

WHAT EFFECTS CAN BIOAEROSOLS HAVE ON YOUR HEALTH?



RESOURCES

- 1 x animation** (What effects can bioaerosols have on your health?)
- 3 x handouts** (Key Terms: session 1, Key Terms: sessions 2 and 3, Pre-existing conditions that can increase the risk of adverse health outcomes)
- 2 x activity sheets** (The respiratory system, Conduct your own epidemiological investigation)
- 3 x PowerPoints** (The basic immune functions of the respiratory system, Health outcomes from exposure to bioaerosols, What is the purpose of epidemiology?)
- Villager cards** (for Conduct your own epidemiological investigation)



SESSIONS

- Session 1:** Introduction to the respiratory and immune systems
- Session 2:** Health outcomes from exposure to bioaerosols
- Session 3:** Linking exposure to health outcomes (For KS3 & KS4 only)



OBJECTIVES AND LEARNING OUTCOMES

Introducing students to the potential effects of bioaerosols on health, in both a negative and positive way. Students will also look at how exposure to bioaerosols could lead to health outcomes in some people, and how we can use certain tools to gain a snapshot of exposure and health. These objectives are grouped according to Key Stages in the UK National Curriculum, and are also internationally relevant.

KEY STAGES 1-2 (AGE 5-11)

Students will be able to:

- Identify the key features of the respiratory system
- Identify negative and positive health effects of bioaerosols
- Understand the difference between hazard and risk

KEY STAGES 3-4 (AGE 11-16)

Students will complete all learning outcomes for KS1-2 and be able to:

- Explain the terms 'exposure' and 'risk'
- Understand how risk and exposure can lead to a health outcome
- List pre-existing health conditions that make a person 'at risk' (i.e., asthma)

Session 1: Introduction to the respiratory and immune systems

- Describe the aims of this topic as outlined in the learning objectives.
- Open PowerPoint: **The basic immune functions of the respiratory system**
- In groups or as a class, recap the definition of a bioaerosol. See **Key Terms: Session 1**
- Watch the animation: **What effects can bioaerosols have on your health?**
- Give out activity sheet: **The respiratory system**

KS1-2: Students link the words to the different parts of the respiratory system

KS3-4: Students fill in the missing words and explain the function of each part of the respiratory system. Give out **Key Terms: Session 1** so that students can correct themselves

- Go through the rest of the PowerPoint: **The basic immune functions of the respiratory system**. The Key Terms are highlighted in bold in the PowerPoint.

KS1-2: Slides 1-5 and 15 (plenary)

KS3-4: Slides 1-15

Session 2: Health outcomes from exposure to bioaerosols

- Open the PowerPoint: **Health outcomes from exposure to bioaerosols**
- In groups or as a class, discuss the positive and negative effects of breathing in bioaerosols.
- Ask students to draw a table and write their answers down. The answers are on slide 3 of the PowerPoint.

KS1-2: Ask students to design a poster that explains the positive effects of exposure to bioaerosols.

- Go through the remainder of the PowerPoint, which includes a YouTube video: Hazard vs Risk: What's the difference?

KS3-4: Give out handout: **Key Terms: sessions 2 and 3**. In a poster, ask students to describe what a health outcome is and the types of adverse health outcomes that can develop from exposure to bioaerosols - infection, allergy, and sensitisation.

Session 3: Linking exposure to health outcomes (For KS3 & KS4 only)

- Give out handout: **Pre-existing conditions that can increase the risk of adverse health outcomes**
- Open the PowerPoint: **What is the purpose of epidemiology?**
- Watch the YouTube video link in the PowerPoint: **What is epidemiology?**
- Print out the villager cards and map, and start the activity: **Conduct your own epidemiological investigation.**

1. Each student is given a villager card that provides key information about where they live, work or study. The card will also contain characteristics i.e., sex, age, and health status, and any symptoms the villager may be experiencing.

2. Ask students to map where the villagers with symptoms live, work or study (this could be with coloured sticky dots or small post-it notes).

3. Ask students to:

- a. Identify the source that is causing the symptoms using the information they have
- b. Identify separate hotspots where villagers are likely being exposed
- c. Identify patterns in the symptoms being experienced by the villagers. Are there symptoms that do not fit with the known symptoms of an allergy?
- d. Identify whether people with certain conditions are more at risk of experiencing symptoms

KS3: Students complete part a), b) and c)

KS4: Students complete part a), b), c) and d)

Note: William, Kelly, Fred and Thomas are all RED HERRINGS. These four villagers have symptoms associated with an infection rather than an allergy. The students should be able to identify that their symptoms are different to those experienced by most of the villagers.

KS4: In addition to the above, ask students whether they can identify people with certain conditions which put them more at risk of experiencing symptoms. This will require calculations to determine if those with health conditions are more likely to suffer from symptoms.

Answers:

A) The newly planted wildflower meadow is the likely cause of the symptoms.

B) There are three major hotspots:

1. The primary school, specifically the Year 1 classroom
2. The bus stops next to the wildflower meadow
3. The houses nearest to the wildflower meadow

C) There are three groups of symptoms:

1. Itchy and watery eyes and/or sneezing
2. Wheezing and/or difficulty breathing
3. Blocked nose, sore throat, and fever

Group 1 symptoms are associated with allergy, especially for those who suffer from hay fever. **Group 2** symptoms are associated with allergy and asthma or other respiratory condition, such as COPD. **Group 3** symptoms are not associated with allergy and are more likely associated with an infection.

Responses to KS4 activity:

Of the 85 people living in the village, 25% suffer from a respiratory condition such as asthma, hay fever or COPD.

Therefore, 21 people have respiratory conditions and 64 people do not.

Of the 26 patients with symptoms (minus the four red herring patients), 10 do not have any known health conditions and 16 suffer from a respiratory condition.

Therefore, 15.6% of villagers with no known conditions are likely to experience symptoms (10/64).

76.2% of villagers with respiratory conditions are likely to experience symptoms (16/21).

Conclusion: Villagers with respiratory conditions are more likely to experience symptoms than those without health conditions.