
3. What measures might you take to prevent an emerging disease spreading within a population?
4. List two kinds of organisms that cause emerging diseases?

While Viewing the Program

1. Rank, in order of severity from least severe to most severe, the following: a pandemic, an outbreak, an epidemic.

2. List two ways an emerging disease can arise?

3. Name three emerging diseases to be discussed in the program?

4. Complete the sentence:

   An _____ can lead to a _____ when infected individuals travel to other countries.

5. What is the causative agent in Creutzfeld-Jacob disease (CJD) and how does it work?

6. Give the scientific word that best describes CJD patient's brain tissue when viewed under a microscope?

7. Name two ways CJD can be transmitted?

8. What disease is caused by the bovine form of CJD?

9. How were the Fore Tribe thought to have contracted kuru?

10. Give two examples of zoonotic diseases?

11. Complete this sentence.

    Rift Valley Fever is caused by a _____ that is able to be transmitted by M _____.

12. Bird flu kills more people each year than normal influenza virus?

    True or False

13. How is avian influenza most likely spread from birds to humans?

    _____

    _____

14. What version of the H and N proteins are found on the current strain of bird flu? (Give a number between 1 and 5 for each)

    _____

15. Why has bird flu killed only small numbers of humans so far?

    _____

16. Circle the virus family that SARS is derived from:

    Rhinoviruses Rotaviruses Corona viruses Papilloma viruses

17. What animal is the natural host of SARS? What other animal can also host the virus?

    _____

    _____

18. Name two of the tests that scientists can use to detect SARS? What is actually being detected in each case?

    _____

    _____

    _____

19. Why won't antibiotics help a patient infected with SARS?

    _____

    _____

20. What could you do for a patient with this disease, and how could you stop them from spreading it to other people?

    _____

    _____

    _____

    _____

After Viewing the Program

1. Design a chart that summarises two of the emerging diseases discussed in the program under the headings:

    - causative agent
    - transmission
    - symptoms
    - treatment

2. Visit the WHO website and look at the latest statistics on human infection with bird flu. What is the current mortality rate from bird flu? Where have the most deaths occurred? Create a world map and use colour coding to show the distribution of bird flu infections.

3. Create a one-page comic (of up to 10 panels) that tells the story of a person that has just come back from an overseas volunteer position on a chicken farm in China. He/she has just come down with a severe cold and goes to see a doctor about it. Use as much scientific information as you can in the comic.

4. In small groups come up with a short five minute news report detailing an outbreak of SARS in Australia. Include at least one interview with a fictitious scientist discussing the science of the subject.

Suggested Student Responses

During the Program

1. Rank, in order of severity (from least severe to most severe) the following: a pandemic, an outbreak, an epidemic?

   outbreak, epidemic, pandemic

2. List two ways an emerging disease can arise?

   New organism brings new disease.
   A previously discovered disease moving into a new area.
   Evolution of a disease i.e. organism has changed/mutated.
   Re-emergence of a disease that was previously under control.

3. Name three emerging diseases discussed in the program?

   Creutzfeld Jacob Disease (CJD), Zoonotic Disease (or Zoonoses), Avian Influenza (Bird Flu), Severe Acute Respiratory Syndrome (SARS)

4. Complete this sentence

   An **epidemic** can lead to a **pandemic** when infected individuals travel to other countries.

5. What is the causative agent in Creutzfeld-Jacob disease (CJD), and how does it work?

   Prions (proteinaceous infectious particles). They disrupt the function of normal cellular proteins leading to a degeneration of nerve cells in particular in the brain of infected individuals.

6. Give the scientific word that best describes CJD patient's brain tissue when viewed under a microscope?

   Spongiform

7. Name two ways CJD can be transmitted?

   Via products containing human growth hormone
   Corneal grafts
   Dual grafts
   Cornal implants
   It is also inherited in some cases.

8. What disease is caused by the bovine form of CJD?

   Mad cow disease

9. How were the Fore Tribe thought to have contracted kuru?

   Through their ritual cannibalism, they ingested the brain tissue of infected individuals.

10. Give two examples of Zoonotic diseases?

    Malaria **Yellow fever**
    Ebola fever **Anthrax**
    Rift Valley fever

11. Complete this sentence.
    Rift valley fever is caused by a **virus** that is able to be transmitted by **Mosquitos**.

12. Bird flu kills more people each year than normal influenza virus?

    True or **False**

13. How is avian influenza most likely spread from birds to humans?

    During the handling and butchering of birds and preparation of birds to eat.

14. What version of the H and N proteins are found on the current strain of bird flu? (Give a number between 1 and 5 for each)

    H5N1

15. Why has bird flu killed only small numbers of humans so far?

    Because it is not able to be transmitted from human to human as yet.

16. Circle the virus family that SARS comes from

    Rhinoviruses Rotaviruses **Coronaviruses** Papilloma viruses

17. What animal is the natural host of SARS? What other animal can also host the virus?

    The masked palm civet
    Bats

18. Name two of the tests that scientists can use to detect SARS? What is actually being detected in each case?

    ELIZA – measures antibodies developed by a patient to the virus
    Immunofluorescence –also detects antibodies to the virus or proteins from the virus itself.
    PCR (polymerase chain reaction) - detects viral DNA

19. Why won't antibiotics help a patient infected with SARS?

    It is caused by a virus, not bacteria. Antibiotics only work on bacteria.

20. What could you do for a patient with this disease, and how could you stop them from spreading it to other people?

    Give them antipyretics (fever-reducers) and oxygen/ventilation to help with breathing. Also steroids may be administered to dampen down a potentially damaging over active immune response to the virus. They would need to be kept in isolation in hospital or quarantine.