Information Sheet

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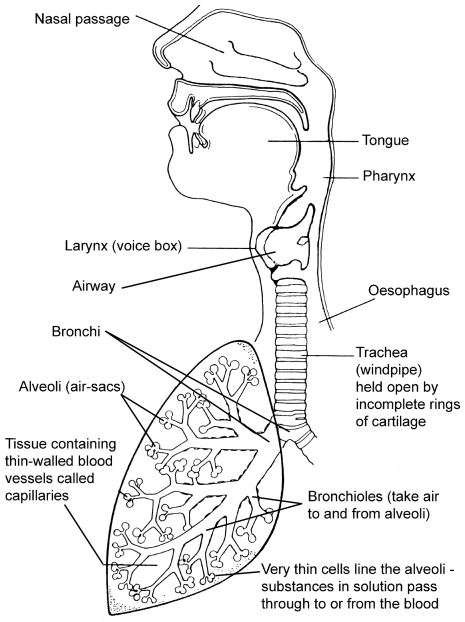
Smoking & lung disease

How the lungs work

We all need to take in oxygen to stay alive. Breathing is the process where we inhale oxygen, and exhale (breathe out) carbon dioxide, a waste gas produced by the body. Usually, this happens without us noticing. Air is drawn into the body through the mouth and nose, and into the trachea or windpipe, and then into the lung through the bronchi. The bronchi have many branches that gradually decrease in size, like the limbs of a tree. Finally, after going through smaller and smaller bronchi, air reaches tiny air sacs called alveoli. Inside the alveoli, oxygen moves from the air sacs into tiny blood vessels, called capillaries, where the red blood cells carry it around the body to supply the body tissues. Blood then carries carbon dioxide back into the lungs, where it is breathed out.

The lungs also clean the air that we breathe, making sure that germs and particles don't get into our bodies. Mucus lines the airways and traps unwanted material. Special hairs or cilia, line the walls of our airways - nose, throat, trachea and bronchi - to help move particles and germs trapped in the mucus and sweep them towards our mouth where they can be coughed out or swallowed.

If we damage our lungs or airways, they are no longer able to take in oxygen, remove the waste carbon dioxide as well as before, or protect us from germs and irritant particles



The lungs of smokers

Many smokers can tell that smoking is causing damage to their lungs. They sometimes feel short of breath and puff more easily than they used to. These things happen because every time a cigarette is smoked, the following occurs:

- the minute hairs in the upper airways (cilia) are paralysed or damaged by the chemicals in cigarette smoke
- the lungs are irritated so the airways narrow, which encourages phlegm and makes it harder to breathe
- carbon monoxide, a poison, is forced into the blood and restricts the oxygen carrying capacity of the blood.[1]

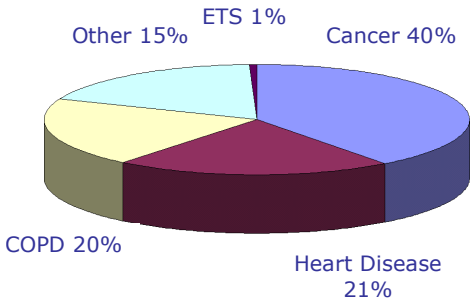
Government of South Australia Department of Health
Heart Foundation
The Cancer Council South Australia

Lung diseases and smoking

Smoking has been linked to a number of respiratory diseases

- Chronic Obstructive Pulmonary Disease (COPD) - a group of diseases including chronic bronchitis and emphysema
- Lung cancer and other cancers of the airways, including the oesophagus and larynx
- Asthma.

The diagram below shows how many deaths in Australia due to smoking are caused by any particular disease group. [3]



Chronic Obstructive Pulmonary Disease (COPD)

Chronic obstructive pulmonary disease (COPD) is a long-term lung disease that causes shortness of breath, which initially occurs with exertion and becomes progressively worse over time. Limitation of the airways due to COPD is irreversible. [17]

Initially, shortness of breath may happen only when walking up hills or stairs. But with serious disease, even walking and normal activities will become difficult. People with these diseases often live for many years in varying degrees of discomfort and disability.

Smoking and COPD. The following three separate but often interconnected processes that occur in the lung lead to COPD.

- Inflammation of the bronchi, causing excessive amounts of mucus to be produced. This leads to coughing and phlegm production, and breathlessness. It may be associated with low-grade infection in the airways (***chronic bronchitis***).
- The alveoli (air sacs) are gradually destroyed, so it becomes difficult to get enough oxygen. (***Emphysema***).
- Bronchi become narrow and floppy, making it difficult to breathe out. [5]

Chronic bronchitis and ***emphysema*** usually occur in current or former smokers. Current smokers are up to 10 times more likely to have the disease than non-smokers. [17] Many people have a mixture of both diseases. While COPD is irreversible, quitting smoking has been shown to slow the progression of the disease.

Other effects of COPD include a greater susceptibility to ***chest infections*** and ***pneumonia***.

Statistics. Most people with COPD have smoked over 20 pack years of cigarettes (20 cigarettes per day for 20 years). Smoking contributes about 85% of the risk of developing COPD.[1]

- In 2003, there were 5,578 deaths from COPD. (5th leading cause of death) The rate of male COPD deaths is going down, but is rising in women[17]
- AIHW estimates that in 1996, there were 300,000 people in Australia with COPD, with 20,000 new cases each year[3]
- COPD accounts for about a third of tobacco related hospital separations (visits) in Australia
- Respiratory disease is the fourth leading cause of death of Aboriginal Australians[4]

It is estimated that in the Australian population in 1998, 70% of all COPD in men, and 60% in women was attributable to smoking. In smokers, 90% of COPD is attributable to smoking. [2]

Most COPD in Australia could be prevented if people did not smoke.

Lung cancer

The other major respiratory disease that smoking causes is lung cancer - the first major disease to be causally linked with smoking. During the 1920's and 1930's doctors and scientists began to notice that more patients were developing lung cancer.[6] Until then, lung cancer had been an unusual disease.[7], [8]. In 1950, research from the United States of America and Britain identified smoking, and especially cigarette smoking, as the cause of the rise in the amount of lung cancer.

New evidence has identified an important gene - p53, found in the nucleus of every cell. P53 is described as the 'guardian of the genome' and one of its main roles is to clean up any errors or changes that occur within copied cells. This means that any cell with damaged p53 is highly susceptible to cancer.[9] Damaged DNA that replicates during cell division results in a modified cell population that may ultimately evolve into cancer.

In 1996, scientists made a direct link between smoking and lung cancer when they proved that benzopyrene, a carcinogen found in high concentrations in cigarette smoke, directly damages p53, and leaves a distinctive signature.[10]

Risk. The risk of developing lung cancer is related to both how long and how much a person has smoked. For instance, a person who takes up smoking in their teens is five times more likely to die of lung cancer than someone who starts after their mid twenties. Smokers' risk of dying from

lung cancer is more than 10 times that of a non-smoker, and heavy smokers are between 15 and 25 times more at risk.[11]

Lung cancer usually takes at least 20 years to develop, and death rates today from lung cancer reflect increasing smoking rates beginning in 1910 -1920.[12] Men's lung cancer rates peaked in the early 1980's and are now in decline, reflecting declining smoking rates over the past three decades. Lung cancer in women is still increasing. In Australia in 1998, 90% of lung cancers in men and 65% in women were attributable to smoking. In smokers, the proportion of lung cancer attributable to smoking reaches 90% in both men and women.[2]

Mortality. In Australia in 2002, lung cancer was the third leading cause of death for men, and the sixth most common cause for women. (Compared to other cancer deaths, lung cancer is leading cause for men, and 2nd most common cause of cancer death in women.)[4]

Lung cancer mortality (death due to lung cancer) remains high once it has been diagnosed. Unlike many other cancers, there has been very little progress made in terms of early diagnosis and treatment. Consequently, the lung cancer mortality to incidence ratio (MIR) is high (between 0.8 and 0.9), which gives a rough indication of the survival rate of people with lung cancer. In layman's terms, this means that once diagnosed with lung cancer, most people die from the disease. As the MIR approaches 1.0, the survival rates of these cancers decrease. For comparison, the MIRs for some other cancers are 0.42 (colorectal), 0.37(cervix), 0.25 (prostate), 0.26 (female breast cancer) and 0.11 (melanoma). [13]

Most lung cancer in Australia would not occur if people did not smoke.

Quitting begins to reverse some of the health effects of smoking, including the risk of getting lung cancer. Ex-smokers' lung cancer risk continues to decline as the years go by, but as many as half of all lung cancer is diagnosed in ex-smokers.[16]

Other cancers of the respiratory system

Smoking is a major cause of cancers of the oral cavity, oesophagus and larynx. The use of alcohol in combination with smoking greatly increases smokers' risk for these cancers. [15]

Asthma

Asthma is a very common condition affecting the airways in the lungs. These become inflamed and irritable. When these irritable airways are exposed to certain 'triggers' the airways narrow, leading to difficulty in breathing. The result is a reduction of the flow of air in and out of the lungs.

The most common symptoms of asthma are difficulty in breathing or shortness of breath, a feeling of tightness in the chest, wheezing and coughing (particularly at night). Asthma attacks can occur without warning, but are often related to poor control.

According to Asthma Australia, two in five primary aged children have asthma. As well, one in seven adolescents and one in ten adults have asthma.

The most common asthma trigger is viral infections (colds and flu). Others include

- house dust mite
- pollens
- moulds
- animal dander (or hair)
- exercise (but this can be managed)
- tobacco smoke.

Tobacco smoke is a powerful trigger for people with asthma, and one that all children should avoid. Smoking should be avoided anywhere around infants and children - like family rooms, kitchens, cars etc. Young people and adults with asthma should not smoke, as this further damages lungs. Where possible, they should try and avoid places where other people smoke too.

Exposure to cigarette smoke during pregnancy and early childhood significantly increases the risk of children developing asthma, and has also been shown to make asthma attacks more severe. It has been estimated that 8% of all childhood asthma (46,500 children) in Australia is due to parental smoking. [16]

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Useful web links

The Cancer Council South Australia
http://www.cancersa.org.au

Asthma SA
http://www.asthmasa.org.au

Australian Lung Foundation
http://www.lungnet.org.au

AIHW health publications
http://www.aihw.gov.au/publications/health.html

- Chronic diseases and associated risk factors in Aust 2001
- Heart, stroke & vascular diseases-Australian facts

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