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# Progress towards cancer cures

Position statement from

The Institute of Cancer Research, London

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## Introduction

Cancer research has been very successful at driving up survival rates. In England and Wales, the proportion of patients surviving cancer has doubled since the 1970s. Median cancer survival increased from five years to 10 years in just a five-year period between 2005-06 and 2010-11, thanks to advances in our understanding of the biology and genetics of cancers, and a move towards earlier diagnosis and more targeted treatments.

But survival rates vary greatly between different cancer types and remain poor for some cancers, while some treatments can have serious side-effects. New targeted drugs are often effective at extending life but will need to be used in combination if we are to cure more patients, and we currently only have drugs that target about 5% of the 500 cancer genes we know of.

There is still an urgent need for more effective treatments, capable of improving survival and quality of life. Targeted cancer drugs are often highly effective initially, only for tumours to develop resistance. Giving patients combinations or sequences of life-extending treatments can help to control the disease for many years. The Institute of Cancer Research (ICR) believes that these life-extending therapies are an important step towards our ultimate aim – which is to cure cancer. At the ICR we expect cancers to be defeated through a wide variety of different treatments or treatment combinations, matched to a cancer's tumour type and genetics.

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## Key ICR positions

### **Cancer is many different diseases – so it must be treated in many different ways**

What we term cancer is made up of more than 200 different diseases, and each of these is itself genetically diverse. The ICR therefore expects cancers to be defeated through a wide variety of different treatments or treatment combinations, rather than by a single, catch-all cure.

Each patient's cancer is unique. We think that the most effective way of treating cancer will be to design personalised, precision cancer treatments tailored for individual patients and their disease, rather than trying to create a universal cure. Treatment combinations will often include drugs targeted at the specific molecular features of a tumour, plus conventional chemotherapy, enhanced precision radiotherapy, surgery and new treatment approaches such as immunotherapy.

We expect to continue to create innovative targeted drugs and combination therapies that will be highly effective in individual types or genetic sub-types of cancer – offering individual patients increasingly longer lives and eventually a cure.

### **Drug discovery must meet the challenge of cancer's genetic diversity**

We now understand not only that cancers differ genetically from each other, but also that individual tumours are highly genetically diverse. Genetic diversity allows tumours to develop drug resistance through a Darwinian process of evolution, with treatment contributing to the selection of cell types able to survive the particular therapy.

The genetic variation and evolution within tumours can make it difficult to design personalised treatments that have lasting effects against cancer. Tumours often respond initially to new cancer drugs, only to later develop resistance to treatment.

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We must meet the challenge of genetic diversity by innovative new approaches to drug discovery, and by combining personalised and targeted therapies with each other and also used alongside other treatment strategies.

There are a number of approaches to prevent or overcome drug resistance. We could target so-called 'founder mutations' present in every cancer cell, or design drugs that hit multiple pathways at once. Drugs may also need to be used in combination, either with each other, or with other types of treatment. Use of targeted therapies in combination with immunotherapies, or drugs that alter the surrounding environment of a tumour, could also hold particular promise.

Using precision treatments that are targeted to the evolving pattern of genetic changes in individual patients will allow us to personalise care, finding the right combination of therapies for each cancer patient.

## **Our ultimate aim is not just to control cancer – but to cure it**

The ICR's aim is to improve outcomes for patients – by helping patients live longer, and by improving their quality of life. We believe our increased understanding of cancer biology, including how tumours evolve during treatment, provides us with the tools to further improve outcomes. Both long-term control and cure of cancer are important outcomes, and controlling the disease long term can be a route to cure.

Many new cancer treatments are often effective at extending the lives of patients by months or even years. These treatments offer patients valuable extra time with their loved ones. Drugs that currently extend life by a few months could end up being used as part of combinations that help patients live for much longer and perhaps even cure them.

Each new targeted drug that is discovered teaches us more about how cancers develop and respond to treatment, and increases the chances of creating better drugs in future that can cure patients. At the ICR we believe these life-extending therapies are an important step towards our ultimate aim – which is not only to control cancers, but to cure them.