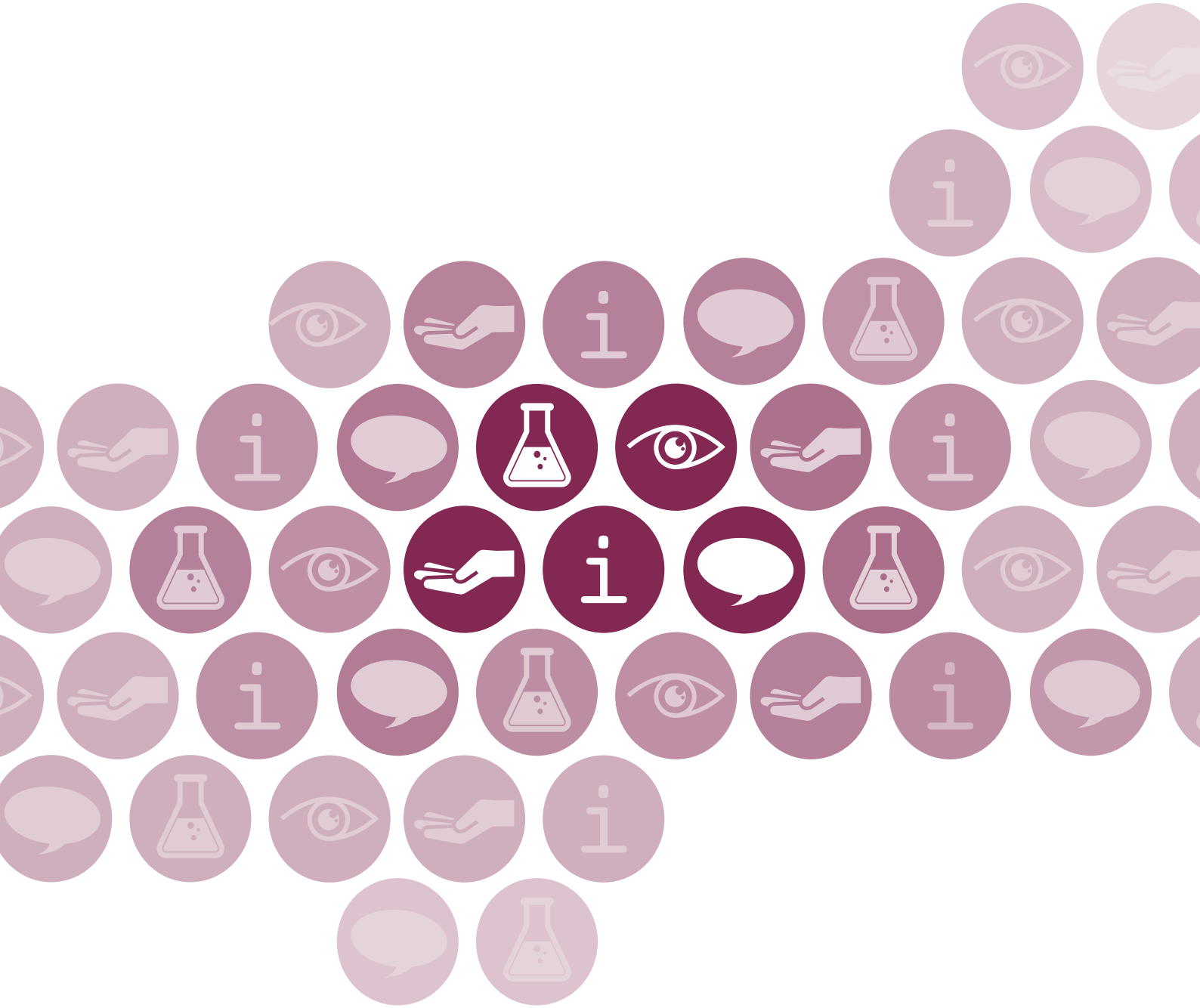
The Royal College of Pathologists
Pathology: the science behind the cure

Scouts N.I.

cubs



DISEASE DETECTIVES

BEAVER AND CUB SCOUT RESOURCE PACK

Disease Detectives

Welcome to the Disease Detectives activity pack! This pack aims to assist Cub Scout leaders to complete the Health and Science criteria of various badges (such as the Scientist Activity Badge). It also fits well with the Challenges Awards section. Your Balanced **Programme Checker** should help you with this alignment. Some of the activities are also suitable for Beavers aged between 6 and 8 years old.

There are a variety of activities based around the prevention, diagnosis and treatment of disease. Our intention is that young people should get to know about healthcare science and in particular the role of pathology and pathologists in detecting diseases and ensuring good health.

These activities do not have to all be done together, or in a particular order. They can be mixed and matched to suit your requirements, and it is open for you to adapt your own favourite game or activity to get across key concepts to your group.

We would particularly welcome news of any adaptations you make so that they can be included in the pack in the future. Please use the contact information at the back of this pack.

We have provided a risk assessment template and example risk assessment at the back of this guide, since this will be dependent on your group and location. The activities themselves contain few hazards, but leaders should conduct simple risk assessments to spot potential hazards and how to reduce or eliminate them.

Other ways to use this pack

This pack can also be used by teachers, parents and others who work with young people. The wide range of short and easy to run activities offered in this pack work well in the classroom or at home. If you are a school teacher, these activities would work well for a Science Week (or similar) event and there are ideas on adapting the activities for different age groups throughout.

About the Royal College of Pathologists

The Royal College of Pathologists is a professional membership organisation. Our members are pathologists and clinical scientists in 17 different specialties, including histopathology, haematology, clinical biochemistry and medical microbiology. They work in laboratories and directly with patients in hospitals and the community. Together, they are involved in the majority of diagnoses. They also play an important role in disease prevention, treatment and monitoring. If you have ever had a blood test, tissue biopsy or cervical screening, a pathologist will have been involved in your care. Another critical role pathologists have is in research, advancing medical knowledge and devising new treatments to fight inherited disorders, infections and diseases like cancer. In addition, they are involved in teaching medical students and junior doctors.

Information from Cub Scout Leaders

The games and activities set out in this pack are suggestions rather than rigid requirements. Our intention is that your young people should participate in a range of activities that will help them to get to know about healthcare science, and in particular the role of pathology and the pathologist in detecting diseases and ensuring good health.

You may wish to align the project elements with the mainstream Challenges Awards in your section. Your Balanced Programme Checker should help you with this alignment.

Please feel free to adapt the suggested elements to suit your own situation, but please ensure you carry out at least one activity from each section. We would particularly welcome news of any adaptations you make so that they can be included in the future. It is also open to you to adapt your own favourite games and activities to get across key concepts to your young people.

It is of course everyone's responsibility to spot any hazards associated with the suggested activities and leaders should conduct simple risk assessments to spot potential hazards and how to reduce or eliminate them.

It would be helpful to see any notes you keep during the project and we would appreciate your feedback using the form at the back of this resource pack.

We hope to keep in touch with you during the project but if you would like more help or advice please do not hesitate to get in touch.

Introduction from Northern Ireland Scout Council

Northern Ireland Scout Council is grateful for the opportunity to work with the Royal College of Pathologists and health and social care trusts on this exciting pilot project. It will help our young people to be more aware of pathology, the science behind the cure and how the human body works.

Scouting began in Northern Ireland 100 years ago; its programme has developed and adapted to suit society's needs.

We support young people aged 6 –18 to develop life skills outside of academic settings. We do this through play, craft, exercise and various other activities.

Scouting in Northern Ireland is being supported by the Royal College of Pathologists resource pack to raise awareness of health and wellbeing and all the challenges that this can bring. The pack provides new and exciting activities to help deliver the balanced programme.

A big thank you to everyone concerned in developing the unique pilot project which we hope will be welcomed more widely by scouting across Northern Ireland and eventually be launched nationwide among scouting in the rest of the UK.

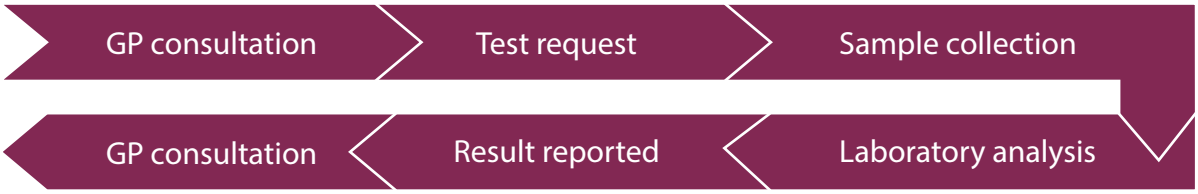
NI Scout Council

Find out more online: www.scoutsni.org

Activities

Aim to complete at least five activities from those described below. You might also like to extend the activity day into an event or project. For example:

1. Invite a pathologist from your local laboratory to visit your group and help with activities.
2. Research your local laboratory and create a poster or collage charting the journey of a sample, for example:



Use the free colouring-in resource **Incredible You** on the Royal College of Pathologists' website to create artwork on a pathology topic you find particularly interesting.

Contents

The activities below cover a variety of badge work, including the following aspects of the Skills badges: Healthy eating, Exercise and Learning how the human body works. These are mentioned alongside each activity. **Click the activity name to jump to that page.**

Introduction

There are hundreds of thousands of diseases, illnesses and infections in the world, and if you catch any, it will usually be a pathologist who will have to find out what you have.

Pathology is the study of disease, bringing together science and medicine. Millions of pathology tests are carried out every year in this country, to help diagnose disease and to help choose the right treatment.

Pathologists are the 'disease detectives' and they specialise in a particular area of pathology.

Pathologists work with other doctors, scientists, nurses in hospitals and GP surgeries. They have been important in discovering successful treatments for cancers, safe blood transfusions, vaccines against infectious diseases and treatments for inherited conditions.

Disease transmission and infection

- Disease bluff
- Name that disease
- Who started the infection?
- It's a cut

Disease bluff

Covers:

Cubs/Beavers Our/My Skills Challenge Badge:

- Other (learning about diseases)

Aim:

To help young people think about the number of diseases out there and to introduce them to diseases they have not heard of before.

Instructions:

- Ask all the cubs to stand in a group in the middle of the room.
- Place the 'No' sign at one end of the room and the 'Yes' sign at the other.
- Read out each disease in turn and hold up the corresponding sign. Tell the participants to run to the Yes sign if they think the disease is a real disease and the No sign if they think it is made-up/ not a disease.
- Reveal the answer to each as you go along and read out the few lines of information about each real disease (or ask the participants to put up their hand and describe what the disease is like, where it infects the body, etc.). With the more common childhood diseases you might also ask the group to put up their hand if they have had the disease and/or had a vaccine injection for it.

Equipment:

- Two A3 laminated signs: Yes and No
- List of diseases and information for leader (see below)
- A4 signs displaying each of the diseases below

Suggested duration: 10 minutes

Tonsillitis: Yes

Tonsillitis is inflammation of the tonsils. It's usually caused by a viral infection or, less commonly, a bacterial infection. Viruses are very small microbes. Scientists can only see them with very powerful microscopes. Tonsillitis is a common condition in children, teenagers and young adults. The symptoms of tonsillitis include: a sore throat and pain when swallowing.

Frumps: No

Frumps is not a disease but mumps is a viral disease caused by the mumps virus. Initial signs and symptoms often include fever, muscle pain, headache, and feeling tired. This is then usually followed by painful swelling of one or both parotid salivary glands.

Chickenpox: Yes

Chickenpox, also known as varicella, is a highly contagious disease caused by a very small microbe called a varicella zoster virus. The disease results in a characteristic skin rash that forms small, itchy blisters, which eventually scab over. It usually starts on the chest, back, and face then spreads to the rest of the body.

Dragon pox: No

In the fictional world of Harry Potter, dragon pox is described as a potentially fatal contagious disease that occurs in wizards and witches. Its symptoms are presumably similar to Muggle illnesses like smallpox and chickenpox. However, in addition to leaving the victim's skin pockmarked, dragon pox causes a lasting greenish tinge. Simpler cases present with a green-and-purple rash between the toes and sparks coming out of the nostrils when the patient sneezes.

Scarlet fever: Yes

Scarlet fever, also called scarlatina, is an infection that causes a blotchy, pink-red rash. It's most common in young children, but can affect people of any age. It isn't usually serious and can be treated with antibiotics from your GP. Once you've had it, you're unlikely to get it again. Scarlet fever is usually caused by a bacterial infection and was a leading cause of death in children in the early 20th century before antibiotics were available.

Polio: Yes

Polio is a serious viral infection that used to be common in the UK and worldwide. It can cause paralysis. It's rare nowadays because it can be prevented with vaccination – this is an injection that protects you from the disease. You will have had this when you were a baby and a toddler and you'll get a booster vaccination when you're 14.

Taramasalata: No

Taramasalata or taramosalata is a Greek dip made from tarama, the salted and cured roe of fish (either cod, carp or grey mullet).

Bronchitis: Yes

Bronchitis is inflammation of the bronchi (large and medium-sized airways) in the lungs. Symptoms include coughing up mucus, wheezing, shortness of breath, and chest discomfort. Most cases of bronchitis are caused by a virus that is passed between people in air droplets but sometimes bacteria or air pollutants can cause the inflammation.

Appendicitis: Yes

Appendicitis is a painful swelling of the appendix. The appendix is a small, thin pouch about 5–10cm (2–4 inches) long. It's connected to the large intestine, where stools (faeces) are formed. Appendicitis typically starts with a pain in the middle of your tummy that may come and go. Within hours, the pain travels to the lower right-hand side, where the appendix usually lies, and becomes constant and severe. Pressing on this area, coughing, or walking may all make the pain worse. You may lose your appetite, feel sick and occasionally experience diarrhoea. If you have a suspected appendicitis you will normally need to have it removed by a surgeon. Nobody knows exactly why we have an appendix, but removing it isn't harmful.

Elephantiasis: Yes

Elephantiasis is a human disease caused by parasitic worms known as filarial worms. Most cases of the disease have no symptoms. Some people, however, develop symptoms marked by severe swelling in the arms, legs, breasts, or genitals. It is most common in tropical Africa and Asia.

Penicillin: No

Penicillin is not a disease. It is the name for a group of antibiotics that were among the first medicines to be effective against infections caused by bacteria. You may have been prescribed one by your doctor when you were ill. Penicillin and other antibiotics cannot be used to treat diseases caused by viruses.

Fish odour syndrome: Yes

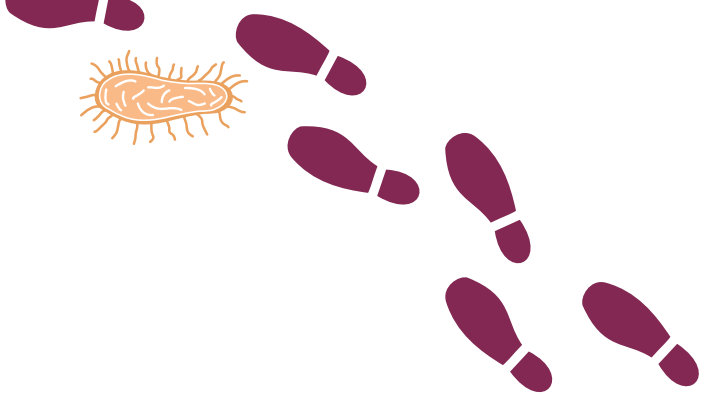
The medical name for this syndrome is trimethylaminuria. It is an uncommon genetic disorder that causes a strong body odour usually described as like rotting fish, faeces or garbage. The odour is created when the body isn't able to process a smelly chemical that's produced in the gut, particularly when certain foods like seafish and eggs are digested.

Crazy bear syndrome: No

This is made-up! Maybe a disease will be called that one day!

Alice in Wonderland syndrome: Yes

Alice in Wonderland syndrome is a disorienting condition that affects perception. People experience size distortion – so they see things around them as bigger or smaller than they really are. Sometimes this condition is caused by a virus or by abnormal blood flow to the parts of the brain that control our vision and sense of touch.



Name that disease
(For older cubs aged 8 and up)

Covers:

Cubs/Beavers Our/My Skills Challenge Badge:
- Other (learning about diseases)

Instructions:

- Ask all the scouts to stand in a circle.
- Throw a bean bag to one of the scouts and the individual who catches it has to name a disease.
- Ask them to throw the bean bag to another scout and the process continues, but no one is allowed to name a disease that has already been mentioned.
- Find out if the group know about the diseases named, at the end.

Equipment:

- Bean bags
- Watch/timer (optional)

Suggested duration: 10 minutes

Additional information:

Let the scouts know that there are hundreds of thousands of diseases, and probably many more of which we are still unaware.

Extension activity for 'Name that disease' and 'Disease bluff':

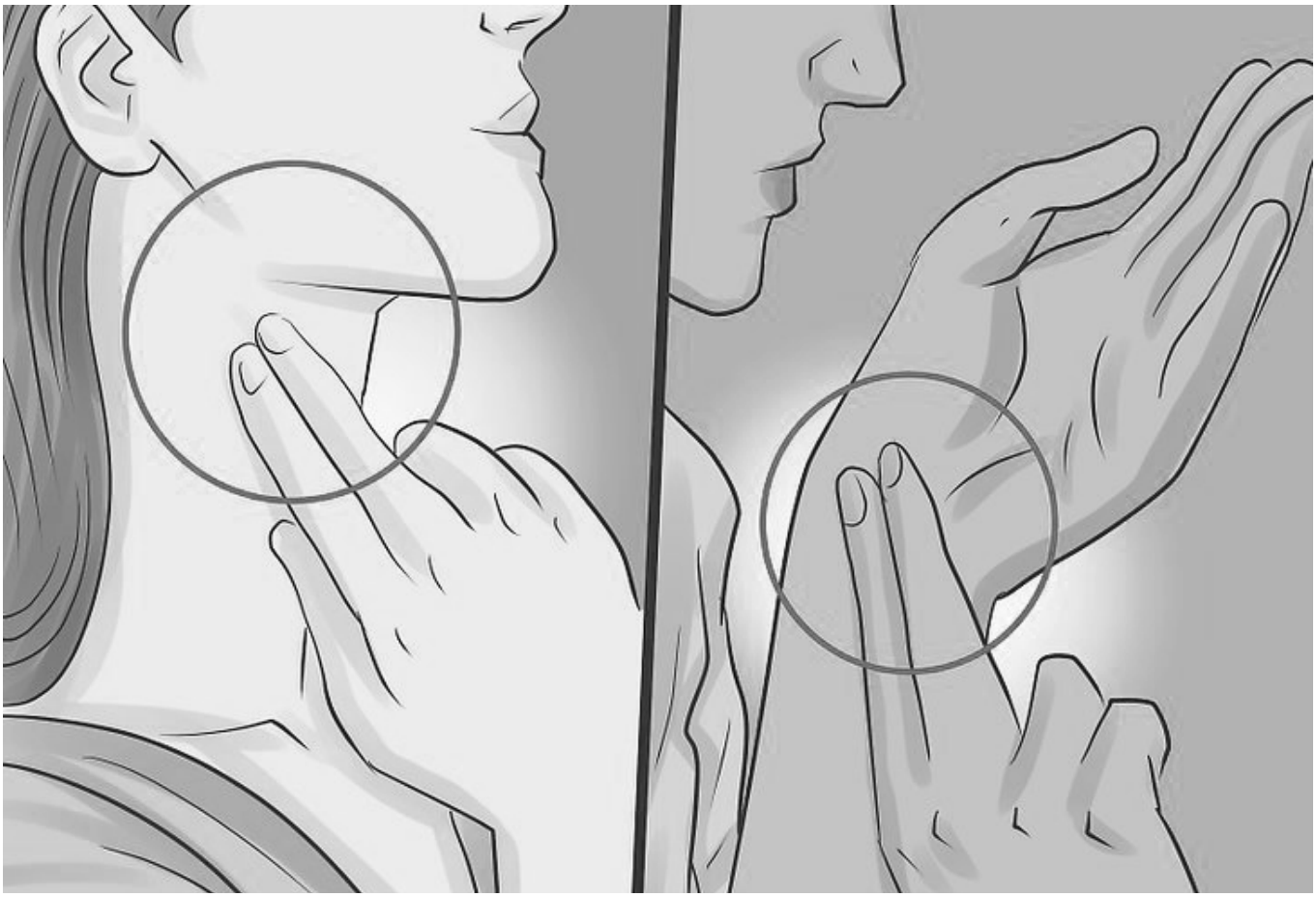
- Ask all the scouts to stand in a circle. Ask them to run around (in the circle formation) until you blow the whistle.
- Blow the whistle, shout 'Stop!' then throw a bean bag to one of the scouts and the individual who catches it has to name a disease.
- Ask them to throw the bean bag to another scout and the process continues, but no one is allowed to name a disease that has already been mentioned.
- The group runs around after each.
- Find out if the group know about the diseases named, at the end.

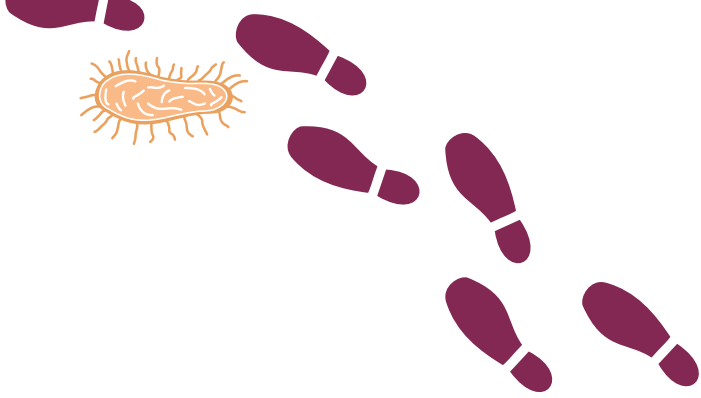
You could ask the young people to move around while throwing and catching the bean bag and look at their pulse rates during exercise. Get the scouts to take their pulses before the activity and make a note of what it is. Then ask them to repeat this after the activity. Has their pulse rate increased?

To check their pulse rates at their wrist, ask them to find their radial artery, which is on the thumb side of their wrist. Then place two fingers on the artery, between the bone and the tendon. Ask them to count the number of beats in 15 seconds, and multiply by four to get the beats per minute. You may need to use a watch or timer for this (or tell the scouts when to start counting and then tell them to stop after 15 seconds). See diagram below.

The pulse rate increase means their hearts have started to speed up and pump extra oxygen and nutrients to all their muscles during exercise. Also, their breathing rate will increase to get oxygen in and get rid of carbon dioxide.

Exercise is essential for good health.





Who started the infection?

Covers:

Cubs/Beavers Our/My Skills Challenge Badge:

- Other (stopping the spread of disease)

Aim:

To understand the spread of infection through a simple simulation.

Instructions:

- Ask all scouts to stand in a line and tell them to stretch their hands out, palms facing upwards, with their eyes closed.
- Add a small amount of hand sanitiser/lotion to their palms. But for a few scouts, add a mix of the hand sanitiser/lotion with glitter.
- Ask the scouts to rub their hands together and, without looking at their hands, open their eyes and walk around the room, shaking the hands of others they meet.
- After five minutes, ask them to look at their hands. Explain that only some people had the glitter on their hands, i.e. were 'infected'. But look how many people are infected now. Who do they think started it all?

Equipment:

- Hand sanitiser or body lotion (in a squeezy bottle)
- Glitter

Suggested duration: 10 minutes

Additional information:

We can catch diseases quite easily: some through the air and some by touch! When we sneeze, each sneeze can travel up to 100 mph taking microbes (bacteria and viruses) far away from us, perhaps landing on someone else. This is why we must cover our mouth and nose during a sneeze. Microbes on your hands could be picked up by others too... and spread to even more people.

For older groups:

Think about what this activity showed about the spread of disease and why **vaccination** that gives people immunity to diseases is important. Most children are given the measles, mumps and rubella vaccination. Other vaccinations people commonly receive in the UK include polio and tuberculosis vaccines.

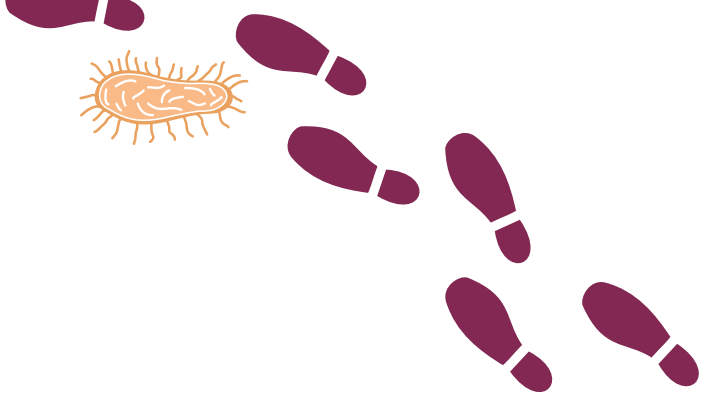
Pathologists and other biomedical scientists carry out research that leads to development of vaccines against infectious diseases.

If there was to be an outbreak of a disease and the few unvaccinated people caught the disease, it would be difficult for the disease to spread as everyone else is vaccinated. This is known as 'herd immunity'. If more people are unvaccinated than vaccinated, then the disease can spread more easily.

In a disease outbreak, it's important to find the first person to become infected with the pathogen called - 'patient zero'- because knowing that person's history can help researchers determine how and when the outbreak started.

Extension activity:

Make a poster that helps raise awareness of how easily germs can spread between people and the importance of washing your hands.



It's a cut

Covers:

Cubs/Beavers Our/My Skills Challenge Badge:

- Learning how the human body works

Aim:

To learn how our bodies fight off germs that would make us sick.

Instructions:

- Select two young people to be macrophages (the soldiers who fight the germs) to run around catching the other scouts who are the germs (microbes).
- Once captured, the germs are taken to an area of the room: 'the cut service' where they have to lie down in a line, forming the pus under the healing cut.
- You can use a large parachute, gradually rolling this out over the scouts lying down, to simulate the cut being healed.
- You could squeeze the parachute at on end so cubs roll out, a bit like squeezing an infected cut or spot.

Equipment:

- A parachute (optional)

Suggested duration: 10 minutes

Additional information:

Even the tiniest of cuts in our skin can get infected by any germs in the air, or on surfaces.

Macrophage 'soldiers' are a type of white blood cell that finds anything that isn't a healthy body cell (e.g. germs) and then 'eats it up' (engulfs it). White blood cells are an important part of the immune system (the body's 'army'), and without them we wouldn't be able to get better when germs make us ill.

Pus is a yellowy-white liquid, made of all the white blood cells (soldier cells).

Anatomy

It is important to know where and how all the organs in our bodies work, as then we know when to go to the doctors when we feel that something might be wrong.

- Pin the organ
- Bendy bones
- Heart skips a beat

Pin the organ

Covers:

Cubs/Beavers Our/My Skills Challenge Badge:

- Learning how the human body works

Aim:

To learn about the various organs' functions and where each organ is in the body.

Instructions:

- Ask one of the scouts to lie on a piece of old wallpaper, flipchart paper stuck together or a concrete area/pavement. Using a marker/chalk, draw around the scout so that there is a body outline. Remember to complete the groin area freehand once the scout is off the paper.
- Get all the scouts to work together to place the organs in the body outline in the right place.
- Then bring out the fruit and tin of beans and let the scouts know that these items weigh the same as some of the organs. Ask the scouts to try matching up the 'weights' to the organ.
- Show the scouts the information table so they can check if they were correct.

Equipment:

- Organ illustrations, which can be downloaded from the same page as this pack.
- Photocopies of the organ information tables (see following page)
- Chalk, if running this activity outdoors (or large pieces of flipchart stuck together /old wallpaper, and some marker pens)
- Fruits: melon, grapefruit, avocado, water melon
- Large tin of baked beans

Suggested duration: 20 minutes

Additional information:

Our organs carry out all the major functions of our body: our lungs help with our breathing, our heart pumps blood around our body and our digestive system makes sure we get all the nutrients from our food to all our cells.

You can also find out more about organs and get other activity ideas on our **Organ Resource** page.

Organ	Function
Appendix	The appendix is a worm-like structure attached to the first part of the colon. It has no known function. It can get inflamed and cause pain (appendicitis). We don't miss our appendix if it is removed.
Brain	The brain is where we do our thinking. It also controls movement that we don't think very hard about such as breathing and walking. The brain stores our memories.
Colon	The colon, also known as the large intestine, is the final part of the digestive tract. It packages the food waste and removes water to form solid poo (faeces).
Heart	The heart pumps blood around our body through a system of arteries. Blood picks up oxygen in the lungs and delivers it to where it is needed. Veins return the blood to the heart.
Kidney	Most of us have two kidneys and this is where our pee is made. Pee contains waste chemicals that kidneys have filtered out of the blood. They do an important job as these chemicals would be harmful to our bodies if they didn't get taken out of the body in our pee.
Liver	The liver filters the blood supply from the intestine, which is full of absorbed food. Some of this food will be stored in the liver and some of it will be used to make other chemicals the body needs. The liver also has a role in destroying chemicals which could make us sick.
Lungs	The lungs are the organs responsible for taking in oxygen from the air. The oxygen is transferred to the blood so that it can reach every cell in the body. Smoking seriously damages the lungs.
Oesophagus	The oesophagus is the tube that joins the back of the mouth with the stomach. Waves of contractions move swallowed food to the stomach to be digested.
Small intestine	This is the part of the digestive tract between the stomach and the colon. It is where food is digested and nutrients absorbed. The small intestine is about five metres long.
Stomach	The stomach stores food that is swallowed, secretes enzymes to start digestion, produces acid to kill any infective organisms and contracts to break food into smaller pieces.
Tonsils	The tonsils are a pair of organs at the back of the throat that help protect against infection. They can become enlarged and inflamed, resulting in painful tonsillitis.
Trachea	The trachea is the tube that links the back of the throat with the lungs. Air that is breathed in travels down the trachea. The trachea is held open by rings of hard cartilage.

Bendy bones

Covers:

Cubs/Beavers Our/My Skills Challenge Badge:
- Learning how the human body works
- Healthy teeth

Cub Scientist/ Beavers Experiment Badges:
- Reactions – bicarbonate/vinegar

Aim:

To learn about the importance of the mineral calcium.

Instructions:

- Make sure the chicken bone is clean, by removing any pieces of leftover meat and rinsing under the tap.
- Ask the young people to pass the bone around, noticing how hard it is. Ask them to try to bend it.
- Choose some young people to put the bone in the jar and pour vinegar into the jar, making sure the bone is covered completely by vinegar.
- After three days (or a week), take the bone out of the jar, rinse under the tap and pass around again.
- What's the bone like this time? Can the young people bend it?
- Another option is to use any of the cubs' milk teeth that have fallen out, and add to a glass of cola drink.

Equipment:

- Chicken bone (preferably leg/drumstick bone)
- Vinegar (preferably clear)
- A jar or glass large enough to fit the bone and vinegar

Suggested duration: 10 minutes at each session (plus three days to a week of leaving the bone in vinegar)

Additional information:

Chicken bones are like our human bones and contain calcium, a mineral that makes bones hard. The bone becomes bendy because vinegar is an acid that can dissolve the calcium – this is called a chemical reaction. When there's no calcium, the bone is no longer hard and only the soft tissue is left behind, so the bone becomes bendy.

The same kind of reaction happens when you leave a human tooth in a glass of cola or other fizzy drink – the acid in the drink dissolves the calcium in the tooth and it goes soft, transparent and can actually disappear. Another example is when acid rain can cause chalky (calcium carbonate) buildings and rocks to weather away and crumble.

This is why it is important to eat and drink lots of calcium-rich foods (e.g. milk, dairy products and leafy vegetables). If our bones don't have enough calcium, and get soft, we cannot lead healthy, active lives. Vitamin D is also essential for healthy teeth and bones.

Heart skips a beat

Covers:

Cubs/Beavers Our/My Skills Challenge Badge:

- Learning how the human body works
- Exercise
- Other (stopping the spread of disease)

Aim:

To find out more about what the heart does, and how blood gets oxygen. To understand that diseases can spread more easily through the body if the disease-causing microbes (pathogens) are present in the blood.

Instructions:

- Mark out three areas of the room as heart, lungs, muscles.
  - The heart area should contain a pile of both red and blue bean bags.
  - The lung area should contain a pile of red bean bags.
  - The muscles should contain a pile of blue bean bags.
- Split the scouts into three groups and station the groups at each of the areas.
- Tell them that the red bean bags are oxygenated blood (blood cells that have picked up oxygen) and the blue bean bags are deoxygenated blood (blood cells that have given up their oxygen).
- Quickly discuss the circulatory system and ask the scouts to move the red and blue bean bags according to the system, in a relay format (i.e. they stop in the new area once they've given up a bean bag, to let a scout from that area take their bean bag to the next area).
  - Blue bean bags go from the heart to the lungs.
  - Red bean bags go from the lungs to the heart.
  - Red bean bags go from the heart to the muscles.
  - Blue bean bags go from the muscles to the heart.
- Before they start get them to measure their heart rate.
- During each of these 'relay movements' the scouts have to skip!
- On conclusion get them to measure and compare their heart rate with what it was at the start.

Equipment:

- Two sets of bean bags in different colours (e.g. red and blue)

Diagram of the circulatory system (heart, lungs and blood supply) – optional, can be downloaded from the **www.rcpath.org/disease-detectives**

Suggested duration: 10 minutes

Additional information:

The heart pumps deoxygenated blood to the lungs to get rid of carbon dioxide and to pick up oxygen. This oxygenated blood then returns to the heart where it is pumped all around the body, to the muscles and vital organs, making sure all cells get oxygen. The carbon dioxide from the cells in the body then returns in this now deoxygenated blood to the heart, and the cycle continues.

By comparing the pulse at the start and end, we can explain how muscles need more oxygen when working hard during exercise and how the heart rate increases so more oxygen can get to muscles.

Regular exercise is important to keep our muscles strong, keep our blood transport system in perfect working order and to burn off extra food we have eaten that we don't need for normal activities. Impact exercise such as running is important in making our bones pick up the calcium we eat.

Blood

Without blood, and our oxygen-carrying red blood cells, we would not be able to survive. All living organisms need a transport system, and our blood is truly amazing. Many of the activities in this section are based on activities in our **Blood and Bugs resources**, which were developed to mark the centenary of World War One. For older children, the more detailed background information included in these resources might be useful; you might also consider using the careers information on blood-related careers alongside these activities.

- Give blood
- Clots of blood
- So sweet

Give blood

Covers:

Beavers Creative Activity Badge

Cubs Artist Activity Badge

Aim:

To help the young people understand the importance of giving blood through creating a poster. This activity links with community impact.

Instructions:

- If it's possible, invite someone from NHS Blood and Transplant (NHSBT) to speak about the importance of giving blood and to help with designing the posters. Otherwise contact them for leaflets and information that will be useful for this session. The Public Engagement Team at the Royal College of Pathologists may be able to help with this: email **publicengagement@rcpath.org** with details of the date and location of your session.
- Ask the scouts to produce a poster based on what they've found out, to encourage people over the age of 17 to give blood, using the materials provided.

Equipment:

- Leaflets and information from NHSBT and/or access to the **NHSBT website**.
- A3 or A4 paper
- Art and craft materials (coloured pens, pencils, paints, glitter, glue)

Suggested duration: 30 minutes

Additional information:

Giving blood saves lives. Many people need blood (and the components in blood, such as blood cells, plasma and platelets) for long-term treatments or when a lot of blood is lost during operations. Many people owe their lives to those donors who have given their blood.

The NHSBT service needs 6,000 blood donations every day to treat patients in need across England, so there's always a need for people to give blood. Anyone healthy aged between 17 and 65 years old can give blood.

Clots of blood

Covers:

Cubs/Beavers Our/My Skills Challenge Badge:

- Learning how the human body works – clotting

Aim:

To learn about the importance of blood clotting.

Instructions:

- Make up two consistencies of fake blood ahead of time:
  - Container 1: Clotted blood (made up of red food colouring, water and enough arrowroot or sodium alginate to thicken up with 'clots'. Alternatively, you could use blackcurrant jam that has been diluted down with a little water so that it's not too solid.
  - Container 2: Fresh blood (made up of red food colouring and water).
- Ask the scouts to have a look at both types of blood, and to investigate the consistencies more closely, using the pipettes and spoons.

Equipment:

- Plastic shot glasses
- Water-soluble red food colouring
- Arrowroot powder/Sodium alginate/Blackcurrant jam
- Water
- 3 ml pipettes
- Hand towels
- Two large clear containers: one labelled 'clotted blood' and the other labelled 'fresh blood'
- Plastic spoons

Suggested duration: 15 minutes

Additional information:

If our blood didn't clot, every time we cut ourselves we would keep bleeding forever. But clots can also cause harm, such as when there's an internal bleed and blood vessels become blocked, preventing blood flowing to vital organs. Heart attacks and stroke can happen because of blood clots.

Whenever the skin gets broken, blood vessels are damaged, blood is released and the sticky platelets contained in the blood form clots to stop blood flow. As soon as blood from a wound is exposed to the air, the platelets disintegrate and react to create fibrin, a mass of tiny threads. The fibrin hardens very quickly to form a scab, sealing the wound. The wound heals and the clot dissolves.

We need to stop clotting from happening when we want to store blood in blood banks, and so an anti-clotting agent, known as an **anticoagulant**, is added.

So sweet

Covers:

Cubs/Beavers Our/My Skills Challenge Badge:

- Learning how the human body works
- Importance of a healthy diet
- Foods that are good and bad to eat

Aim:

To understand more about blood sugar.

Instructions:

- Mix some of the high glucose drink with red food colouring, to make a pretend blood sample, belonging to a diabetic.
- Choose some volunteers, or allow them all to have a go: using a pipette or paintbrush, dab a little drop of the 'blood' on their finger, to simulate a pin prick.
- Then follow the instructions on the blood glucose monitor to test the blood.
- Tell the scouts that people with diabetes have a high blood sugar level.
- Ask them to note the reading on the monitor and then look at the glucose table: do they think the blood belongs to someone with or without diabetes?

Equipment:

- Blood glucose monitor – you can buy these from as little as £12 from online retailers such as Amazon, or why not ask your local GP surgery if you can borrow one?
- High glucose drink such as a sports drink
- Red food colouring
- 3 ml pipette/thin paintbrush
- Glucose table

	Blood glucose level of a non-diabetic
Normal range	4–8 millimoles per litre
Before meals	3.5–5.5 millimoles per litre
Two hours after meals	Less than 8 millimoles per litre

Suggested duration: 10 minutes

Additional information:

About 2.8 million people in the UK are known to have diabetes and a further three quarters of a million may have the condition and not know it.

Blood glucose monitors are machines that measure the amount of sugar in the blood. They are mainly used by diabetics so that they know how much medication to take to keep their blood sugar within a normal range. Very high or low blood sugar can be dangerous. Diabetics need to keep a record of their blood glucose/sugar levels to help themselves and their healthcare team to check how well their diabetes is being managed.

Diabetes is when the body can't break down glucose (sugar) to produce energy. Blood sugar levels are controlled by a hormone (this is a chemical messenger) called insulin, which is produced by the pancreas. Insulin allows blood sugar to get into the cells to produce energy. There are two types of diabetes. Type 1 is when the body's immune system destroys the cells that produce insulin, and so patients with Type 1 diabetes need to take insulin injections throughout their lives. Type 2 diabetes is more common, when the body either doesn't produce enough insulin or the body's cells don't obey the message from insulin. Those with Type 2 diabetes can either control their condition with a healthy diet, plenty of exercise and monitoring their blood glucose level, or by taking tablets.

For more information visit **www.diabetes.org.uk**

Microbes

We have trillions of microbes (or microorganisms) living on the outside and inside of our bodies. Many of them are beneficial, such as the good bacteria that help in digestion. But some microbes can be disease-causing, and are known as **pathogens**.

- My-croscope
- Antibiotic resistance
- Petri dish accessories

My-croscope

Covers:

Cubs DIY Badge:
- Help design and make two items

Beaver Creative Badge:
- Construct something

Cubs Artists Badges:
- Design and build a model

Aim:

To make your own microscope and hear from pathologists about how they use microscopes in their work.

Instructions:

- Ask the participants to make a small hole, using the hole-puncher, in the middle of the larger square of card. It does not need to be directly in the middle.
- Ask them to stick the cellophane square over the hole, using the sticky tape. This is going to be the droplet-card, i.e. the lens of the light microscope.
- Using a pipette, participants can add a small drop of water carefully over the hole, on top of the cellophane. (Tip: Make sure they add the droplet onto the side with the cellophane on it, as the droplet can leak into the card if they use the other side). Make sure that they do not flip the card over, otherwise the droplet will slip off.
- The droplet-card already works as a magnifying glass, so you can ask the participants to hold it over various small items and to make observations on the detail they can see.
- Using the smaller piece of card, ask the participants to wrap it in a small amount of foil (carefully so that there are no creases) in order to make a mirror. Make a stand for the mirror out of another piece of card.
- Tell them to place the mirror at an angle on to a piece of plasticine and place this under an upside down shot glass.
- The base of the shot glass is now a platform onto which they can place whatever it is they wish to view: a small dead insect, a flower petal, etc. Then ask them to place their droplet-card on top.
- Ask them what they can see through the water drop. (See a photo of a finished microscope on page 32.)
- Older groups can investigate ways in which to make the image sharper, and other ways they could create a simple microscope.
- An extra option is to show how a smart phone can be used as a digital microscope. Switch the camera on the phone to 'selfie-mode' and place it on the table. Add a droplet of water to the front-facing camera and gently lower specimens in front of the water droplet. Images will appear on the screen and can be photographed.

Equipment:

- Clear plastic shot glasses
- Strong card, in 2.5 cm squares and 4 cm squares (e.g. cereal box card or plain craft card – note that corrugated card is not suitable)
- Hole-puncher (to make a hole in the 4 cm square card)
- Aluminium foil
- Clear plastic sleeve, in 2.5 cm squares (e.g. cellophane/cornstarch wrapping from greeting cards)
- Water
- Plasticine (note that soft/ air-drying modelling clay is not suitable)
- Pipettes
- Sticky tape
- Small items to view (dead insect, leaf, flower, onion skin, newspaper pieces and skeleton leaves work well – collect lots as these go missing easily)
- Torch (optional, if natural light is not suitable)
- Mobile phone with front-facing camera (optional)

Suggested duration: 20 minutes

Additional information:

Microscopes are vital in diagnosis. Pathologists can look at tissue samples under microscopes to magnify cells and find any abnormalities. Anything that looks different can hold clues as to what the patient might be suffering from, and what the treatment needs to be.

The droplet lens of a microscope can magnify small items up to 50 times, and works like a convex lens. When we look at an object, light travels in parallel rays, bouncing off an object into our eyes, where an upside down image of the object appears on the back of the eye (retina), and our brain makes sense of what it is (and flips it the right way up). A convex lens is rugby-ball shaped, and bends (refracts) the light rays, bringing them together to a point. This reaches our eyes and creates an image on the retina, which makes it seem as if the object is bigger than it actually is.

For older groups:

- Foldscope **www.foldscope.com/**
- Cellscope **cellscope.berkeley.edu**
- Instructables **www.instructables.com/id/10-Smartphone-to-digital-microscope-conversion**

Finished microscope

Antibiotic resistance

Covers:

Cubs/Beavers Our/My Skills Challenge Badge:

- Learning how the human body works
- Exercise
- Other (stopping the spread of disease)

Aim:

To better understand antibiotic resistance.

Instructions:

- Choose two cubs to be the antibiotic - each will wear a different colour t-shirt.
- Choose two cubs to be the resistant bacteria. Give each all of one colour of wrist bands and the other all of the wrist bands of the other colour.
- All of the other cubs are bacteria. Tell the antibiotic cubs they can catch any of the 'bacteria' without any wristband(s) and they are not able to catch those bacteria wearing the colour wristband that corresponds with their t-shirt.
- Tell the cubs with wristbands that they need to pass a 'resistance band' to as many of the cubs as possible (the bands represent plasmids but probably unneccessary to introduce this term to the cubs).
- The cubs run around and the antibiotics and resistant bacteria try to catch those they can. When a cub not wearing a wristband is caught by an antibiotic they should sit down.
- Continue until all of the bacteria have either been caught by the antibiotic or have 'become' resistant.

Equipment:

- Two different colour t-shirts that correspond to the colour of the wrist bands.

Suggested duration: 15 minutes

Additional information:

Antibiotic resistance is a huge issue in medicine, because bacteria are continually changing (evolving), and becoming more resistant to the antibiotics we have available, so we could have huge disease outbreaks if we're not careful.

Antibiotics are medicines used to treat, and sometimes prevent, a bacterial infection (not virus infections). There are different types of antibiotics that can be used to treat different bacterial infections, e.g. penicillin, amoxicillin, gentamicin, tetracycline, ciprofloxacin and erythromycin.

If we use antibiotics unnecessarily (overuse, inappropriately prescribed, the complete course is not taken, or they are shared with others), this can lead to antibiotic resistance. This is when bacteria can adapt and evolve to survive the effects of an antibiotic, meaning the antibiotic can no longer kill off the bacterial infection.

For older children:

Staphylococcus aureus that has become resistant to the antibiotic methicillin is known as **MRSA** (Methicillin-resistant Staphylococcus aureus). It can cause severe problems for those who have it.

Petri dish accessories

Covers:

Cubs/Beavers Our/My Skills Challenge Badge:
- Learning how the human body works
- Exercise
- Other (stopping the spread of disease)

Cubs Artist/ Beavers Creative Badges:
- Glass painting (if using glass paints)

Aim:

To learn about antibiotic susceptibility testing.

Instructions:

- Explain how antibiotic discs work and what the clear zone indicates.
- Ask the young people to use a hole punch to make their own antibiotic discs out of filter paper or plain paper.
- These can be stuck to the bottom of the Petri dish, or onto one of the discs of clear acetate.
- Ask the scouts to paint around the paper discs, with glass paints (or markers or other paint), choosing some of the discs to contain powerful antibiotics, i.e. they will need a clear zone round them.
- Add the lid of the Petri dish, or place the second disc of clear acetate on top, and seal with the thin clear tape.
- Attach key ring fastenings, badge pins or loops of wool using sticky glue dots, sticky pads or similar so that these Petri dishes can be worn (or if possible attach in advance using a glue gun).

Equipment:

- Small Petri dishes: **www.thermofisher.com/uk/en/home.html**
- If Petri dishes are unavailable, give each young person two discs of clear acetate.
- Hole punches
- Filter paper or plain paper
- Glass paints (red, cream-yellow and light brown to represent agar) – these can be found easily online or in craft shops (marker pens or poster paints can also be used if glass paints are not available)
- Narrow clear tape, e.g 12 mm (Search for 'narrow clear sticky tape' on Amazon)
- Glue sticks or adhesive dots (can be found on Amazon and other online suppliers)
- Image of a bacterial culture in a Petri dish that has antibiotic discs and visible clear zones

Suggested duration: 20 minutes

Additional information:

In order to decide which antibiotics can be used against different bacteria, we need to test them to see which antibiotic will stop the bacteria growing. This method is called **Antibiotic Susceptibility Testing.**

To do this, a sample of the bacteria is spread across a number of a particular type of agar jelly plate.

A small paper discs is then added on top of each plate. Each disc contains a particular antibiotic, which will slowly leak from the disc into the surrounding jelly. The letters written on top of each disc tells us which antibiotic is in the disc. The plates are then left in an incubator overnight, usually at 37°C (body temperature).

If the antibiotic in the disc is powerful enough to stop the bacteria from growing at all, the agar plate will be completely clear. This means that the antibiotic will work and make the patient better.

When the antibiotic is not able to stop the bacteria growing, and bacteria is able to grow all over the agar plate, we say the bacteria are resistant to the antibiotic.

But what usually happens is that the antibiotic will be able to stop some of the bacteria growing, but only in the area closest to the disc (where there is the highest amount of antibiotic). This means that there will be a circle of agar around the antibiotic disc which appears clear, as there are no bacteria growing there. The diameter of this circular area, or 'clear zone', can be measured to work out how well each antibiotic works against those particular bacteria.

Testing

Running tests on patients is a pathologist's way of finding clues as to what might be causing their condition. It's like being a real detective. By piecing together all the bits of information, they can find out how to treat each patient.

- Tinkle testing
- A little bit pooey

Tinkle testing

Covers:

Cubs/Beavers Our/My Skills Challenge Badge:

- Healthy eating
- Lifestyle
- Exercise

Cub Scientist Activity Badge

Beavers Experiment Activity Badge

Aim:

To understand that pathologists can diagnose conditions from urine samples.

Instructions:

- Make up some pretend samples of urine with water and a drop of yellow food colouring.
- Add some glucose/sugar into some of the samples.
- Ask the scouts to use urine dipsticks to test the samples, and check the colour changes on the dipsticks using the colour chart guide on the bottle.
- What do they see?
- Optional: Make up a sample with a few drops of green food colouring (it should be very faint green), another sample that is more yellow/dark yellow than the original urine sample, and a final sample with a slight pink tint to it.

Equipment:

- Urine dipsticks (Search for 'One Step Urine Glucose Test Strips Diabetes Testing Kit')
- Yellow food colouring
- Green food colouring (optional)
- Red/pink food colouring (optional)
- Water
- Small plastic shot glasses or test tubes
- Liquid glucose (you can find this easily by searching online).

Suggested duration: 10 minutes

Additional information:

We can find out a lot about a patient from their urine sample. Urine dipsticks are thin strips with ten of squares special filter paper, which can test for various medical conditions (not drugs) such as diabetes, kidney and liver disease, once they are dipped into the urine.

Here we're looking at glucose/sugar levels. The presence of glucose/sugar in urine usually indicates diabetes. The full name for diabetes is 'Diabetes mellitus' which means 'sweet fountain' in Latin, as in your urine will contain sugar, i.e. glucose.

We can also look at the colour of the urine itself. For example, sometimes it's completely harmless: a green colour to your urine could be because of something you've eaten earlier (e.g. asparagus), a more concentrated yellow-orange colour could mean you haven't had enough water to drink and you're feeling a little thirsty, and a pink tint to your urine can either mean you've eaten something like beetroot or that there may be some blood. If there's blood it can be very serious and it will mean a visit to the doctor.

Also see the Royal College of Pathologists' resource pack: **Urine Trouble**

A little bit pooey

Covers:

Cubs/Beavers Teamwork Challenge Badge

Cub Scientist/Beavers Experiment Activity Badges:

- Reactions
- pH indicators
- Testing
- Experiment

Aim:

To introduce how digestion works, and how pathologists look for early signs of disease on the inside by testing what comes out!

These two activities about digestion and poo are from a longer Royal College of Pathologists resource pack called **What does your poo say about you?** They use the enzyme reaction seen in a faecal occult blood (FOB) test to show how blood in the poo can be detected. If possible, find a chemical pathologist to introduce the session, and to talk about screening poo samples from older people to look for early signs of disease. The more accurate faecal immunochemical test is not included in this Disease Detectives pack as the explanation around the introduction of this is likely to be too complex for Cubs and Beavers, but the full set of activities in the 'What does your poo say about you?' pack are a good option for older age groups.

Introduce the digestive system with a printed poster of it, which can be downloaded from the same page as this pack.

Activity 1: Pompom peristalsis

This is a simple activity to explain the process of peristalsis. It was developed by The Physiological Society.

Audience:

A minimum age of 5 is advised for this activity. It works well as a race with two teams competing to get their pom poms through the 'digestive tract' first.

Equipment:

- Transparent plastic bag tubes x two (see **www.polybags.co.uk**) – make this 9 m if you have space; if not, use 4.5 m long (to represent the length of the digestive system)
- 4.5 cm fluffy pompoms (from craft supply stores or search online)

Suggested duration: 5–10 minutes

Instructions:

After you eat, it takes about six to eight hours for food to pass through your stomach and small intestine. Food then enters your large intestine (colon) for more digestion, absorption of water and, finally, getting rid of undigested food (poo!).

Food moves through digestive system by a process known as **peristalsis**: the wave-like squeezing of two sets of smooth muscles in the walls of the gut. One set runs along the gut, while the other set circles it. These muscles create a squeezing action, moving food down the gut. Peristalsis begins in the **oesophagus** when food is swallowed. The strong wave-like movement carries the food to the **stomach**, where it turns into a liquid called **chyme**. Peristalsis continues in the small intestine where it mixes and moves the chyme back and forth, and nutrients are absorbed into the bloodstream through the **small intestine** walls.

Peristalsis ends in the **large intestine** where water from the undigested food is absorbed into the bloodstream. Finally, the remaining waste products, faeces (poo!), are excreted from the body through the **rectum** and **anus**.

Did you know?

'Food to poo' can take 24–72 hours.

Activity 2: Testing poo

Introduce the second activity, 'Testing poo', by explaining that pathologists test people's poo to check for signs of disease and today we are going to carry out a real test that can be used in labs to check for blood in poo. Reassure the cubs that they'll be using pretend poo!

Follow the instructions below for running the FOB test experiment. If you don't have time to run the activity with the cubs carrying out their own experiments, you can do this as a demo and involve a couple of cubs as volunteers.

Audience:

A minimum age of 5 is advised for this activity.

Equipment:

- Potato or horseradish (see below)
- Instant porridge flakes (e.g. Ready Brek)
- Cocoa powder
- Water
- Food processor (not required if you use ready-creamed horseradish–see below)
- Sample tubes or plastic shot glasses
- FOB cards (enough for two or three per pair –these can be obtained from **Alpha Labs**)
- Box of safety gloves (for handling reagent)
- Lolly sticks or similar if the FOB card kits don't have them included
- Developing reagent (which can be obtained from **Alpha Labs**)

Suggested duration: Approximately 30 minutes

How to prepare the pretend poo:

Make up some pretend patient stool samples using some raw potato or horseradish that has been chopped into pieces and liquidised or blended to a purée; you can also use creamed horseradish bought in a jar. Mix with some dark cocoa powder to resemble faeces. Add small amounts into sample tubes or plastic shot glasses. These samples will give a positive FOB test result.

Make up some pretend stool samples similar to the above, that will give a negative FOB test result, this time by mixing up some porridge flakes (e.g. Ready Brek) with some dark cocoa powder and water.

Practical/discussion activities:

If a pathologist has been invited, they can give a quick background on laboratory testing and their role as a pathologist.

Discuss with the cubs the digestive system, and what exactly faeces are. What else do we call it (poo, stools)?

A digestive system diagram can be downloaded from the same page as this pack.

Our organs are great at telling us when something is wrong inside, by sending something outside. And pathologists know exactly how to find this out, by testing that something... for example, testing our poo! Poo, or faeces, is the undigested food matter that comes out of our bottom. But there is so much more in our poo: bacteria, skin cells, salts, minerals and sometimes even blood. The clues in our poos can tell us if we have a healthy gut... or not.

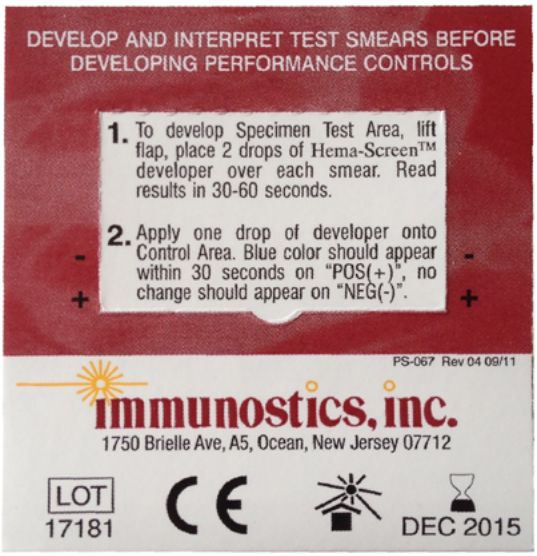
Show the cubs the FOB cards. These are faecal occult blood cards.

'Faecal' refers to faeces, i.e. the waste product from the gastrointestinal tract (from the mouth all the way down to the anus), also known as stools. 'Occult' means 'no obvious symptoms or signs, i.e. the presence of blood in the stools for no obvious reason.

Show the cubs how the cards work.

FOB tests are used to screen for various conditions, but mainly bowel (or colorectal) cancer. It detects the presence of haemoglobin, i.e. blood. Blood found in faeces can be a symptom of early cancer. By detecting cancer early enough, the patient can receive treatments so that the cancer cannot spread, and they can be cured.

For every 100 people tested, only two have an abnormal result. And of these, they don't usually have cancer. There are other reasons for gastro-intestinal bleeding, so further tests must always be done.



Ask the cubs to work in pairs, choose a stool sample, and to pick up a FOB card and an applicator. They can write some pretend 'patient details' on the front of the card, and lift up the flap to apply the samples. Using the applicator, ask one participant to take a small amount of stool sample and smear it onto the first of the two oval areas. Then repeat, but this time ask them to take another small amount from a different area of the stool sample (i.e from a different pot of pretend poo) and smear lightly onto the second oval area.

They can follow the instructions on the card. Ask the cub to close the flap and pass it onto the other cub. This cub now should turn over the card, peel the 'developing area' section on the back and apply two drops of the developing reagent onto the two areas.

An intense blue colour should occur within seconds if the test is positive (i.e. that there is blood in the stool sample).

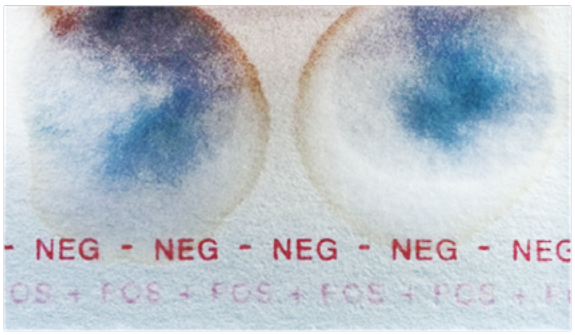
How the test works:

The test paper is covered with a layer of guaiac resin (plant-based material). When the developing reagent (hydrogen peroxide) is added to the guaiac resin, it oxidises it, turning it into a blue coloured quinone.

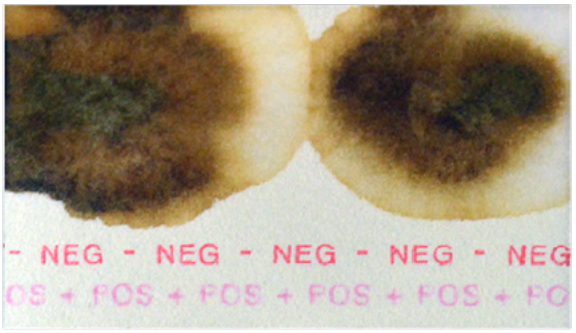
By adding a stool sample, containing haemoglobin, the haem that is present, has a peroxidase-like effect and catalyses the reaction, so the colourless-to-blue reaction happens within seconds.

Guaiac resin + Hydrogen peroxide → **Peroxidase** → **Blue reaction**

Positive



Negative



Prevention and cures

There are all kinds of diseases in the world; some are preventable, as we can take vaccines. Other diseases, such as bacterial diseases, that we might catch, can be cured with antibiotics. That is, unless the bacteria are antibiotic-resistant.

Other conditions such as diabetes and heart disease need different treatments, and often lifestyle changes.

- Poxy pox
- Rose-tinted glasses

Poxy pox

Covers:

Cubs/Beavers Our/My Skills Challenge Badge:
- Learning how the human body works
- Other (stopping the spread of disease)

Cub Scientist/Beavers Experiment Badges:
- Reactions
- pH indicators
- Testing
- Experiment

Instructions:

- Label a set of plastic shot glasses/test tubes as: 'Person A', 'Person B'.
- Label at least two larger cups with the following: 'Cowpox pus', 'Smallpox'.
  - Cowpox pus: vinegar.
  - Smallpox: bicarbonate of soda solution.
- Label one container for the indicator. This is a pH indicator, but here we are using it to indicate if the person is infected and dies (or not). Bromothymol blue will remain blue in alkaline conditions, but turns yellow/ colourless in acidic environments.
- 'Person A' and 'Person B' shot glasses can be given actual names, as these represent two people. Only one of these 'people' will be vaccinated against smallpox (i.e. given some cowpox pus), but both 'people' will be then infected with smallpox.
- Ask the young people to vaccinate 'Person A', using a pipette.. Ask them to add 2 ml of 'Cowpox pus' (vinegar) to the 'Person A' glass.
- Now both 'Person A' and 'Person B' are going to be subjected to smallpox. Ask them to add 2ml of 'Smallpox' (bicarbonate of soda) to both 'people'.
- 'Person A' will have started fizzing (i.e. something is working with the vaccine!). Ask the scouts to add 2 ml of the indicator to indicate who is still healthy and alive, and who is infected and likely to die.
- Result: the 'Person A' glass should remain colourless, whereas 'Person B' will turn blue, indicating that 'Person B' has got smallpox and will most probably die.
- Explain to the scouts that this practical activity simulates what Edward Jenner did when he came up with the smallpox vaccine. By giving people a small amount of the disease-causing microbes (cowpox pus) which cause a mild reaction in healthy people, it made these people less likely to suffer from smallpox, and they would survive.
- Ask the scouts about the acid-alkali reaction that they saw take place and how the indicator worked.

Equipment:

- 3 ml pipettes
- Vinegar (colourless)
- Bicarbonate of soda (made up into a solution with water)
- Bromothymol blue (made up into a solution with water) – search online for 'Bromothymol Blue Aqueous 0.04%'
- Permanent marker pens to label containers
- Hand towels
- Plastic shot glasses or plastic test tubes
- Clear cups/jars (to act as 'pox' reservoirs)

Suggested duration: 15–20 minutes

Additional information:

Smallpox is a contagious infectious disease caused by the variola virus. It was eventually eradicated in 1977, but caused millions of deaths worldwide. In the late 18th century, physician Edward Jenner noticed that milkmaids exposed to the mild infection from cowpox rarely caught smallpox. He took cowpox pus from the hand of a milkmaid and introduced it to scratches on the hand of an eight-year-old boy, James Phipps. The boy developed a mild illness but did not develop smallpox when exposed to the virus several times afterwards. This was disease prevention: it meant one disease could be prevented by exposure to another.

Rose-tinted glasses

Covers:

Cubs/Beavers Our/My Skills Challenge Badge:
- Learning how the human body works
- Other (stopping the spread of disease)

Cubs Artist/Beaver Creative Badges:
- Design and make a model
- Try a craft

Instructions:

- Ask the young people cut around the glasses template they are given, remembering to cut out the eye-holes too (do this safely using a piece of plasticine underneath the cardboard to push a pencil or scissors into to start the cut).
- Ask them to stick four squares of red acetate to the template, using tape, as the lenses for their glasses – two for each eye, so two acetate sheets thick (one sheet thick will only partially work).
- These glasses are now an antibiotic. This is a medicine that kills specific bacteria that make people ill.
- Once the glasses are made, ask them to have a look at the yellow and red bacteria sheet. And then put their glasses on and look at the sheet. What happens?
- The yellow bacteria will disappear – these are the susceptible bacteria that the antibiotic has killed. The red (resistant) bacteria remain.

Equipment:

- Glasses template photocopied onto sheets of A4 paper or printed onto A3 or A4 card – see separate resource on the Royal College of Pathologists' website or download it from the same page as this pack.
- Scissors
- Sellotape
- Red acetate sheets to cut into small squares
- Coloured pens and pencils to decorate the glasses
- Plasticine
- A coloured print out of the Bacteria Sheet (plus spare copies to give away if the printing budget allows).

Suggested duration: 20 minutes

Additional information:

This activity links well with the 'Antibiotic resistance' activity (page 33).

Antibiotics are medicines used to treat and, sometimes prevent, a bacterial infection.
There are different types of antibiotics that can be used to treat the various bacterial infections that we might suffer from.

To prevent antibiotic resistance we need to use antibiotics correctly: the right antibiotic, the right dose, at the right time for the right duration.

Thank you

Thank you for using this pack – we hope you enjoyed the activities.

For more information about pathology and the Royal College of Pathologists please visit **www.rcpath.org/discover.**

If you have any questions about the activities please contact **publicengagement@rcpath.org**

For more information about Cubs and Beavers please visit **https://scouts.org.uk/cubs**

If you have any questions about Cubs in Northern Ireland please contact **cubs@scoutsni.org**

Risk assessment template

All employers must conduct a risk assessment. Employers with five or more employees have to record the significant findings of their risk assessment.

Organisation name: **Date:** _____

_____Cub Group

Responsible person:

_____

Assessment outline:

This is a risk assessment for the _____ activity from the Disease Detectives activity pack.

What are the hazards?	Who might be harmed and how?	What are you already doing to manage this risk?

Do you need to do anything else to manage this risk?	Action by whom?	Action by when?	Done

Risk assesment example overleaf.

Combined risk assessment and policy template published by the Health and Safety Executive 11/11

Risk assessment example

All employers must conduct a risk assessment. Employers with five or more employees have to record the significant findings of their risk assessment.

Organisation name:
The Royal College of Pathologists

Date: November 2019

Responsible person:
Public Engagement Manager

Assessment outline:
This is a risk assessment for the Rose-tinted glasses activity from the Disease Detectives activity pack

What are the hazards? Who might be harmed and how?	Do you need to do anything else to manage this risk?	What are you already doing to manage this risk?
Anyone taking part in the activity including volunteers and participants. Acetate might be a slip hazard if it falls on the floor.	Keep floor clear of additional equipment, boxes, slip hazards such as laminated materials, etc.	The brief for leaders, volunteers and cubs includes a request to help keep the stand tidy and the floor clear. We are bringing bin bags to keep waste at a minimum. The risk of injury is very small. We have made all leaders and volunteers aware of the first aid arrangements at the event in their briefing.
Some equipment and materials are sharp (e.g. scissors) so could cause injuries (e.g. to hands). Paper and card could cause paper cuts.	Leaders will ensure scissors are not left out and do regular safety checks during activity delivery and impose further safety measures if any additional risks are identified.	Safety scissors will be used by children. Pre-cutting of as many elements of the activities as possible will be done by leaders or adult volunteers before the event starts. Safety measures such as adult supervision of activities at all times and the use of plasticine when piercing holes in cardboard have been built into the activity instructions and included in the volunteer briefing. We have made all leaders and volunteers aware of the first aid arrangements at the event in their briefing.

What are the hazards?	Action by whom?	Action by when?	Done
Risk of falls, slips, trips	All leaders and/or volunteers	Date of event	
Risk of injury caused by equipment used in activities	All leaders and/or volunteers	Date of event	

Combined risk assessment and policy template published by the Health and Safety Executive 11/11

Feedback

Please rate all of the activities you tried out with your cubs. Please rate under each criterion below on a scale of 1 to 5, with 5 being the most positive.

Disease transmission and infection

Activity	Clarity of instructions	Accuracy of instructions	Engagement and enjoyment (of cubs who took part)	Overall success of activity	Additional comments/ suggestions for improvements
Disease bluff					
Name that disease					
Who started the infection?					
It's a cut					

Anatomy

Activity	Clarity of instructions	Accuracy of instructions	Engagement and enjoyment (of cubs who took part)	Overall success of activity	Additional comments/ suggestions for improvements
Pin the organ					
Bendy bones					
Heart skips a beat					

Blood

Activity	Clarity of instructions	Accuracy of instructions	Engagement and enjoyment (of cubs who took part)	Overall success of activity	Additional comments/ suggestions for improvements
Give blood					
Clots of blood					
So sweet					

Microbes

Activity	Clarity of instructions	Accuracy of instructions	Engagement and enjoyment (of cubs who took part)	Overall success of activity	Additional comments/ suggestions for improvements
My-croscope					
Antibiotic resistance					
Petri dish accessories					

Testing

Activity	Clarity of instructions	Accuracy of instructions	Engagement and enjoyment (of cubs who took part)	Overall success of activity	Additional comments/ suggestions for improvements
Tinkle testing					
A little bit pooey					

Prevention and cures

Activity	Clarity of instructions	Accuracy of instructions	Engagement and enjoyment (of cubs who took part)	Overall success of activity	Additional comments/ suggestions for improvements
Poxy pox					
Rose-tinted glasses					