The Normal Lung

This information sheet will explain what lungs are and how they work.

How do the lungs normally work?

The chest has two lungs, one lung on the right side of the chest, the other on the left side of the chest. Each lung is made up of sections called lobes.

The lungs are soft and protected by the ribcage. The lungs' purpose is to bring oxygen into the body and remove carbon dioxide.

How does air get into the body?

To get oxygen to the body, air is breathed in through the nose, mouth or both. The nose filters out, for example, dust, it warms the air and it adds needed moisture (humidity).

Air entering through the nose or mouth travels down the trachea or "windpipe". The trachea is the tube that runs down the neck. Behind the trachea is the oesophagus (used to swallow food). When we inhale (breathe in), air moves down the trachea, and, when we eat, food moves down the oesophagus. The epiglottis controls 'a gate' that stops food from going down the trachea. Sometimes, food or liquid goes down the trachea and causes coughing and choking.

The trachea divides into one left and one right breathing tube and these are called bronchi. The left bronchus leads to the left lung and the right bronchus leads to the right lung. These breathing tubes divide again into smaller and smaller tubes called bronchioles. The bronchioles end in little air sacs called alveoli. Not all alveoli are in use at one time, so that each lung has many to spare if damaged by disease, infection or surgery.

How do lungs deal with oxygen and carbon dioxide?

Small blood vessels or capillaries surround each alveoli like a net. Through these, oxygen that has travelled down the breathing tubes into the alveoli enters the blood. The carbon dioxide or "exhaust" gas from the body trades places with the oxygen by leaving the blood and entering the alveoli. Carbon dioxide is then breathed out (exhaled out) of the lungs.

The lungs also have blood vessels and a covering of nerve fibres. On the outside of the lungs there are two layers of thin material called pleura. One pleura is joined on to the outside of the lungs and the other is joined to the inside of the chest, close to the ribs. Pleura allows the organs to move easily past each other with each breathe.

What blood vessels do in the lungs

The lungs also have two sets of blood vessels. Blood vessels can be arteries or veins. One set of blood vessels feed into the lungs, while another set moves oxygen from the lungs to the body through the heart. Blood that picks up oxygen from the lungs returns to the left side of the heart. It is then pumped out to send this oxygen-rich blood (called arterial blood) to the body.

After the blood has delivered oxygen to the cells of the body (skin, organs, etc.) it is called venous blood. Venous blood returns to the right side of the heart. It contains high amounts of carbon dioxide and small amounts of oxygen. The venous blood returns to the lungs to remove carbon dioxide and to pick up oxygen.

Which muscles help breathing?

Many different muscles are used in breathing. The largest muscle is the diaphragm. The diaphragm is a large muscle that lies under the lungs and parts them from the organs below, such as the stomach, intestines and liver. As the diaphragm moves down or flattens, the ribs flare outward, the lungs get bigger and air is drawn in. As the diaphragm relaxes, air leaves the lungs and they spring back to their original position. The lungs, like balloons, need energy to blow up but no energy is needed to let air out.

Breathing uses muscles that sit between the ribs and muscles running from the neck to the upper ribs. The diaphragm, muscles between the ribs and one of the muscles in the neck called the scalene muscle are involved in almost every breath we take. If we need more help expanding our lungs, we get these other muscles in the neck and shoulders to help.

How do the lungs protect themselves?

The lungs have several ways to protect themselves from things that damage them. The nose filters air when we breath in, stopping, for example, dust from going into the lungs.

If things we breathe in with the air go into the lungs, it gets stuck in a thin layer of mucus (also called sputum or phlegm) that lines the inside of the bronchi (breathing tubes). Mucus is "swept up" to the mouth by little hairs called cilia that line the breathing tubes. Cilia move mucus from the lungs up the throat to the epiglottis. The epiglottis will then open to swallow mucus without us thinking about it.

Prolonged coughing or needing to spit up sputum is not "normal" and does not happen unless the person has chronic bronchitis or there is an infection, such as a chest cold, pneumonia or chronic obstructive pulmonary disease (COPD).

Lungs cough to protect themselves. A cough, while common, is not normal. It's caused by irritated bronchial tubes. A cough can remove mucus from the lungs faster than cilia.

The last of the common methods used by the lungs to protect themselves can also create problems. The airways in the lungs are surrounded by bands of muscle. When the lungs are irritated (sore), these muscle bands can tighten, making the breathing tube narrower as the lungs try to keep the thing causing a problem out.

Related content

American Lung Association (2016) "What Are The Symptoms of Lung Cancer?"

European Lung Foundation (2016) "Lung Cancer"

Lung Foundation Australia (2012) "Better Living with Lung Cancer: A Patient Guide"

About Lung Foundation New Zealand

Lung Foundation New Zealand is a non-government organisation dedicated to promoting healthy lungs and early detection of lung disease (including lung cancer, New Zealand's biggest cancer killer). The Lung Foundation is devoted to supporting people affected by lung disease and provides a voice for patients and their families.

Lung Foundation New Zealand advocates on a range of issues, including access to more effective funded treatments, an increase in research funding and a commitment to making Aotearoa a smoke free nation by 2025.

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Lung Foundation New Zealand is an independent organisation and is reliant on support from fundraising events, donations and bequests. This resource has been produced as the result of generous support provided by members of the public.

If you or a member of your family would like to support our work we would love to hear from you. Together we can save lives by increasing awareness about lung health and early detection of lung disease. Please visit our website www.lungfoundation.org.nz or contact Philip Hope, CEO on (+64) 021 959 450 or philip.hope@lungfoundation.org.nz

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Thanks to the American Lung Association and the European Lung Foundation for allowing us to adapt their resources for our New Zealand readers.