

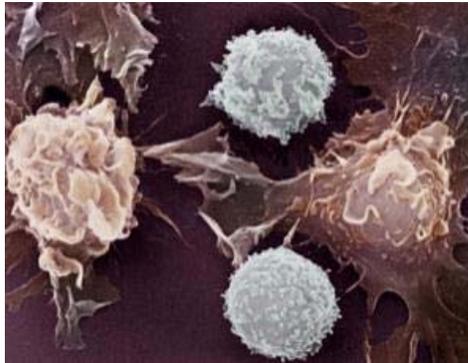
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## Introduction: Cancer

11:45 04 September 2006 by [Phyllida Brown](#)  
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One in three of us will get [cancer at some point](#) in our lives. Once so feared its name was whispered, the disease is [no longer an inevitable death sentence](#). Today, almost two-thirds of those who develop cancer will still be alive five years later, compared with just half in the 1970s.

Cancer has turned out to be tougher to crack than everyone hoped when US President Richard Nixon launched the War on Cancer in 1971. But death rates are [falling](#), thanks to [earlier detection](#) of tumours and improved use of existing treatments - mainly [chemotherapy](#) and [radiotherapy](#). The success has been biggest for children: since the mid-1970s, death rates from cancers of childhood have halved. Of those with the most common [childhood cancer](#), acute lymphocytic [leukaemia](#), 85% are still alive five years later, compared with just 53% in the 1970s.



Cancer is a group of over one hundred diseases, all of which share the common feature of uncontrolled spreading of malignant cells in the body (Image: Science Source / Science Photo Library)

### Inner workings

A key reason why cancer patients are living longer, is that scientists now understand more clearly what happens when cells turn cancerous. Cancer begins when genes which [normally control cell division](#), growth and repair are damaged [through mutation](#). These genes can then cause cells to grow and divide uncontrollably, [destroying neighbouring healthy cells](#). For example, a gene called [p53](#), which normally acts as a brake on cell division, turns out to be mutated or lost in about half of all tumours. Another [proto-oncogene](#), *Myc* normally helps healthy cell division, but can [become an oncogene](#) if damaged, causing cells to divide unchecked.

Mutations can arise by [chance errors in DNA replication](#), and genes can also be damaged by [carcinogens](#) - such as [tobacco chemicals](#), [benzene](#), possibly [acrylamide](#) and some [food additives](#) - or ultraviolet light from sunshine. Certain [viruses](#) can also trigger gene mutations, such as the [human papilloma virus](#) that can cause [cervical cancer](#).

Some mutated genes are inherited: two examples are [BRCA1](#) and [BRCA2](#), which together account for about 5% of all breast cancer cases. [Other genes](#) such as [DBC2](#), [EMSY](#) and [FA](#) have been implicated in ovarian, breast and lung cancer.

Once a cell has turned cancerous, it divides until a mass of cells forms a tumour. Diagnostic tests can quickly distinguish between [malignant, or cancerous](#), tumours and those that are benign, or harmless. As a malignant tumour progresses, cells or clumps of cells break off and spread, [or metastasise](#), around the body via the lymphatic system and blood vessels.

The latest generation of treatments exploit our knowledge of what happens within cancerous cells. These target proteins and messenger chemicals - such as [growth factors](#) or [enzymes](#) - that the errant cells need to survive and grow.

[Glivec](#) (or Gleevec), for example, targets abnormal proteins that help cancerous cells to grow. Dubbed the first "[magic bullet](#)" for cancer, it is used to treat one type of [leukaemia](#) and a rare cancer of the gut. Another drug, [17AAG](#), targets cancer cells by suppressing [Hsp90](#) - a protein vital for their growth. The drug is undergoing trials to treat melanoma and other cancers that affect the prostate, kidney and breast.

An alternative approach is to persuade the immune system to attack [tumours](#), using [vaccines](#), biological therapies such as alpha interferon or [interleukin 2](#) and [genetically altered white blood cells](#). In the future, scientists hope to target [stem-cell-like cells](#) within cancers that may be responsible for

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most of the growth of some tumours, and evade existing drugs. They also plan to use [nano-drugs](#), [nano-bullets](#) and "smart bombs" to [deliver molecules](#) with pinpoint precision to tumour cells.

Even [soil-living](#) or [flesh-eating](#) bacteria, [engineered viruses](#), [weed extracts](#), [microwaves](#), chemicals from [Antarctic sea squirts](#) and the immune [cells of siblings](#) have been recruited to destroy tumours.

## Prevalence Patterns

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In developed countries, the cancer most likely to afflict you is [non-melanoma](#) skin cancer, often caused by the Sun's harmful [ultraviolet rays](#). This is usually treated and cured. [Melanoma](#), a deadlier skin cancer, is less common but is [increasing](#) by around 3% a year in the US. Though UV light is the cause of many [skin cancers](#), there is [some evidence](#) that small amounts may also [help prevent](#) other cancers. In the developing world the most common cancers are linked to infectious agents, such as [cervical cancer](#) or [liver cancer](#), caused by hepatitis B.

The biggest killer in industrialised nations remains [lung cancer](#). For men, lung cancer mortality has been falling since 1990, mirroring a peak in [popularity of smoking](#) during the 1960s. For women, who commonly took up smoking later, lung cancer mortality is still rising. Tobacco is also rapidly becoming the leading cause of cancer [in Asia](#).

[Breast cancer](#) accounts for almost one in three of all cancers diagnosed in women each year. For men, [prostate cancer](#) is just as common, with the highest rates in [African American](#) men and Caribbean men of African origin.

Screening for both of these diseases has [improved sharply](#). Early breast tumours show up on a [mammogram](#) long before they can be [felt as a lump](#). More women now survive the disease - three-quarters of women whose breast cancer was diagnosed 10 years ago are still alive today. Similarly, a [prostate-specific antigen](#) (PSA) test has revolutionised [early diagnosis](#) for this cancer in the US. Some [experts argue](#) that screening can be [harmful](#), however.

## Factoring in risk

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Dozens of factors affect an individual's risk of getting cancer. [Smoking](#) is the biggest single risk factor - with tobacco linked to about a [third of all cancers](#).

Another clearly established risk factor is exposure to [ionising radiation](#). This may be responsible for cancers in people living around [Chernobyl](#) in Ukraine, [Toikamura](#) in Japan and for people working in [nuclear power plants](#). [Radiation](#) may also have led to a high incidence of cancer in those who witnessed [early nuclear tests](#) or have been in contact with [depleted uranium](#) munitions, though a recent study [contests this risk](#).

Risk factors for developing breast cancer include: being childless or [delaying childbearing](#) until aged over 30, starting periods early, using [hormone replacement therapy](#), being exposed to [oestrogen-like](#) chemicals, and drinking one or more [units of alcohol](#) daily. More than one risk factor is usually needed before cancer cells develop.

Risks posed by living near overhead [power lines](#) or [petrol stops](#), or using [cellphones](#), are less clear.

## Preventative steps

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If everyone stopped smoking, cancer deaths could be cut by one-third, researchers estimate. Moves to protect people from [passive smoking](#), in bars for example, are gaining ground in many industrialised countries.

Staying out of sunlight and using strong [sunscreens](#) could prevent hundreds of thousands of us from developing skin cancer worldwide annually. [Foods](#) rich in [antioxidants](#) and beneficial fatty acids such as [omega-3](#) and oleic acid found in [olive oil](#) - a key ingredient of the healthy [Mediterranean diet](#) - seem to protect against some cancers, although the findings are mixed.

Doctors can increasingly intervene directly to prevent cancers. For example, [vaccines against hepatitis B](#) could soon cut deaths from liver cancer. There are also preventive therapies - such as [tamoxifen](#) or the trial drug [anastrozole](#) - that [interfere with](#) the production of the hormone oestrogen, implicated in many breast cancers. Doctors believe that it could halve the rates of breast cancer in women with a family history of the disease.

All this means that, while hopes of total cure for cancer are still unrealistic, the disease is increasingly under control.

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