

What Causes Cancer?

This leaflet gives a brief overview of the causes of cancer. There are separate leaflets on the different types cancer.

What is cancer?

Cancer is a disease of the cells in the body. The body is made up from millions of tiny cells. Different parts of the body such as organs, bones, muscles, skin, and blood are made up from different specialised cells. All cells have a centre called a nucleus which contains genes made from DNA. The genes control the functions of the cell.

There are many different types cells in the body, and many different types of cancer which arise from different types of cell. What all types of cancer have in common is that the cancer cells are abnormal and multiply 'out of control'. See the leaflet called 'What is Cancer' for more details.

What causes cancer?

Each cancer is thought to first start from one abnormal cell. What seems to happen is that certain vital genes which control how cells divide and multiply are damaged or altered. This makes the cell abnormal. If the abnormal cell survives it may multiply 'out of control' into a malignant tumour.

We all have a risk of developing cancer. Many cancers seem to develop for no apparent reason. However, certain risk-factors are known to increase the chance that one or more of your cells will become abnormal and lead to cancer. Risk factors include the following:

Chemical carcinogens

A carcinogen is something (chemical, radiation, etc) which can damage a cell and make it more likely to turn into a cancerous cell. As a general rule, the more the exposure to a carcinogen, the greater the risk. A list of known and suspected chemical carcinogens can be found at <http://physchem.ox.ac.uk/MSDS/carcinogens.html> Well known examples include:

- **Tobacco smoke.** If you smoke, you are more likely to develop cancer of the lung, mouth, throat, oesophagus, bladder and pancreas. Smoking is thought to cause about a quarter of all cancers. About 1 in 10 smokers die from lung cancer. The heavier you smoke, the greater the risk. If you stop smoking, your risk goes down considerably.
- **Workplace chemicals** such as asbestos, benzene, formaldehyde, etc. If you have worked with these without protection you have an increased risk of developing certain cancers. For example, a cancer called mesothelioma is linked to past exposure to asbestos.

Age

The older you become, the more likely that you will develop a cancer. This is probably due to an accumulation of damage to cells in the body over time. Also, the body's defences and resistance against abnormal cells may become less good as you become older. For example, the ability to repair damaged cells, and the immune system which may destroy abnormal cells, may become less efficient with age. So, eventually one damaged cell may manage to survive and multiply 'out of control' into a cancer. Most cancers develop in older people.

Lifestyle factors

Diet and other lifestyle factors may increase or decrease the risk of developing cancer. For example:

- If you eat a lot of fruit and vegetables you have a reduced risk of developing certain cancers. The exact way in which they protect against cancer is not fully understood. These foods are rich in vitamins and minerals, and also contain chemicals called 'anti-oxidants'. They may

protect against damaging chemicals that get into the body. We should all eat *at least* five portions of fruit and vegetables per day (some experts recommend even more).

- Eating too much fatty food possibly increases the risk of developing certain cancers.
- The risk of developing certain cancers is increased by: obesity, lack of regular exercise, and drinking a lot of alcohol.

Radiation

Radiation is a carcinogen. For example, exposure to radioactive materials and nuclear 'fallout' can increase the risk of leukaemia and other cancers. Too much sun exposure and sunburn (radiation from UVA and UVB) increase your risk of developing skin cancer.

The larger the dose of radiation, the greater the risk of developing cancer. But note: the risk from small doses such as from a single X-ray test is very small.

Infection

Some viruses are linked to certain cancers. For example, people with persistent infection with the hepatitis B virus or the hepatitis C virus have an increased risk of developing cancer of the liver. But, most viruses and viral infections are not linked to cancer.

Immune system

People with a poor immune system have an increased risk of developing certain cancers. For example, people with AIDS, or people on immunosuppressive therapy.

Your genetic make-up

Some cancers have a strong genetic link. For example, in certain childhood cancers the abnormal gene or genes which may trigger a cell to become abnormal and cancerous are inherited. Other types of cancer may have some genetic factor which is less clear-cut. It may be that in some people their genetic make-up means that they are less resistant to the effect of carcinogens or other factors such as diet.

Most cancers are probably due to a combination of factors

Not everybody who comes into contact with a carcinogen or has an unhealthy lifestyle will develop cancer. For example, not all smokers develop cancer of the lung. In fact, we are all probably exposed to low doses of carcinogens a lot of the time.

The body has certain mechanisms which may protect us from developing cancer. For example, it is thought that many cells which are damaged by carcinogens can repair themselves. Also, the body's immune system may be able to destroy some types of abnormal cells before they multiply into a tumour. Perhaps one carcinogen may only damage one gene, and two or more genes may need to be damaged or altered to trigger the cells to multiply 'out of control'.

In many cases it is likely that a combination of factors such as genetic make-up, exposure to a carcinogen, age, diet, the state of your immune system, etc, play a part to trigger a cell to become abnormal, and allow it to multiply 'out of control' into a cancer.

Further help and information

Cancer Research UK

Their website www.cancerhelp.org.uk provides detailed facts about cancer.

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Comprehensive patient resources are available at www.patient.co.uk