Activity M

Spreading Disease

Introduction

This lesson focuses on an issue never far from the headlines, namely the spread of the influenza (flu) virus. It should appeal to pupils because it makes use of recent events. Some pupils may even have been to places where they had to wear masks due to the outbreak of SARs. The lesson involves pupils collecting and considering evidence related to masks.

Objectives

Pupils will learn:

- how microbes spread disease;
- to identify the variables to vary and control;
- to identify relevant evidence to support the theory that humans could catch avian flu.

Learning Outcomes

By the end of the lesson, pupils will be able to:

- describe how masks can prevent the spread of disease;
- identify the variables that they need to control;
- to identify supportive evidence for a particular theory.

Teaching Sequence

- Starter activity: pupils read the 'newspaper' article *'Are pigs carrying flu super virus?*' (Pupil information sheet A) They then sort out the true/false statements (pupil activity 1). One spokes person from each group feeds back to the class.
- Next ask how we can prevent the spread of disease. Introduce the idea of masks and other ways by using recent news items SARS, masks, culling, and isolation (see photos on pupil information sheet B). Raise issues of microbe size and mesh size.
- Main activity is focused on the question, '*How can we test the effectiveness of different materials used in masks*?' This question can be investigated through a class practical activity (details provided below), a teacher demonstration (details provided

below), or by using the specimen data provided (pupil information sheet C). **Whichever activity is chosen, it is important to stress to pupils that only fungi and bacteria will grow on the agar plate, as viruses (such as those that cause flu) will not. Viruses exist in living cells.**

- Plenary – pupils are given data on size of microbes and size of hole in different materials (pupil information sheet D), in order to interpret which would be the best filter. Look at pre-prepared agar plate evidence or specimen results provided. Pupils analyse data and state whether the masks are effective filters against air borne microbes (pupil activity sheet 2).

- A suggestion for homework is pupil activity sheet 3

Teacher Notes

There are a number of options for investigating the effectiveness of materials used in masks.

Whole class practical (Takes a minimum of three lessons)

Equipment needed per group:
3 boiling tubes, 3 samples of material suitable for a mask, test-tube rack, alcohol and pipette, tape, sterile cotton buds, agar plate and marker pen, paper towels, forceps, beaker and sterile water.

Instructions

- Place the material samples over the end of the boiling tubes, and seal with tape.
- Sterilise the material with alcohol using pipettes - only a small amount of alcohol is needed.
- Label each rack of tubes with group name.
- Leave at back of class for a week.

One week later:

- Each group to have one agar plate, divided into four and labelled with control and each material type plus group's name.
- Use paper towels to create a sterile area on bench.
- Carefully, without touching the exposed area, peel back the material. Some pupils may find it easier if material is completely removed from boiling tube, and laid down on sterile area.
- Moisten the swab with sterile water.
- Swab the underside of the material and transfer microbes to appropriate section of agar plate.
- Repeat for other material samples, taking care to keep the lid on the plate between swabbing. Clear away debris from each sample.
- Control is just a sterile water swab sample.

- Seal the plates with two strips of tape that go around of the petri dish.
- Leave a few days upside down (so that moisture drips off the agar) at room temperature.

A few days later:

- When microbes grown into visible colonies give back to class for data analysis, as suggested below**. DO NOT OPEN PLATES!**
- Technicians dispose of plates

2, Demonstration with a vacuum cleaner:

- Cover the end of a vacuum cleaner with a sample of cloth, turn the vacuum cleaner on and collect microbes.
- Place the underside of the cloth on to an agar plate and remove, thereby transferring the microbes.
- **Or** swab the underside of the cloth and wipe the swab onto the agar.
- Seal the agar plate - explain it has to be left to culture the microbes.
- Produce plates that you have already prepared or photographs of cultured plates.
- Use for analysis and discussion.

3, Photographs

(Technician friendly and less time consuming.)

- Discuss how the practical would happen, but due to 'time' etc., photographs of agar plates with cultures of microbes and different masks are being used.
- Distribute photos to pupils for analysis and discussion.

Analysis (could be done with any of the methods).

Some suggestions for analysis:

Prediction: Which do you think will be the best material to make a mask from? Why?

Results:

- How many colonies grew form each sample?
- Count the colonies and construct graphs, using own data and/or class data.
- Draw a conclusion. Which is the best material to make a mask from and why?
- Evaluate the experiment and evidence. What were the problems with the experiment? How reliable is the evidence? How could the experiment be improved?

These materials were produced, modified and piloted by:

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Are pigs carrying flu super virus?

In December 2003, a human being became ill after catching a strain of flu from farmed birds. Because of this it was called *bird flu*. In Vietnam and Thailand, 31 people have caught this disease, and 22 have died. All those infected caught the disease after handling farmed birds. This type of flu virus is passed from birds to humans, but cannot be passed from one human to another. The bird flu was passed to farmed birds in eight other countries. Over 10 million birds had to be killed to prevent the spread of infection.

The flu virus exists in the airways and lungs of animals and when the animal sneezes, the virus is sprayed into the air. Normally, a virus that infects humans will only infect humans and a virus that infects birds will only infect birds, but this virus was different.

In 1918, 20 million people around the world died from Spanish flu. Everybody was confused how the flu could travel around the world so easily because in 1918 it was not very easy for people to travel from country to country. It was discovered that Spanish flu is very similar to the flu that pigs get and that people had caught the

virus from pigs! In this way pig flu is very similar to bird flu.

Scientists have done tests and found the bird flu virus on the snouts of pigs. These pigs were very healthy and did not show any symptoms of flu. They have also done tests on pigs and found that pigs can catch human flu and bird flu.

Some scientists fear that the current bird flu virus will combine with a human flu virus in the pig and form a highly dangerous virus, which could be passed from humans to humans.

Some other scientists fear that a highly dangerous flu virus could be formed if a human who had the human flu virus caught the bird flu virus at the same time.

The question we are asking is who is correct?

True or False?

1. Thirty-one people caught bird flu after being in contact with farmed birds.

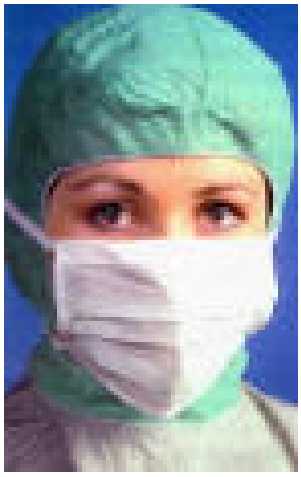
2. Bird flu virus has been found on the snouts of pigs, but they did not show any symptoms of infection by the flu virus.

3. Bird flu cannot be passed from humans to humans.

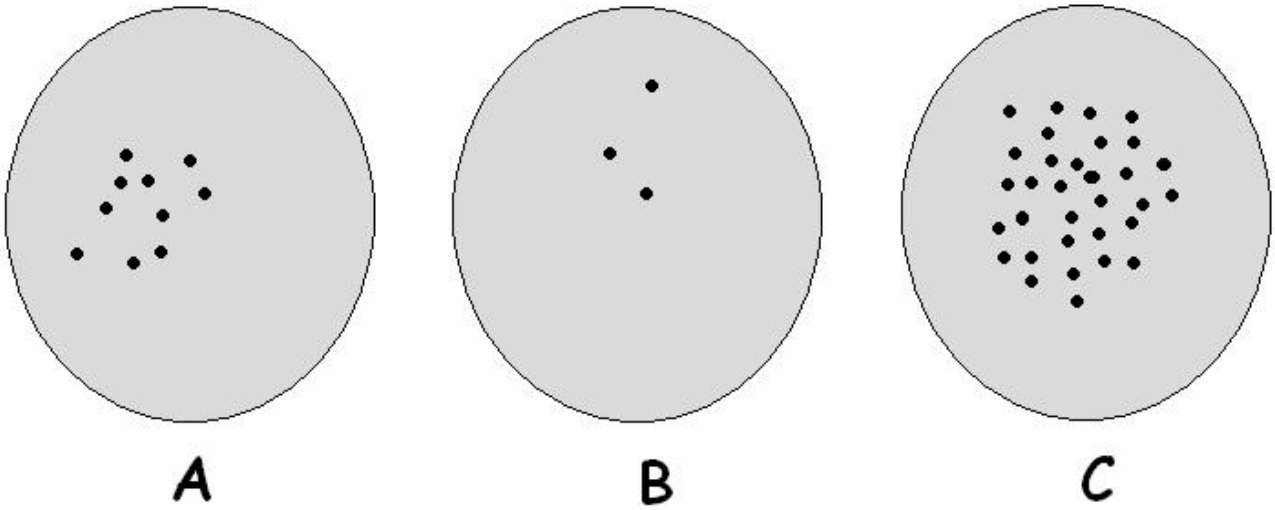
4. The flu virus lives in the lungs and throats of animals and can only be passed to animals of the same species.

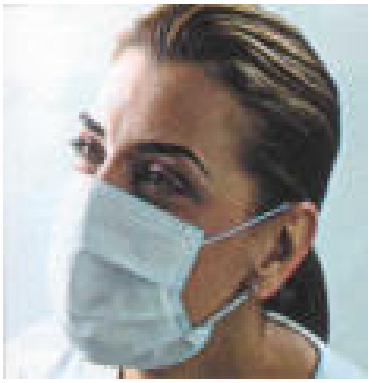
5. Pigs can be infected with the human and bird flu virus.

Pupil information sheet B: Spreading Disease

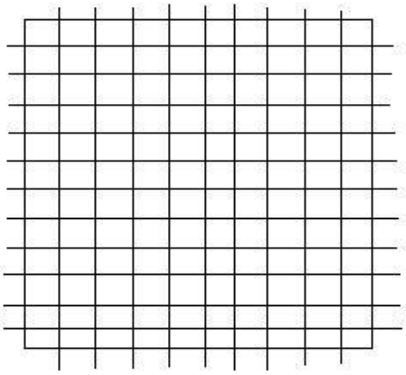


Specimen results



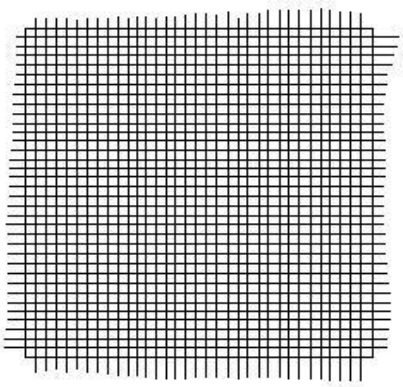


A



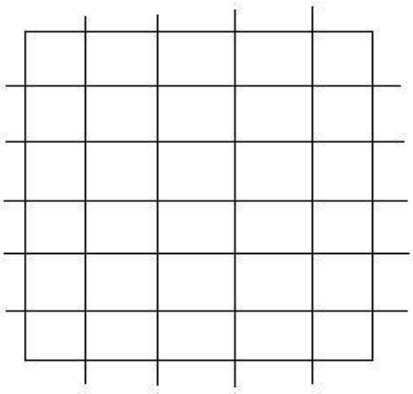
Mesh size: 2.5 - 3.0mm

B



Mesh Size: 0.5 -1.0 mm

C



Mesh Size: 4.5 - 5.0mm

Processing evidence

What are the facemasks actually stopping? Compare the sizes of microbe against the mesh sizes.

Evidence 1 – microbe size

Microbe	Size (nm)
Bacteria	0.001
Virus	0.0001
Fungi	0.01

Evidence 2 – mesh size (use the data on pupil information sheet D to complete this table)

Material	Mesh Size (nm)
Gauze	
Cotton	
Silk	

Evidence data 3

Results of the agar plate experiments

Q1: What conclusions can be drawn on the effectiveness of filters based on the evidence?

Q2: Why are the masks produced usually several layers thick?

Q3: Many microbes, including viruses, are spread in water droplets. Would these pass through the masks?

Spreading Disease

Here are some examples of oil filters that would be used on a car.

Find four filters that are used in and around the home. Explain what type of filter it is and draw it.

1.

2.

3.

4.