Dust and breathing

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Educator notes

Learning objectives

- Explaining the impact of asthma and allergies on gas exchange systems
- Understanding what peak flow is and how to measure it
- Analysing and record data from microscope observations
- Evaluating observations using graphs and table

Curriculum links

- Science (Biology)
  - Cells and organisation
  - Gas and exchange systems
  - Working scientifically
- Mathematics
  - Numbers
  - Statistics

Resources required

- Dust and breathing slides
- Searching for dust mites student sheet
- Investigating peak flow student sheet

This lesson is designed to follow the **How we breathe** starter activity. Unless your students have already been introduced to the basics of the respiratory system, we recommend you deliver that module before this one.

Equipment needed

- For the **Dust mites** activity, you will need:
  - Microscopes
  - Glass slides
  - Cover slips
  - Tweezers
  - Plain paper and a pencil
  - Dust samples (either from your home or around the school)
- For the **Peak flow** activity, you will need:
  - Peak flow meters
  - Disposable mouth pieces
  - Graph paper
  - Pencils
  - Rulers

Time needed: 60 minutes

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Lesson plan
Resources needed: Slides
5 mins

Slide 1
Introduction

- Introduce the lesson by letting the class know they'll be doing activities that explore the impact of allergens and dust mites on the respiratory system and a method used to measure people's breathing ability

Slide 2
Dust mites

- Introduce the class to the appearance of dust mites (be prepared for reactions from some of the students to the image on the slide)
- Explain that dust mites are microscopic creatures that feed off objects including the flakes of skin constantly falling off our bodies, and share the facts on the slide:
  Dust mites…
  - Are only a third of a millimetre long
  - Appear where there is dust and humidity
  - Males live for 10-19 days
  - Females live for 70 days, and can produce 100 eggs in that time
- Explain that one of the more common allergens people have is to 'dust', which is actually an allergy to dust mite faeces
- An allergic reaction to dust mite faeces can have a range of symptoms. These include nasal congestion, a runny nose and cough
  - Make it clear to students that dust mites do not bite and are too small to be seen with the naked eye. If you're not allergic, you won't even know they're there
- Tell students that they will be attempting to find dust mites through a microscope and distribute the **Searching for dust mites student sheet**

Slides 3-4
Searching for dust mites

Activity 1
Searching for dust mites
40 mins

1. Students should read through the instructions in full before they begin
2. Tell students to set up their microscopes. Make sure they start with the lowest magnification (around x40), or the weakest zoom setting. A crisp, evenly lit white circle should appear when they look through the eyepiece
3. Share out samples of dust, reminding students to be careful not to blow it off the slide

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Activity 1

Searching for dust mites Continued…

4. Students should use tweezers to transfer a tiny pinch of dust onto their slide
5. They should then gently lower the cover slip onto their house dust sample, handling the cover slip by the edges to avoid fingerprints
6. Students should try and focus on the sample, moving around the slide carefully
7. Move to **Slide 4** so students can compare what they can see to the drawings on the presentation
8. Students can sketch and label an example of each thing they see and attempt to match their drawings to what's on **Slide 4**. If it helps, they can begin switching to a higher magnification (around x100) or stronger zoom setting for more focus
9. Remind students that dust mites are only a millimetre across and can't bite or sting
10. Ask if anyone found anything on their slide that they couldn't identify. Discuss as a class what it might be

Slide 5

Asthma

- Mention to students that one of the things dust mites can trigger, along with allergies, is asthma
- **Optional:** If you feel it appropriate, ask the class to put their hands up if they know someone who suffers with asthma or if they do themselves
- Explain that 1 in 11 children and 1 in 12 adults in the UK currently suffer from asthma. Asthma is a condition that causes breathing difficulties, as tubes carrying air to the lungs becomes inflamed and narrow, causing thicker mucus
- Explain that scientists think changes to our lifestyles, like more urban and indoor living, are affecting the way our immune system reacts to allergens, resulting in an increasing prevalence of conditions like asthma
- Tell students that even though there is currently no cure for asthma, it can be managed with the right treatment
- Ask students if they know what the item the girl pictured is using. Once identified, explain that people with asthma generally have two types of inhalers. Reinforce the fact that inhalers treat symptoms, they do not cure the condition
- Ask students if they know what colour the two different inhalers are, and what each type does. If no one knows, explain that:
  - The brown inhaler: helps to reduce lung inflammation and is preventative
  - The blue inhaler: helps to open the airwaves and give immediate relief
  - **Bonus question:** Has anyone seen a pink inhaler? Let them know that this is a combination of both
- If someone has asthma, they will regularly have their peak flow checked by doctors, as it is an indicator of how tight and inflamed the airways are. Done regularly, results can be used to assess if asthma symptoms are getting worse

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Slide 6
Investigating peak flow

- Tell students they will be measuring their peak flow today by finding out how fast they can blow air out of their lungs in one breath
- Distribute the **Investigating peak flow**, which contains instructions for the lab activity and a results table matching height with predicted peak flow results
- Remind students to read through all the instructions before they begin
- Things to bear in mind:
  - Students getting over a cold or with breathing problems may find this challenging and do not have to take part in this activity
  - If you have any students with a cold or asthma, they will probably have a lower peak flow than others. Make sure they're comfortable doing this test, and know they don't have to participate if they don't want to

Activity 2
Investigating peak flow

15 mins

1. Ask students to get into pairs, and collect a peak flow meter and mouthpieces from you
2. One student should fit an unused disposable mouthpiece to the peak flow meter - remind them to change the mouthpiece with **each user**
3. The marker arrow should be set to zero on the flow meter's scale
4. Direct students to:
   a. Stand up straight
   b. Take a deep breath
   c. Seal their lips around the mouthpiece
   d. Breathe out as hard and as fast as they can in one big blast
5. Their partner can record the reading on the meter
6. The student using the peak flow meter will then repeat this twice more. The best of the three is their 'peak flow'
7. The readings should be the same or similar. If not, students may not be blowing into the meter properly, so remind them to make a tight seal around the mouthpiece and really blow as hard as they can
8. Remind students to **take the mouthpiece off** the peak flow meter and **throw it away** after their three attempts
9. Once one person's peak flow has been measured, partners can switch roles and repeat steps 2-7
10. Direct students as they plot their results using the graph paper. They should use the table matching height and predicted peak flow results in the student sheet to make a graph:
    a. Height should be on the x-axis and predicted peak flow on the y-axis
    b. Plot a line graph of height (m) against predicted peak flow (l/min)
11. Students should then mark their own peak flow result with a cross and compare with the predicted flow results plotted in the graph already. They can also plot their partners results

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Discussion

- If their results do not match the predicted peak flow for their height, ask the class to offer suggestions why, such as the following:
  a. People have different sized bodies
  b. Maybe they exercise regularly (increased fitness gives people a higher peak flow)
  c. Some people might have allergies or asthma, which restrict their airways
  d. Some people may be tired or have a cold

Extension/homework

- Students can prepare a short PowerPoint presentation, with the help of the additional student handout, about asthma on one of these topics:
  – The science of asthma: what is it?
  – Living with asthma: how is it controlled?
  – Inhalers: how do they work?
  – Asthma triggers: what causes asthma?
- The presentations should answer the following questions:
  – What is asthma?
  – What triggers asthma?
  – What happens to your airways when you have an asthma attack?
  – What helps alleviate asthma?
- The following are useful sites to direct students to when they are researching information for their presentations:
  – Asthma UK
  – The NHS web page on asthma
  – Asthma.com
- **Optional:** If time allows, the students could deliver their presentations in a future lesson

Try next: It would be helpful to follow this activity up with a lung dissection exercise to further explore the structure of animal cells, and the anatomy of gas exchange systems.