

Pig Lung Demonstration Kit

Purpose

The pig lung demonstration kit is a resource to support educators to teach students about the effects of smoking on the lungs so they can make informed decisions to support their health and well-being.

Although the pig lungs were designed to show the effects of commercial tobacco smoke on the lungs, rather than cannabis or vaping, using this resource also provides an opportunity to start a discussion with students and make connections with areas of the curriculum related to cannabis and vaping.

Curriculum Links

[Health and Physical Education in Grades 1–8 | ontario.ca](https://www.ontario.ca/education/curriculum-links)

Grade 4

D1.4 identify substances (e.g., nicotine, carbon monoxide, tar) found in tobacco* and vaping products (e.g., cigarettes, e-cigarettes, cigars, pipe tobacco, chewing tobacco, snuff) and smoke, and describe their effects on health.

D3.2 describe the short- and long-term effects of first- and second-hand smoke on smokers and on people around them, and the effects of vaping.

Grade 6

D1.2 describe the range of effects associated with using cannabis, other drugs (e.g., prescription medications such as opioids; illicit opioids such as heroin, crack, cocaine, Ecstasy, crystal methamphetamine), and intoxicating substances (e.g., gas, glue).

Grade 7

D3.2 analyse the personal and societal implications of issues related to substance use, addictions, and related behaviours (e.g., effects of technology dependence on school and workplace performance, personal

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relationships, and physical health; impacts of pornography viewing patterns on relationships; risks associated with and chewing tobacco; effects of second-hand smoke on non-smokers and children; legal and health implications of underage drinking and cannabis use; body damage and reputation loss among athletes as a result of the use of steroids and other performance-enhancing drugs; risk of HIV/AIDS with intravenous drug use; risk of fetal alcohol spectrum disorder [FASD] as a result of alcohol use during pregnancy).

Handling Instructions

- Please handle the lungs carefully, as they are expensive to replace and repair.
- Use rubber/latex gloves when handling the lungs. The oil from skin can damage the lungs over time. Please make gloves available for any audience members who may want to touch the lungs.
- The lungs can hold a lot of air, but it is important to not over-inflate them and to not poke them once inflated.
- The liquid in the container that holds the lungs prevents the lungs from drying out. Please ensure the container is tightly sealed when not in use and when repackaging the lungs for return.
- The dried lung sample included in each kit must be stored in a bag and handled with clean dry gloves to prevent damage.

About the Pig Lungs

- Pig lungs are similar in shape and size to human lungs.
- The pigs were not killed for this experiment and were not forced to smoke. The meat of the pig was not wasted, and the lungs have been dyed to look like the lungs of a person who has smoked for 20 years.
- The real-life lungs of a person who smokes are greyer with spotted areas and can look much worse than these pig lungs.

Key Facts about Your Lungs and Smoking

How Lungs Work

- When air enters your lungs, it goes through the windpipe (called the *trachea*), then through two main airways (called *bronchi*), and then through a maze of smaller and smaller tubes (called *bronchioles*) until it reaches tiny sacs (called *alveoli*).
- The alveoli look like bunches of grapes at the end of the bronchioles.
- The alveoli are where the oxygen from the air enters your bloodstream and the carbon dioxide from your bloodstream goes into the air.
- Alveoli are very tiny — you have a lot of them in your lungs (three hundred million alveoli in each lung, or six hundred million in total).

Tobacco and Cigarettes

- Smoking cigarettes is the most common form of commercial tobacco use. Other tobacco products include cigars, cigarillos, chewing tobacco, and waterpipes. (WHO)
- Commercial tobacco use is the leading cause of early and preventable disease and death worldwide. (CAMH)
- Commercial tobacco use is different from the traditional use of tobacco by Indigenous and Métis cultures for sacred or ceremonial purposes. For more information about tobacco as a sacred medicine, visit: [Indigenous Tobacco Program | Indigenous Tobacco Program \(cancercareontario.ca\)](https://www.cancercareontario.ca/indigenous-tobacco-program). You are encouraged to discuss the difference between the commercial and traditional use of tobacco with your students.

Health Effects of Smoking

Cancer:

- Of the 7,000 chemicals found in cigarette smoke, up to 70 of these are known *carcinogens*, which means they cause cancer.
- Smoking can cause dozens of types of cancer, including cancer of the lungs, mouth, stomach, esophagus, kidney, brain, bladder, pancreas, liver, larynx (voice box), pharynx (throat), cervix, ovaries, and blood (also known as *leukemia*).
- Smoking causes cancer by damaging the cell's DNA (i.e., genetic material). This damage can cause cells to start dividing and not be able to stop, leading to the development of a tumour.
- Carcinogens also weaken the immune system, which is needed to fight the growth of cancer cells.

Heart Disease & Stroke:

- Smoking causes heart disease and stroke by damaging the cells that line our blood vessels, thickening and narrowing the blood vessels, forming blood clots, blocking blood flow, increasing levels of the fat found in our blood (called *triglycerides*), and lowering levels of good cholesterol.

Lung Diseases:

- Smoking can cause lung diseases by damaging the airways and alveoli.

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- **Emphysema** is a disease where the walls of the alveoli are destroyed, causing the sacs to become larger. This reduces the lung tissue's elasticity and reduces the ability of the lungs to transfer oxygen and carbon dioxide.
- **Chronic bronchitis** is the inflammation (or irritation/swelling) of the lining of the bronchial tubes, which causes increased coughing and mucus production.
- Smoking can also trigger **asthma attacks** in those who are susceptible.

Diabetes:

- Smoking can increase the risk of developing type 2 diabetes.
- Smoking can also lead to dangerous complications for people with diabetes, such as kidney disease, changes to the eye that can lead to blindness, poor blood flow to the extremities (hands and feet), and damage to the nerves of the feet and toes that could lead to eventual amputation.

Other Health Effects:

- Smoking has been found to have a negative impact on almost every organ of the body:
 - **Skin:** wrinkles, pre-mature aging, loss of skin tone
 - **Eyes:** cataracts, blindness
 - **Hair:** odour, discolouration
 - **Teeth:** staining, discolouration, gum disease, gingivitis, tooth loss
 - **Mouth and throat:** bad breath, impaired sense of taste, sore throat
 - **Ears:** hearing loss, ear infection
 - **Immune system:** impaired resistance to infection
 - **Hands and feet:** poor circulation (cold hands and feet)
 - **Skeletal system:** osteoporosis, back problems, hip fracture, rheumatoid arthritis
 - **Female reproductive system:** painful menstruation, early menopause, reduced fertility
 - **Male reproductive system:** infertility, prostate cancer

Second-Hand Smoke

- Second-hand smoke is smoke that comes directly from a burning cigarette as well as the smoke exhaled by the person smoking. Second-hand smoke is what a person inhales if they are around someone who smokes.

- When a person is exposed to second-hand smoke, they are also exposed to the various carcinogens and other toxic chemicals produced by burning tobacco. The level of some of these chemicals can be higher in second-hand smoke than in the smoke inhaled directly by the person smoking.

Cannabis, Vaping and Your Lungs

Cannabis

- Cannabis smoke contains levels of chemicals that are like tobacco smoke, which can increase the risk of lung disease and cancer.
- Other harmful effects of cannabis use on the lungs include bronchitis, lung infections, chronic (long-term) cough, and increased mucus buildup in the chest.
- Ophea's **Cannabis Education Resources** can support you in exploring this topic further with your class: [Cannabis Education Resources | Ophea.net](https://www.ophea.net/cannabis-education-resources)

Vaping

- Short-term effects of vaping on the lungs include cough, wheezing, and a worsening of asthma symptoms.
- Most e-cigarette liquids or concentrates contain and release several potentially toxic substances. Heating the liquids can create new chemicals, such as formaldehyde, acetaldehyde, and acrolein.
- These substances can cause lung disease, as well as heart disease.
- Contaminants like nickel, tin, and aluminum might also get into the vapour and be inhaled into the lungs.
- Ophea's **Vaping Education Resources** can support you in exploring this topic further with your class: [Vaping Education Resources | Ophea.net](https://www.ophea.net/vaping-education-resources)

How to Demonstrate the Lungs

1. Read and become familiar with the content in the sections above: **Handling Instructions**, **About the Pig Lungs**, **Key Facts About Your Lungs and Smoking**, and **Cannabis, Vaping and Your Lungs**.
2. Assemble the lung display according to the assembly instructions (included with the pig lung kit).
3. Start by asking the group to name the organ of the body that is most affected by smoking (answer: the lungs).

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4. Explain to the group that you are going to show them two lungs today: one shows what healthy lungs are like, and the other shows what the lungs of a person who smokes are like. You can share some background information from the **About the Pig Lungs** section.
5. Show the healthy lung first:
 - a) Tell the group that this is how healthy lungs should look: bright and pink.
 - b) Point out how the lung feels: soft, flexible, and elastic.
 - c) Describe to the group how lungs work (using information from the **How Lungs Work** sub-section above).
 - d) Illustrate how lungs work by using the pump to fill them with air, just like when you inhale. Allow 3-4 seconds to pass between compressions.
 - e) Point out how well the healthy lung can fill completely with air, and how quickly it returns to normal size when you stop pumping.
6. Show the unhealthy lung next:
 - a) Have the group take note of its colour. Explain that the colour shows the build-up of tar from cigarettes.
 - b) Slowly begin pumping the lungs, allowing 3-4 seconds to pass between compressions.
 - c) Point out how the unhealthy lung inflates slowly and fails to return to normal size between “breaths.” This is like what a person who has emphysema might experience while breathing. Share some information about emphysema and other diseases from the **Health Effects of Smoking** sub-section.
 - d) With your gloved hand, point out the lump in the bottom part of the unhealthy lung and how it is blocking off the air. Ask the group how they think a person with lungs like this would breathe.
 - e) You can let individuals come up and **put on gloves** to touch the lungs. Have each person take one glove to use. Let them feel the tumor and the emphysema.
7. You can share some facts from the **Second-Hand Smoking** sub-section and the **Cannabis, Vaping and Your Lungs** section.
8. Finish by discussing how important our lungs are for living. For example, talk about activities like soccer, basketball, hockey, dancing, volleyball, biking and walking and how much we need our lungs to be able to do all these things.

For more information on how to set up the lungs or properly handle any of the materials, please contact the Porcupine Health Unit 1-800-461-1818.

Adapted with permission from North Bay Parry Sound Health Unit.

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Sources:

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<https://www.drugfreekidscanada.org/> Drug Free Kids Canada (Accessed: October 19, 2023)

Learning About Emphysema

<https://myhealth.alberta.ca/health/AfterCareInformation/pages/conditions.aspx?HwId=uf10356>

MyHealth.Alberta.ca Government of Alberta Personal Health Portal (Accessed: July 6, 2021)

Lesson Plan - Pig Lung Demonstration Model <https://nuquits.gov.nu.ca/resources/item/lesson-plan-pig-lung-demonstration-model> Nunavut Quits (Published: December 07, 2020)

COPD <https://www.mayoclinic.org/diseases-conditions/copd/symptoms-causes/syc-20353679> Mayo Clinic
(Published: April 15, 2020)

Tobacco <https://www.who.int/news-room/fact-sheets/detail/tobacco> World Health Organization (Accessed: October 20, 2023)