The Babraham Institute

Weapons of Microscopic Destruction
Microorganisms and your immune System

Resources needed:

- Lab coats
- Balloons
- Different shapes for antigens (slides 11,12) and antibodies (slide 15)
- Colouring pencils/pens, sticky tape, scissors general craft stuff
- Glitter gel
- Plant mister
- Microscopes, slides and yoghurt with live bacteria
- Plates with bacterial cultures for demonstration purposes – not essential! - consult http://www.cleapss.org.uk/ for advice on this area

Top tips:

Present the slides as questions wherever possible
Ask the students for their ideas before you give explanations
Suggest students discuss some questions in groups rather than individually

Learning outcomes

This workshop helps students to discover that although we are surrounded by pathogens that can cause disease, our immune system works day and night to defend us.

In response to the threats of attack our body has developed an army of specialist cells which are always ready, particularly at the sites where we are most exposed to the environment.

The specialist cells of the immune system identify and target invaders, destroying them whilst leaving our own cells and other beneficial bacteria unharmed.

Practical activities will introduce the students to where bacteria can be observed, how easily infection can spread and how antibodies recognise antigens on invaders.

Slide 1
Welcome students to the workshop, explain that today we'll be learning about our Immune System - a part of our body that protects us from getting sick (protects us from infections)

Slide 2 – What are scientists?
We are scientists – we investigate how our bodies work.
Each scientist/presenter gives their name and one-liner about their research
(make sure that they use very basic language!)

Slide 3 - An ice-breaker for the students, especially if this is run by scientists/presenters they don't know
Ask students to talk about themselves
Are any of their family members scientists?
What is their favourite experiment etc?

Slide 4
Introduce the idea that the students are scientists for the day….we are trying to find out what can make us sick and what our bodies to try to stop that happening…pull them into the 'story' – put on lab coats if possible

Slide 5
What are Microorganisms – introduce the basic facts – why not look up some of your own!
They are tiny, small living creatures; we use microscopes to see them.
They can be bacteria, viruses, fungi etc.
They were on Earth long before dinosaurs, produce a lot of the oxygen we breathe

Slide 6
Ask what microorganisms do – emphasis that most of them are NOT harmful
But what do they do – these are examples of 'good' and 'bad'.

Harmful things: infections, tooth decay (bacteria), making our food rot, causing diseases in plants

Helpful things: making antibiotics to fight infections, food/drink production (yoghurt = lactobacillus, bread and beer = yeast), decomposing dead plants, animals etc to their constituent chemicals

Slide 7 and 8
Ask where they may be found (a good one for group discussions before answering)
Accept pretty much every answer because they're found everywhere!

Slide 9
Ask how infections can spread
Discuss sneezing, use of tissues, hand washing, contact with other people and other things like door handles, food hygiene. Sneeze particles (aerosol droplets) can remain in a room for 3 days after a sneeze
Look at the spray from a plant mister as a mock sneeze.

Slide 10: A 15 – 12 minute activity session (3 groups can rotate around, 5 minutes each activity if equipment is available)

Tell the students we're going to have a look and see if we can find any bacteria here.

1. Put a small amount of glitter gel on the first pupil's hand and see how many people it can be transferred to by handshakes. This shows how microorganisms can be easily transferred around – emphasise how hand washing is good!
2. Bacteria in food – use microscopes to look at bacteria in yoghurt – emphasises that bacteria can be 'good' for you! See http://www2.mrc-lmb.cam.ac.uk/microscopes4schools/yoghurt.php
3. Examine plates of bacterial cultures – consult http://www.cleapss.org.uk/ for advice on this area

Slide 11: A 10 - 15 minute activity session

Students to make balloon microorganisms with coloured markings which will later represent antigens
Print out and colour in shapes from slides 12 and 13

Slide 13 - 15 - Explanation of the immune system (refer to White Blood cell Types.pdf)

Ok, so if there are all of these microorganisms everywhere, some of which can make us sick – why are we not sick all the time? Ask for ideas…

Give a very basic and brief overview of immune system, initially mentioning barriers such as the skin and physical defences such as saliva, tears, stomach acid

Talk about the immune system army, with many 'cells' that have different jobs to protect us such as cells that fight against bad microorganisms, each with different jobs: Dendritic cell – collect parts of micro-organisms and show them to T cells and B cells. T cells – co-ordinate the attack on the microorganisms – asking B-cells to make signposts called antibodies to direct macrophages to 'eat' them, so eliminating the 'bad' micro-organisms from the body.

Slide 16
We're going to have a go at eliminating, or getting rid of your 'bad' microorganisms from our bodies…

Students swap balloons (spreading the microorganisms). Students colour in antibodies (using the Y shapes on slide 17) to match the antigens on the microorganism they have

Students stick the antibodies and stick them on to the antigens on their microorganism and take it to an adult who will be acting as a macrophage by killing the labelled microorganisms (popping the balloons)

Slide 18 – wrap up session
Ask students what they have learned during lesson
What they should remember to keep them more healthy