

# **Cancer**

## **A Beginner's Guide**

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*Beginners*  
**GUIDES**

# **Cancer**

## **A Beginner's Guide**

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A Oneworld Book

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# Second edition notes

Although the first edition of this book was well received, a number of readers felt that the sections discussing the biology of cells and DNA were rather difficult for the non-scientifically trained. In this edition I have therefore simplified these chapters, restricting their content to what is really essential to the understanding of later parts. The detail that has been removed is now available in the appendices for those who wish to understand the basic biology at a deeper level.

Many changes have been made in response to advances in our knowledge and understanding of cancer. Some of these are simply because time has elapsed. For example, the data on the survivors of the nuclear bomb attacks at Hiroshima and Nagasaki has now revealed a greater increase in the occurrence of solid cancers than was apparent at the time that the first edition was published. Numbers for the risk and survival for several of the cancer types have also been updated. Furthermore, in the past few years new information on the causes of lung cancer and the role of dietary components such as processed meats and alcohol in a wide range of cancers has come to light.

There have also been some significant changes in the available statistics for the risk of breast cancer in relation to hormone replacement therapies and screening. The section discussing the risks and benefits of breast cancer screening and the effects of using HRT have therefore been substantially updated.

It is never possible in such a fast-moving field to be up to date for long, but I have nevertheless provided information on the latest approaches to cancer therapies, especially those that aim to activate the immune system, which are currently at the forefront

of new successes and have largely come to fruition since the publication of the first edition.

This edition ends with a broader consideration of what we can all do to avoid or reduce our risk of cancer. Much of this is very well known, such as avoiding tobacco smoke and excess UV light, etc. However, I also consider the potential role of other factors that might have a less pronounced impact on cancer risk, such as exercise or green tea.

Thanks to Shadi Doostdar of Oneworld for her helpful and thorough criticisms of this second edition. I would like to acknowledge all those who have posted reviews of the first edition of this book, especially those on the Macmillan website, since these have been a driving force for many of the changes in this edition.

Finally, this edition is dedicated to the hardworking nurses at Macmillan and, to put my money where my mouth is, all my royalties from the book's sales will go to that charity.



# Introduction

Cancer is one of the most common life-threatening diseases of the modern world. Of all the potentially fatal diseases we are likely to encounter, cancer is second only to heart disease, killing one in four people in the West. We will all come into contact with it, either personally or as bystanders if friends and family are diagnosed with one of its different forms. And although many cancers are almost entirely curable with minimal therapy, this is not true of all of them. But do most of us really understand what cancer is?

We all know that cancer usually appears as a ‘lump’, an unwanted ‘growth’ called a ‘tumour’. We know it can appear in almost any part of the body. We know that treatments for cancer can cause unpleasant side effects and that they do not always succeed in ridding us of the disease. However, most of us really have very little idea of the true nature of cancer. A clear insight into the biology of cancer is essential for scientists and clinicians, but I believe we can all deal better with the consequences of cancer if we really understand what it is.

For many, cancer is seen as an alien intent on our destruction. It grows inside our bodies, eventually overwhelming our life-support systems. Its purpose is to destroy us, for its own benefit. While this would be a good description of many diseases, it is not a fair portrait of cancer. The drug-resistant ‘superbug’ Methicillin-Resistant Staphylococcus Aureus (MRSA), which lurks in our hospital wards, is indeed such an alien invader. It does attempt to destroy us for its own benefit and moves on to a new host at the first opportunity. Viruses, for example the Human Immunodeficiency Virus, HIV (which causes AIDS),

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are even more sinister in their behaviour. They invade us, enter the body's cells and use the cells' own machinery to provide the building blocks they need to replicate themselves before they leave the body and spread to another victim. Their host's demise is of no consequence to them; viruses have evolved to feed upon us for the good of their own kind.

Cancer is different. It arises from our own flesh and blood. Our bodies are composed of billions of individual cells, organized into tissues such as bone, muscle or skin, that together build our functional organs. The cells of a cancer, which can increase in number to a point when we are eventually left unable to fight them off, are our own cells. Despite its reputation as an aggressive 'being', a cancer gains no benefit from its host's eventual downfall. Cancer cells don't survive when we give up the fight; they do not move on to a new host. They are part of us and they die with us.

Cancers normally arise when, due to damage – mutations – to its genes, just one cell escapes the many controls that make it behave correctly. It is as if a person develops a fatal flaw in their ability to behave in the way their society requires and instead causes mayhem in the community. You might ask 'What is acceptable behaviour for a cell?' As with people, this depends very much on when and where you ask the question. Behaviour that is acceptable in a young, developing child may be far from acceptable in an adult. It's the same for cells: the cells in a baby abide by rather different rules from those in an adult. It's absolutely fine for the cells of a baby's growing bones to increase rapidly in number, but this behaviour would be disastrous in the limbs of an adult. Similarly, it is essential for cells in a baby's developing nervous system to migrate through the body as it grows, but we certainly don't want this to happen once the body is fully formed. Even within a specific tissue, it is fine for some cells to increase in number rapidly, but totally unacceptable for others. These are exactly the sorts of behaviours that go wrong in cancer.

Cancer is the result of cells acquiring many abnormalities in their behaviour. Among these abnormalities are the abilities to produce more cells in an uncontrolled manner, to become immortal and avoid any urge to die and to spread throughout the body. Cells that will become a cancer make these changes gradually, overcoming the many safeguards that normally ensure cells stay on the straight and narrow. When only some of these behaviours have been acquired – for example, uncontrolled growth and immortality – the cells can form an abnormal tissue mass, a *benign* tumour, which can readily be removed and cured. The gradual change from normal cell, to benign tumour to a cancer that can be described as malignant ('showing intense ill will') is called *tumour progression*. I will talk more about tumour progression in Parts 1 and 2.

Even those who spend their lives treating or studying cancer often have only a superficial understanding of aspects of cancer distant from their specialist interest. One reason for this surprising lack of knowledge, given the prevalence of cancer, is that there is no book specifically designed to explain the many issues related to cancer in a clear and straightforward way. This is why I decided to write this book. I will describe what goes wrong in the rogue cells we call cancer, what causes these defects and how scientists and doctors are attempting to remove the wayward cells from our bodies.

This book is aimed primarily at people who want to better understand what cancer is, how we can try to avoid it and how we can treat it. The topics I will cover range from the basic biology of the cell and how this is disrupted in cancer to the underlying mechanisms of cancer therapies and the latest research and successes in developing more effective and less toxic treatments for cancer.

The study of cancer has revealed some of the beauty of how cells work. It is my interest in the intricacies of how things work that drives me as much as the desire to solve the problem of