

Cancer Research UK's Research Strategy

2009/10 – 2013/14



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CANCER RESEARCH UK'S RESEARCH STRATEGY 2009/10 – 2013/14

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CR-UK RESEARCH STRATEGY 2009/10 – 2013/14**1. EXECUTIVE SUMMARY**

Cancer Research UK's research (and broader Charity) strategy for the next five years is directed at reducing mortality from cancer. This will include work on primary prevention, earlier presentation, screening and diagnosis and better treatments and treatment management. All of these areas will be underpinned by maintaining a strong portfolio of basic research in biology, imaging, model systems and epidemiology, as well as by investment into training future generations of non-clinical and clinical scientists.

The strategy calls for an enhanced programme of work in earlier presentation and diagnosis, in radiotherapy and surgery and in areas of unmet medical need, such as oesophageal and pancreatic cancer. Our pre-eminence in areas of basic science, drug discovery and development, epidemiology and clinical research will be maintained and supported. There will be further investments to establish greater critical mass in imaging and animal model systems, as well as in biomarker development in order to enable tailoring of therapy to the individual. Primary prevention research will focus on medical interventions and behavioural interventions for smoking and sun exposure. Investments into behavioural research with respect to other lifestyle risk factors, such as obesity, alcohol and exercise will only be carried out indirectly through partnership initiatives with other research funders.

Critically, our research going forward will be predominantly channelled through our five core-funded Institutes and up to 20 Cancer Research UK Centres across the country. These Centres will play a critical role in establishing global excellence in cancer research in their chosen areas, driving discoveries through to improved outcomes by raising standards of care and developing stronger links with local communities. There will be no new Institutes.

A realistic assessment of fundraising potential over the next five years indicates that approximately £300m *per annum* will be available for research, inclusive of capital expenditure and contributions towards UKCMRI. Although this is a considerable sum of money, it is clear that Cancer Research UK will dilute its impact if this is spread too thinly over too many areas. Therefore this strategy explicitly excludes research into supportive and end of life care, and research into survivorship issues. It is clear that these areas of work, important though they are, will have to be supported by other organisations. Disinvestments in areas such as psychosocial oncology and quality of life research will be carried out in a stepwise and sensitive manner over the five year period and we will make concerted efforts to persuade others to take on this work.

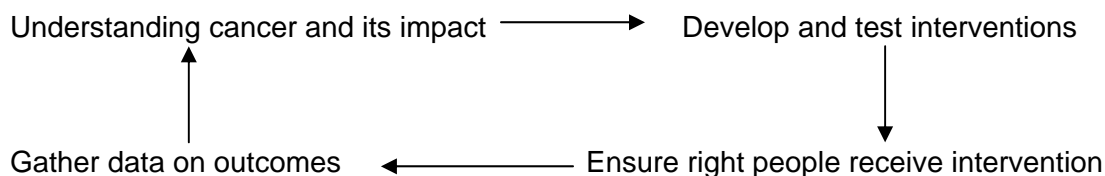
Fundamentally, all of our research investments will be driven by scientific quality and the potential for high clinical impact. We will simplify and streamline our application and administrative processes to maximise the amount of money that goes into research and to give the research community more flexibility to respond to developments and opportunities as they arise.

It is through this strategy that Cancer Research UK expects to make major strides towards achieving the 2020 Goals of the Charity.

1.1 INTRODUCTION

Cancer Research UK has created ten Goals for cancer in the UK that we aim to achieve by the year 2020 by working together with our partners. This document sets out how we plan to work towards these Goals over the years 2009–2014 through our research strategy. It also provides clarity about the areas that we consider to be outside our remit, in which we will cease to invest.

To achieve our Goals we must continue to develop our understanding about how to prevent, diagnose and treat all forms of cancer, we must ensure that such knowledge is developed into interventions and that the right people receive these interventions. We need to gather data on the outcomes and feed this back into our understanding of cancer and its impact. To support this process we need the best people, properly resourced and highly motivated.



Completing this cycle and working towards our Goals involves not only research but also policy work and the provision of factual information. None of this would be possible without the generosity of our supporters and the organisation underpinning the process. Although this document focuses on our research strategy, it has been developed in parallel with Cancer Research UK's five-year Charity strategy, which sets out how the organisation as a whole will work towards our 2020 Goals.

1.2 BACKGROUND

Cancer Research UK's Research Strategy 2009/10 – 2013/14 will ensure that all research into the prevention, diagnosis or treatment of cancer is driven through from basic research to the delivery of our Goals and towards therapy that is tailored to the individual. Our strategic aims are to:

Focus our research – scientific quality and clinical impact

1. Enhance research programmes in early diagnosis, screening and prevention. (Section 3.1.1)
2. Ensure that we have the best mechanisms in place to translate research discoveries into clinical advances in diagnosis and treatment. (Section 3.1.2)
3. Maintain and, where possible strengthen, a broad and balanced portfolio of world-class research in the UK directed at understanding the biology and causes of cancer. (Section 3.1.3)
4. Promote research in areas with the highest levels of unmet medical or research need. (Section 3.1.4)

Provide the right environment for research

5. Establish a UK-wide network of Cancer Research UK Centres to improve outcomes, engage the broader public and increase the knowledge flow from laboratories to patients and vice versa. (Section 3.2.1)
6. Continue to maintain a balanced portfolio of research in different venues, including our five core-funded Institutes. (Section 3.2.2)
7. Create space for bold initiatives. (Section 3.2.3)
8. Continuously review whether we have the right governance and funding streams to meet the needs of our research strategy. (section 3.2.4)
9. Identify and provide access to the key new technologies and infrastructure that are needed to make the fastest progress in cancer research. (Section 3.2.5)

Provide the right people for research

10. Increase the number of international leaders in cancer research working in the UK. (Section 3.3.1)
11. Continue to develop and maintain schemes for training and career development to ensure that the UK is developing a cancer research workforce for the future, pioneering the development and provision of relevant training in our Institutes and Cancer Research UK Centres. (Section 3.3.2)
12. Continue to invest in and foster national and international collaborations to deliver the best research output. (Section 3.3.3)

2. CANCER RESEARCH UK'S VISION, PURPOSE AND GOALS

2.1 VISION

Cancer Research UK's vision is: Together we will beat cancer.

2.2 CANCER RESEARCH UK'S PURPOSE

Our purpose describes what we will do to achieve our vision:

- We carry out world-class research to improve our understanding of cancer and find out how to prevent, diagnose and treat different kinds of cancer.
- We ensure that our findings are used to improve the lives of all cancer patients.
- We help people to understand cancer, the progress we are making and the choices each person can make.
- We work in partnership with others to achieve the greatest impact in the global fight against cancer.

2.3 CANCER RESEARCH UK'S GOALS

In order to articulate how we will measure achievement of our vision, Cancer Research UK has created ten Goals that, together with our partners, we aim to accomplish by the year 2020.

The Goals

We will work with our partners to achieve the following by 2020:

- 1. People will know how to reduce their risk of cancer**
Three-quarters of the UK public will be aware of the main lifestyle choices they can make to reduce their risk of getting cancer
- 2. The number of smokers will fall dramatically**
Four million fewer adults will be smokers, preventing thousands of new cases of cancer every year
- 3. People under 75 will be less likely to get cancer**
The chances of a person developing cancer up to the age of 75 will fall from more than one in four to one in five
- 4. Cancer will be diagnosed earlier**
Two-thirds of all cancer cases will be diagnosed at a stage when the cancer can be successfully treated
- 5. We will understand how cancer starts and develops**
We will have a detailed understanding of the causes and changes in the body in two-thirds of all cases of cancer
- 6. There will be better treatments with fewer side effects**
Treatments that accurately target the cancer and have few serious side effects will be available for at least half of all patients
- 7. More people will survive cancer**
Survival rates for all common cancers will increase, with more than two-thirds of newly-diagnosed patients living for at least five years
- 8. We will especially tackle cancer in low income communities**
The differences in the risk of dying from cancer between the most affluent and the least affluent will be reduced by half
- 9. People with cancer will get the information they need**
At least nine out of ten patients will be able to access the information they need at the time of diagnosis and during treatment
- 10. We will continue to fight cancer beyond 2020**
Sufficient scientists, doctors, nurses and infrastructure will be in place to ensure continued rapid progress in the fight against cancer beyond 2020

3. CANCER RESEARCH UK'S RESEARCH STRATEGY

Why develop a research strategy?

If we are to achieve our 2020 Goals, Cancer Research UK must be clear about its priorities for research. We cannot afford to do everything we would like to do and so we have developed a 5-year strategy for research to support executive decision-making. This strategy provides an overview of our scientific direction, our objectives and targets for science and the expectations we have of our Institutes and Centres. It explains which areas of research we intend to focus on and how we will support that research by providing the right environment and the right people.

How the strategy was developed

This strategy has been developed in the context of the wider Charity five-year strategy, which was approved by Council on 14th October 2008.

The majority of the priorities set out in this document were identified through a process known as the Science Plan, consisting of a programme of 23 separate reviews of individual areas within Cancer Research UK's research portfolio. The Science Plan involved extensive consultation with the research community, other funders, industry, government and our funding committees. All Science Plan reviews were considered by the Council Research Strategy Committee (CRSC) and no recommendations have been implemented without prior approval by CRSC (Figure 1).

Figure 1. Timetable of Science Plan Reviews with CRSC Approval Dates

Review	04/05		05/06		06/07		07/08		08/09
	Sep	Feb	Sep	Feb	Sep	Feb	Sep	Mar	Sep
Radiobiology	Complete								
Drug development		Complete							
SEB & Funding Committees			Complete						
Drug Discovery				Complete					
Epidemiology					Complete				
Basic Cell, Molecular and Tumour Biology Centres				Complete			Complete		
Institutes				Complete					
Research Governance & Management			Complete						
Access to Key New Technologies							Complete		
Clinical Training & Career Development				Complete					
Non-Clinical Training & Career Development				Complete					
Late Phase Clinical Studies							Complete		
Screening & Prevention Clinical Studies								Complete	
Biomarkers								Complete	
Behavioural & Social Sciences									Strategy incorporated
Palliative Care									Strategy incorporated
Surgery							Complete		
Imaging						Complete			
Access to Tissue Resources								Complete	
Disease Specific Review: Pancreatic Cancer							Complete		
Disease Specific Review: Oesophageal Cancer									Complete
Large Projects									Strategy incorporated
Overarching Research Strategy									Strategy incorporated

Complete
 Strategy incorporated into this document

Introduction

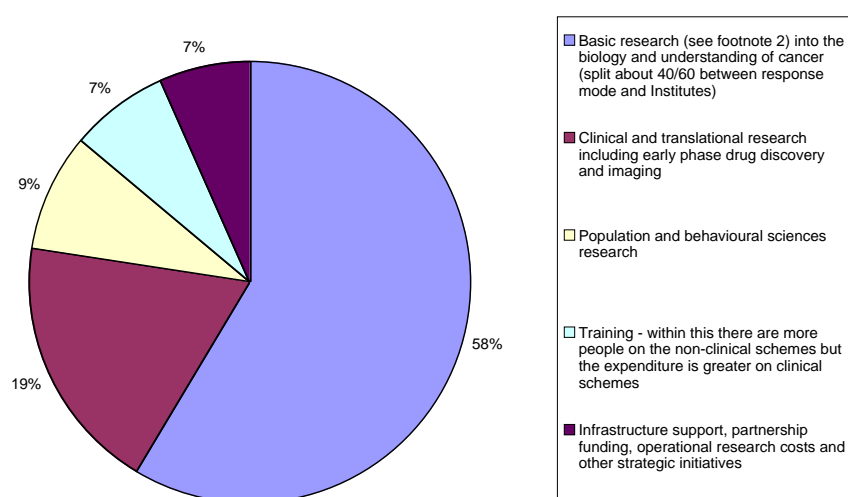
This is a very exciting time for cancer research. The sequencing of the human genome and other major advances in our understanding of biology at a molecular level has led to a transformation in the science and medicine relating to cancer. Technological breakthroughs are enabling exciting discoveries to be made at both a molecular and clinical level. We are now in an era where the large investments made in basic biology over the last several decades have led to an array of discoveries that can be translated into clinical practice. As a consequence,

the effective management of the disease has increasingly moved towards greater tailoring of diagnosis and treatment to each individual on the basis of their biology. The central theme of this research strategy is that Cancer Research UK will make the greatest impact by ensuring that major advances in basic research are driven through to the delivery of our Goals and towards therapy that is tailored to the individual.

Cancer Research UK's reputation is built on our history of funding high-quality research, both in our Institutes and the university and hospital sectors, throughout all parts of the country and across all cancer types. We are acknowledged to have great strengths in epidemiology, in our basic and clinical research portfolios and in our drug discovery and development activities. Over the next five years, Cancer Research UK will focus its research efforts on the understanding of cancer and the development and testing of interventions for prevention, risk stratification, symptom awareness, screening, diagnosis, treatment with curative intent and treatment management. This strategy will allow us to focus and build on our areas of strength, while realising new opportunities. It is also a response to the changing environment as we start to clarify our relationship with, and policy towards, other research funders, and how this should change over time. As we implement our five-year strategy, this should lead to further opportunities for partnership working.

If we continue to invest wisely and build capacity, we have a chance to lead the world in areas outside our acknowledged strengths in basic and clinical research, for example in early detection and chemoprevention, and biomarkers. However, this strategy is based on depth rather than breadth, so we would not extend our portfolio into work outside cancer. Neither would we compromise our basic principles of scientific quality and clinical impact as we seek to build capacity in new areas. Our Institutes are of a very high standard and therefore we should be able to continue to recruit the best scientists from both the UK and overseas where necessary. By developing an overarching research strategy for our Institutes, together with more strategic and coordinated research funding in Universities and hospitals through our Cancer Research UK Centres, we will be in a position to take on tougher scientific challenges and to make real progress towards achieving our Goals.

Figure 2. Current balance of CR-UK research spend¹ based on 2008/09 Budget



1. Excludes capital expenditure.

2. Basic research category includes all core-funded Institutes and therefore includes some clinical and translational research.

3.1 THE FOCUS OF OUR RESEARCH – SCIENTIFIC QUALITY AND CLINICAL IMPACT

Cancer Research UK's great strength is in understanding cancer. To build on this, our research portfolio must remain broad and balanced while allowing enough room to cope with the advent of new technologies and advances. Our basic research portfolio must be both cutting-edge and yet cognizant of what others are doing and we must have the best mechanisms for translating the discoveries in this arena into clinical advances in prevention, diagnosis and treatment. In particular, we need to take the lead in areas that are currently lacking. We must enhance our programmes in early detection, screening and prevention as very few other organisations (at least in the UK) are playing a substantial role in this area. We also need to invest in areas with the highest levels of unmet medical need, such as oesophageal and pancreatic cancers, and other cancer types with the poorest outcomes.

In recent years, other major charities have also been developing their strategies. It is now clear that Macmillan Cancer Support intends to focus on support for cancer patients, from diagnosis onwards; whereas Marie Curie Cancer Care's vision is focused on end of life care, not limited to cancer.

There have also been significant shifts in the priorities and budgets of other research funders. Most notably, the National Institute for Health Research (NIHR) and Health Technology Assessment Programme (HTA) are significantly more involved in clinical trials work whereas the Medical Research Council (MRC) is withdrawing from this area; and the Wellcome Trust has announced increased research funding over the next five years. Much of Wellcome's funding has traditionally been invested in basic research.

The CRSC has clearly stated a concern that Cancer Research UK should not spread itself too thinly, and should focus on responding to the niche that we have identified for ourselves in understanding the disease and in research focused in the middle of the 'basic-to-clinical' spectrum. We will therefore focus our research on the understanding of cancer, through to the treatment of cancer, as described in 3.1.1 to 3.1.4 below. For current work outside our chosen areas of focus, we will seek a managed transition to other research funders. Areas where Cancer Research UK support will discontinue include: palliative care (other than as part of treatment management); end of life care; psychosocial oncology; survivorship (with the exception of research focused on long-term effects of cancer treatment and secondary cancers in survivors); discharge/return to normal life; living with cancer, depression, quality of life, complementary therapies. In addition we do not intend to expand our interests into: areas downstream of treatment; service delivery; emotional and practical support for patients (although we will continue to provide patient information – as described in the five-year Charity strategy); international work (except where there is a strategic reason to do so); work outside cancer.

3.1.1 Enhance research programmes in early diagnosis, screening and prevention

Considering the progress made so far in cancer and following the Cancer Reform Strategy (CRS), there is a need for Cancer Research UK to play a stronger leadership role in prevention and early diagnosis, clarifying the different contributions of research, policy and public health. We have a great opportunity to maximise benefit through greater alignment of these activities.

During the years 2009-2014, our strategy is to:

- Continue to fund research into behavioural change relating to tobacco control and sun awareness
- Establish and facilitate a clear pathway for the discovery and development of cancer predisposition and screening biomarkers
- Prioritise the development of new screening biomarkers

- Increase our investment in symptom awareness and early diagnosis and lead the NCRI initiative in this area
- Grow our activity in medical prevention
- Work in partnership with others through the NPRI and UKCRC to develop and test effective interventions that lead to behavioural change associated with a reduced risk of cancer
- Support and encourage the expansion of our portfolio of prevention clinical studies by working with the US National Cancer Institute (NCI) Division of Cancer Prevention and the NCRN Clinical Studies Groups
- Work in partnership with the NCRI to establish the infrastructure to support prevention and screening clinical studies
- Continue to maintain a relationship with the Director of NHS Cancer Screening to identify potential funding priorities

This strategy will help us to work towards the following Goals:

- People will know how to reduce their risk of cancer
- The number of smokers will fall dramatically
- People under 75 will be less likely to get cancer
- Cancer will be diagnosed earlier
- More people will survive cancer
- We will especially tackle cancer in low income communities

What we will not do

- We will not normally support chemoprevention studies involving the general population – we will focus on those involving high-risk individuals
- We will fund studies of prevention interventions that have a significant benefit for other disease areas (e.g. obesity, alcohol) only in partnership with others
- We will stop supporting international research work on tobacco control (although we will continue our lobbying efforts in this area)
- We will not support research into physician training (e.g. how doctors communicate with patients)
- We will fund large screening trials only in partnership with others

Prevention

Prevention is the most effective form of cancer control, yet it receives limited funding from Cancer Research UK, the UK as a whole and globally. Using the knowledge we gain from intervention studies and trials in prevention, we can come up with practical strategies to help reduce the risk of developing cancer. In order to work towards our Goals, our prevention research must be strengthened in terms of quantity, quality and infrastructure. However, we will be careful about the areas in which we invest. It remains important to support the basic epidemiological research to understand cancer causation (see section 3.1.3) and there is very significant potential in medical prevention interventions (such as vaccines and chemoprevention strategies). In contrast, work on designing and testing interventions directed at behaviour change will be undertaken with caution and we will ensure that these are always rigorously evaluated. Consequently, over the next five years, a significant proportion of our prevention research will be focused on medical intervention studies, such as research in primary¹ or secondary chemoprevention, vaccines, and in identifying and monitoring people at high risk.

¹ Throughout the document primary prevention refers to prevention of the development or progression of pre-cancerous conditions and secondary prevention refers to prevention of recurrence or progression of cancer.

Our portfolio of medical prevention studies is currently relatively small, but it provides a platform for future investment. Cancer chemoprevention has so far delivered relatively little patient benefit, but there is believed to be great potential in chemoprevention for high-risk populations. Opportunities to develop clinical studies should grow over the next five years, as a result both of better understanding of the molecular mechanisms of cancer predisposition and of the identification of effective predisposition biomarkers. For this reason we will seek to grow our activity in this area. Chemoprevention studies are significantly different from treatment studies in terms of the balance of risk and benefit to which participants are exposed and the length of time required to reach the trial endpoint. Primary prevention studies in healthy individuals at average risk of disease (the general population) raise the greatest ethical concern (higher risk to lower potential individual benefit), are of the highest expense (larger participant numbers and longer follow-up required) and, currently, have the lowest likelihood of resulting in significant healthcare outputs. Cancer Research UK will therefore concentrate on funding chemoprevention studies in individuals at higher risk and will not support studies aimed at the general population, which are less likely to make an impact on cancer prevention.

The US National Cancer Institute (NCI) has considerable ongoing activity and experience in the arena of prevention clinical studies that Cancer Research UK could benefit from as it seeks to build its own research portfolio. Cancer Research UK has growing links with the NCI in the clinical trials arena and will seek to extend these. In the UK, a number of the National Cancer Research Institute (NCRI) Clinical Studies Groups (CSGs) have prevention working groups. Cancer Research UK will work with these groups to encourage the development of proposals for prevention clinical studies.

Medical aids for weight loss have not yet made a significant impact on public health and are unlikely to make an impact on cancer prevention in the immediate future. Cancer is only one of many health outcomes of obesity. If an effective weight loss treatment enters clinical practice, Cancer Research UK will consider providing partnership funding for studies of cancer impact alongside other health outcomes. We should not be the sole funder for such studies.

In addition to medical prevention, we recognise that there is also a need for cost effective behavioural interventions, backed by a strong evidence base, so that we can understand why people adopt certain lifestyle behaviours and help them reduce their risk of cancer by changing these behaviours. We are, however, cautious about investing independently in this area, since many of the factors that increase cancer risk also increase the risk of other major diseases. For prevention interventions which also have significant potential benefits for other disease areas (e.g. exercise, alcohol, obesity, diet) we will therefore in future only work in partnership through the National Prevention Research Initiative (NPRI) and UK Clinical Research Collaboration (UKCRC), i.e. we will not fund research directly in these areas.

NCRI launched the NPRI in 2004. It is a mechanism to support research into the primary prevention of chronic disease through a focus on health behaviours (tobacco use, alcohol misuse, physical activity and diet). The partnership² that supports this initiative includes charities, research councils and government departments. Cancer Research UK has been involved in the first two phases of this initiative and will contribute to phase 3 which has been announced during 2008. Most of the NPRI's work so far has focused on alcohol, obesity and exercise, with almost no spend on smoking.

The UKCRC Public Health Research Centres of Excellence is a complementary initiative to the NPRI, with the aim of increasing infrastructure and capacity in public health research across

² Partners contributing to Phases 1 and 2 were MRC, BHF, CR-UK, DH, Diabetes UK, Economic and Social Research Council (ESRC), Foods Standards Agency, Leukaemia Research, Northern Ireland Health and Social Care, Scottish Government Health Directorates, Stroke Association, Welsh Assembly Government, World Cancer Research Fund.

the UK. Grants totalling £20m³ have been awarded to five centres of excellence in Newcastle, Cardiff, Belfast, Cambridge and Nottingham. These Centres will bring together leading experts from a range of disciplines with practitioners, policy makers and wider stakeholders in order to address complex public health issues that will potentially have a significant impact on the nation's health. Investigators in these centres will be able to apply for NPRI grants.

Smoking causes more than one in four UK cancer deaths (although until recently this was more than one in three). The strong evidence base for the link between cancer and tobacco combined with the high cancer burden resulting from this risk factor means that research focused on tobacco control continues to be an important area for Cancer Research UK to support, both alone and in partnership. Furthermore, the behavioural research supported through the NPRI does not have a significant focus on tobacco control and so we intend to continue our independent support for behavioural research in this area, although we will stop supporting international research work. We will also continue to spend a small amount of money on sun exposure and vitamin D, since these lifestyle issues predominantly affect cancer.

Screening

The purpose of cancer screening programmes is to identify individuals in a population who have, or are likely to develop, cancer and can benefit from further tests or treatments. Screening can pick up precancerous changes in the body and so prevent the disease from developing, or detect cancer at a stage when it is easier to treat, with the potential for better treatment outcomes. There are important overlaps and distinctions between screening programmes, screening tests and diagnosis. Cancer or cancer predisposition may be diagnosed by a variety of techniques such as medical imaging (mammography for breast cancer; sigmoidoscopy for colorectal cancer), pathology (cervical smears, biopsies), blood tests or genetic testing (BRCA1/2 for hereditary breast cancer). While all of these techniques can be used to test patients presenting with disease symptoms, not all tests are suitable for use as screening tests, where a large number of pre-symptomatic individuals must be tested and consideration of cost and an acceptable level of invasiveness become important.

CR-UK research has made significant contributions to the development of the NHS Cancer Screening Programmes in breast, colorectal and cervical cancer. Studies are currently underway, funded by Cancer Research UK and others, examining the potential for screening in lung, ovarian and prostate cancers. Our screening research and our systems for funding screening clinical studies remain strong, although we need to take a more systematic approach to identifying areas of research priority. We have not had a clear organisational focus on identifying and developing the new screening and diagnostic agents needed to advance the field and we intend to change this by prioritising the development of new screening biomarkers and by investing in imaging research. As for other biomarker types (section 3.1.2), the discovery and development of predisposition and screening biomarkers is currently hindered by the lack of a clear development pathway and we intend to work with others to address this.

While clinical trials are an area of strength for Cancer Research UK, our support of both prevention and screening clinical studies is critically dependent on our researchers being able to recruit volunteers to their studies. There is concern about the ability of the existing National Cancer Research Network (NCRN) clinical trials infrastructure to support recruitment to prevention and screening studies. Cancer Research UK has already funded a Clinical Trials Unit specialising in prevention and screening and this could become part of a wider initiative. NCRI aims to develop infrastructure in this area and Cancer Research UK will work with the NCRI on this.

³ Investment comes from a partnership involving BHF, CR-UK, ESRC, MRC, NIHR/DH, R&D Northern Ireland HPSS, WORD Wales and the Wellcome Trust.

Large cancer screening studies that provide the evidence base for screening programmes are very expensive to run. Cancer Research UK has a history of providing significant support for cancer screening studies jointly with NCRI partners, particularly the MRC and NIHR. We will continue to seek such partnerships in the future as we do not envisage being the sole funder of large screening studies.

As CR-UK develops a more strategic approach to its screening and diagnostic development activities, there is potentially further benefit to be gained through an iterative dialogue with the National Screening Committee (NSC) and continuing the constructive relationship the Charity has enjoyed for at least a decade with the Director of NHS Cancer Screening Programmes on key areas of opportunity. It is the NSC and the Director of NHS Cancer Screening Programmes that review the evidence base for the development or improvement of screening programmes and identify gaps that must be addressed through research, some of which Cancer Research UK may be well placed to encourage and support.

In parallel with our research efforts, our policy and public affairs teams are working to reduce inequalities in the availability of different screening programmes throughout the UK, as described further in the Charity strategy.

Early diagnosis

Some cancer survival rates are poorer in the UK than for our European counterparts and evidence suggests that this is largely due to diagnosis on average being later, resulting in the disease being more advanced at the time of diagnosis. The reasons for late diagnosis vary among cancer types and among different populations. As was recognised in the Cancer Reform Strategy, there is an urgent need to promote early presentation, reduce GP and other delays and develop new diagnostic technologies. Over the next five years we intend to respond to this by increasing our investment in early diagnosis through our strategies in research and information. The key driver for this work will be the National Awareness and Early Detection Initiative (NAEDI), which the CEO of Cancer Research UK is co-chairing with Professor Mike Richards, the National Cancer Director. Cancer Research UK will also be leading the research component of this initiative, which aims to coordinate a comprehensive programme of activity to increase cancer symptom awareness and encourage earlier presentation. During 2008, workstreams established through NAEDI will review the evidence base and research to understand what evidence exists about late diagnosis in the UK, the areas/tumour sites for which early diagnosis is an important factor in influencing outcomes, and evidence of successful interventions. From 2009, NAEDI will also establish a coordinated programme of existing and new research to address areas where we have insufficient evidence as to the reasons for and impact of late presentation or delays in diagnosis.

As we increase our focus on early detection and also on new diagnostic technologies through biomarkers research, we do not intend to continue supporting research into physician training, such as how doctors communicate with patients. These areas of work are more suited to support through DH/HTA. However, we will continue to do work to develop support tools and systems for GPs to assess risk, communicate risk and encourage earlier presentation, as well as the development of genetic testing and management strategies for individuals at high risk.

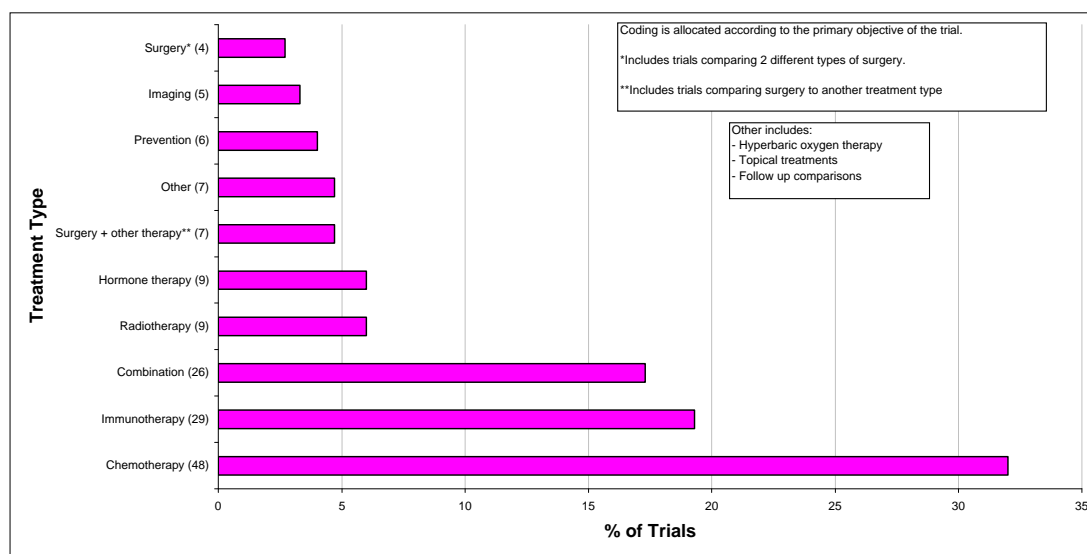
3.1.2 *Ensure that we have the best mechanisms in place to translate research discoveries into clinical advances in diagnosis and treatment*

Surgery, radiotherapy and cytotoxic chemotherapy have been the mainstays of cancer treatment for many years and continue to be very important, despite the introduction of novel approaches. This is not, however, reflected in the research arena (Figure 3). Whereas drug discovery and development is a traditional strength for Cancer Research UK, research in

radiotherapy and surgery has declined significantly in the UK in recent years, to the point where they might be considered as areas of unmet research need.

In contrast, the development of anti-cancer drugs has benefited enormously from the clearly defined pathway that exists from basic research through to delivery to the patient. The contribution that Cancer Research UK has made to the different parts of this pipeline in drug discovery and drug development have been very successful and must continue⁴. For other areas such as biomarkers, the pathway is not so clearly defined. To achieve our Goals, Cancer Research UK must develop a clear view of these pathways and the role it intends to play within them.

Figure 3. CTAAC Portfolio¹ Analysis by Therapeutic Option.



¹Portfolio of CTAAC funded and approved trials as at August 2008.

During the years 2009-2014 our strategy is to:

- Establish a UK-wide network of Cancer Research UK Centres to improve knowledge flow from laboratories to patients and vice versa
- Continue to grow and reshape our drug discovery and drug development operations, maximising the opportunities for clinical uptake
- Whilst maintaining our overall commitment to 3R principles, increase our investment in animal models and maximise the benefits of this by developing a European consortium and a national coordinated resource
- Support research into high-risk or innovative treatments that offer substantial benefits, for example for rarer cancers
- Establish mechanisms to support studies of novel combinations of new drugs both pre-clinically, through a pharmaceutical resource, and in early phase trials
- Revitalise radiobiology and radiotherapy research by supporting the new institute in Oxford and strengthening activity in other places
- Reinvigorate surgical research through establishing a clear focus for this area in a few Cancer Research UK Centres

⁴ By the end of 2008/09, we expect that there will be more than 50 novel treatments in clinical development where the initial discovery, development and/or first-in-man trial was undertaken by CR-UK. Of these, up to 9 will be in Phase III trials.

- Build capacity in imaging research by working in partnership to establish new centres and programmes
- Establish and facilitate a clear pathway for the discovery and development of diagnostic, prognostic, predictive, pharmacological, surrogate response and clinical endpoint biomarkers for cancer, including intellectual property considerations
- Maintain and develop infrastructure to support all stages of clinical trials, through our Drug Development Office, our network of Clinical Trials Units, trial specific funding and Experimental Cancer Medicine Centres
- Maintain a best-in-class technology transfer and commercialisation arm to ensure that patients benefit from publicly-funded cancer research
- Work with industry to establish pathways for the development of therapeutic antibodies

This strategy will help us to work towards the following Goals:

- Cancer will be diagnosed earlier
- More people will survive cancer
- There will be better treatments with fewer side effects

What we will not do

- We will not aim to compete with industry in drug development – we will focus our research at the earlier stages of drug discovery and development and will invest some of our activity on higher risk, innovative targets and approaches that industry cannot or will not undertake
- We will not aim primarily to generate funds through our drug discovery activity, but to accelerate the progress of science and new medicines
- We will not support research in the area of psychosocial oncology
- We will not support survivorship research
- We will not support research into service delivery and/or emotional/ practical support for patients, other than as part of clinical trials work

Drug Discovery

Drug discovery is a key activity for Cancer Research UK, which we have been growing. The development of potential cancer therapies from CR-UK research takes place through:

- 1) **Academic research.** This includes programme and project grants, fellowships, studentships, research based in Institutes and research funded through the Discovery Committee. By far the most substantial academic drug discovery activity takes place at the Centre for Cancer Therapeutics (CCT, Sutton) and the Northern Institute for Cancer Research (NICR, Newcastle).
- 2) **CRT Discovery Laboratory (CRT DL).** The CRT DL provides a CR-UK wide resource for new therapeutics development, directed at small molecules, recombinant proteins and antibody approaches. It offers its expertise to CR-UK as a service rather than seeking project or programme grant funding. This is particularly important for originating laboratories that are unable to develop the research within their own laboratory.
- 3) **Discovery Committee (DC).** The DC funds small “managed” projects targeted at the development of new therapeutics or diagnostics.

We are a substantial player on the world stage in gene therapy and immunotherapies for cancer, but have a relatively low presence globally in the area of small molecules and therapeutic antibodies. To maintain our standing and exploit new targets arising from our basic research portfolio, over the next five years we will continue to increase our activity in small

molecules by establishing two new small molecule drug discovery centres at the Beatson and Paterson Institutes to supplement the four new programmes already underway⁵ and the drug discovery centres at the Institute of Cancer Research (ICR) and Newcastle. We will also grow our activity in therapeutic antibody approaches through the establishment of a small number of new programmes and by exploring opportunities to work with industry, e.g. by pooling novel targets from CR-UK research with antibody platforms in industry. We identified a need for better coordination of drug discovery efforts across the charity and so in 2007, we set up a new Discovery Coordinating Committee which will henceforth undertake systematic reviews of all programme activity including small molecules, antibodies, immunotherapies and other complex biological therapies, such as gene therapy. We have already provided greater capacity for our drug discovery research by doubling the capacity of the Cancer Research Technology (CRT) Discovery Laboratories from 2006 levels, including the establishment of satellite units in Cambridge, Glasgow and Manchester. CRT will also create a central in-house pharmaceutical resource for researchers to draw on, so they can avoid the challenge of negotiating with companies for small samples of important drugs. This would make it easier to assess and prioritise new combinations⁶ in the laboratory, as well as enable basic researchers to use effective drugs in their research.

Drug Development

Drug development is a core strength for the Charity, with a 'new drugs to market' success rate comparable to industry. We however take a different approach by sponsoring some research into high risk, innovative targets or approaches that industry cannot or will not undertake. Over the next five years, as funding permits, we will continue to increase the number of anti-cancer drugs in our pipeline by focusing on areas where Cancer Research UK can add value. These include promising molecules that companies are not taking forward (Clinical Development Partnerships (CDP)), rational combinations of molecular targeted therapies, hypothesis-testing Phase II trials and also helping other reputable organisations to undertake early phase trials in cancer. Through our collaboration with the Children's Cancer and Leukaemia Group, we will establish Cancer Research UK as the partner of choice for early phase clinical trials in children with cancer. To facilitate this expansion we are improving and speeding up the processes carried out by our Drug Development Office (DDO) and investing in new systems to support the increasing volume of trial information necessary for both regulatory compliance and management needs. We are building a new state-of-the-art Biotherapeutics Development Unit (BDU) at Clare Hall to complement the new Formulation Unit at Strathclyde University. These two Good Manufacturing Practice (GMP) facilities will allow us to produce new biological and pharmaceutical agents to regulatory standards for our clinical trials, with any spare capacity being offered to other research funders e.g. MRC, NIHR or industry.

Animal Models

The increased investment in drug discovery and development described above places mounting pressure on the Charity to develop models which more accurately reflect human disease and hence can help us evaluate the potential efficacy of novel cancer treatments. This need is also acutely felt by the Biotech and Pharma industries, where clinical trial failures of new cancer agents are frequent and often due to lack of efficacy.

Over the next five years, we will continue to maintain the basic principles of replacement, refinement and reduction of animals in research. At the same time we recognise that recent developments in sophisticated genetic manipulation of the mouse offer exciting new pre-clinical models that more closely reflect human cancer than the current widely adopted xenograft models. The combination of these new models with modern developments in imaging methods

⁵ These are at the University of Oxford, Imperial College, University of Strathclyde and the School of Pharmacy.

⁶ Experience with cytotoxic drugs has shown that combinations of drugs are generally much more effective than single agents. Furthermore, the rational combinations of targeted agents offers even greater potential for improved cancer management.

offers a real chance to improve the predictability of the human response to new treatments, with enormous potential economic and ethical gains for cancer drug development. They also offer an appropriate platform to study combinations of drugs which will be a critical component of developing broadly effective cancer treatments.

Such animal models are complex and expensive to manage and maintain but many CR-UK academic groups, as well as the DDO and CRT, would benefit enormously from access to standardised models of this kind. We therefore intend to make these models available within the CR-UK community in a more coordinated way through a national resource which would nevertheless draw on expertise from across the country. We are seeking to hire one of the world's leading exponents of this technology to the UK to lead such an initiative. We are yet to determine how such a resource would be structured – it may involve a combination of national coordination and standards with a centralised 'library' of resources.

Once this CR-UK initiative in animal models is established, we must ensure that we get the most out of our investment by coordinating with academia and industry alike, across both the UK and Europe. An ideal opportunity to do this is presented by the European Innovative Medicines Initiative (section 3.3.3).

Imaging

Imaging is a key biomarker technology that is important in numerous areas of translational cancer research. Historically our research capacity in functional and whole-body imaging has been rather low, and that leaves us relatively exposed to loss of expertise and potentially under-resourced to deliver our translational research aims. To address this we have launched a major new funding initiative, establishing four comprehensive imaging centres and five new imaging programmes. These programmes will develop and test new methods, technologies and applications for imaging in cancer diagnosis and treatment management and will replace the vast majority of our existing activity in these areas. There will be a significant training component in all centres and programmes, to encourage workforce development in the very broad range of skilled individuals needed. We want to support integration and coordination between our imaging groups and will run an annual CR-UK imaging workshop to achieve this. We have established a funding partnership with the Engineering and Physical Sciences Research Council (EPSRC) to deliver our ambitions and the MRC and Department of Health, England, have also contributed. EPSRC is an important new partner for CR-UK and we hope there is more we can achieve together in the future.

Biomarker Research

"Biomarker" is a very broad term that can be used to describe any indicator of a biological state. In cancer research a biomarker is often a molecular marker (DNA, protein, etc.), that may also be complemented by imaging as a biomarker technology. Biomarkers are exciting because of the potential they provide for more detailed characterisation of cancer risk and stage, the potential for less invasive screening and diagnosis and for more targeted and personalised treatment approaches. However there are many challenges in the arena of identification and validation of biomarkers. In particular, despite the central role of biomarkers in cancer research, a clear pathway for their discovery and development does not currently exist. This has been recognised at an international level as an issue that needs to be addressed by industry and academia alike. Some progress has been made, particularly by the US National Cancer Institute, and CR-UK intends to work with partners to continue to develop this framework and mechanisms to facilitate it. In addition, CRT will be working on issues surrounding intellectual property and commercialisation with the aim of developing a strategy that optimises the use of biomarkers for cancer patient benefit.

Radiobiology and Radiotherapy

Radiotherapy is the most frequently used method of cancer treatment after surgery and demand is increasing. Surgery is moving towards a less radical approach and this means that it

often needs to be combined with radiation to be effective. In many cases, chemotherapy is also more effective when combined with radiotherapy. Radiotherapy is also extensively used to alleviate symptoms of advanced cancer, such as pain from bone metastases. It is estimated that at least half of all cancer patients require radiotherapy at some point in their care pathway.

In 2003, the NCRI published a report which concluded that there had been a significant loss of critical mass in radiotherapy research in the UK and that there was a lack of interaction and integration with broader high quality research environments. Whereas continued progress has been made in radiation physics (e.g. in targeting radiation more precisely to the tumour), very little progress has been made in radiobiology to address questions such as how we can improve the sensitivity of cancer cells to radiotherapy and how to determine which patients will respond. As a direct consequence of this, Cancer Research UK has worked in partnership with the MRC and the University of Oxford to create a centre of excellence in radiation oncology and biology. This has been established through the co-location of the Cancer Research UK funded Gray Cancer Institute and the MRC Radiation and Genome Stability Unit (RAGSU) at the University of Oxford. Under the leadership of Professor Gillies McKenna, the jointly funded Radiation Oncology and Biology Initiative (ROB) is now one of our five core-funded Institutes (section 3.2.2). It aims to become both a world-class research centre for radiobiology, and the leading facility in exploring the translational possibilities of the field. We will also continue to support radiobiology research in other Centres in the UK.

The decline highlighted in radiotherapy and radiobiology research in the UK has also been reflected in radiotherapy services. Radiation oncology in the UK suffers from a lack of clinical time devoted to the area, a relative lack of linear accelerator machines and a lack of biophysician support. However, capacity in the UK is now being rebuilt, in part as a result of Cancer Research UK's public policy work in this area.

NCRI as a whole reviewed its strategy for radiotherapy and radiobiology research in 2008. CR-UK will be supporting a more coordinated approach to radiotherapy research, through national leadership, from 2009 onwards. This will look at newly emerging technologies and will consider whether opportunities for radiotherapy research in the NCRN and Experimental Cancer Medicine Centre (ECMC) networks are being pursued to best effect.

Surgery

Surgery cures more patients of cancer than any other intervention. For most cancers, surgery is the principal treatment for the vast majority of patients. However surgical research in the UK faces many challenges. Many of these cannot be directly addressed by Cancer Research UK, but nevertheless do affect the research we fund. At present the level of cancer relevant surgical research activity in the UK is very low, the surgical research workforce is in decline and pressures on NHS service provision and ongoing changes to clinical training may make it harder for surgeons to pursue a research career.

Surgeons have a unique role in research to develop and evaluate surgical techniques and technologies. The considerable scope for research to deliver significant benefits in patient care is exemplified by the improvements resulting from total mesorectal excision in rectal cancer and from sentinel node biopsy in breast cancer.

Cancer Research UK already has effective funding streams to support surgical technique and technology development, but does not receive sufficient high quality applications for funding. It has effective fellowship schemes at all career stages and supports a good number of surgeons at PhD level, but (as at September 2008) only one at the next career stage. It has effective clinical trial funding streams, but receives relatively few surgical trial applications when compared to other therapeutic areas; the success rate of applications however is equivalent. Surgical trials face specific challenges in that they tend to compare two very different treatments, for example surgery versus chemotherapy, or open versus closed surgical

techniques. Hence, surgical trials can be challenging to present to patients as compared with drug trials. There are also cultural barriers to enrolling participating centres in trials. There is a perceived lack of support for surgical trial protocol development. However, 6 out of 11 NCRI Accredited or CR-UK supported Clinical Trials Units have stated an interest or expertise in conducting surgery trials.

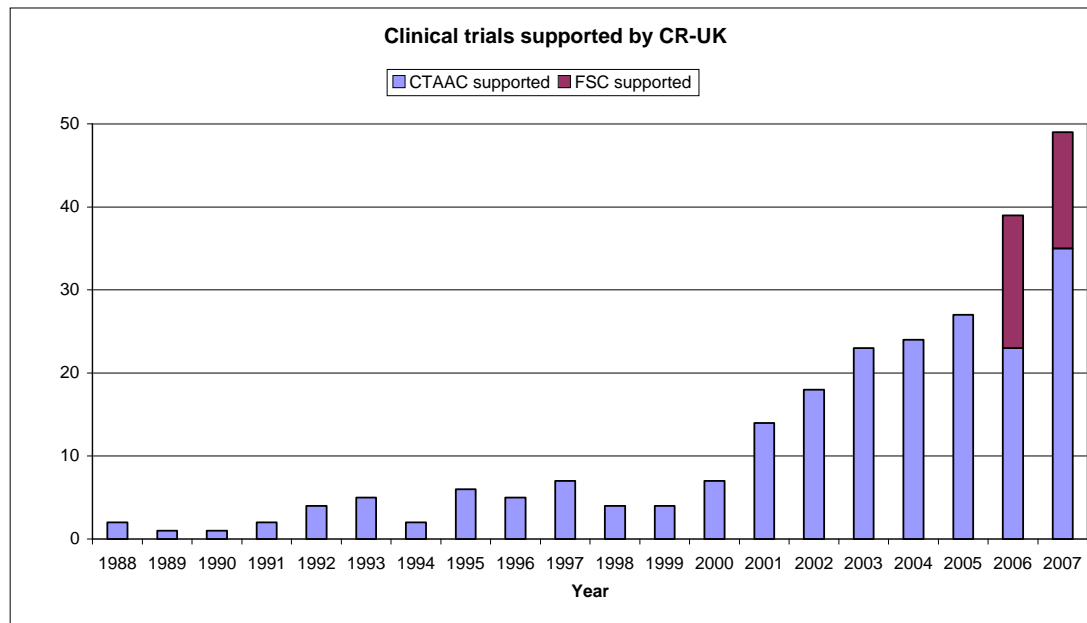
A number of the above deficiencies could begin to be addressed by providing support for surgical research infrastructure in a multidisciplinary environment and there is an opportunity to achieve this through the Cancer Research UK Centres initiative (section 3.2.1). Over the next five years, our highest priority in surgical research will be to establish a sustainable surgical research focus in a small number of Cancer Research UK Centres.

Clinical Trials

The UK has considerable strengths in therapeutic trials, especially in cancer, the vast majority of which are supported by CR-UK. The National Health Service (NHS) is a major asset for all phases of clinical research, from first-in-man studies through to Phase III trials. Infrastructure to support early phase clinical trials work is provided by the Experimental Cancer Medicine Centre (ECMC) network and for later phase clinical trials by the National Cancer Research Network (NCRN), and by a network of accredited Clinical Trials Units (CTUs), most of which are funded by CR-UK. The direct costs for individual studies are provided through peer-reviewed funding schemes run by Cancer Research UK (Clinical Trials Advisory and Awards Committee, CTAAC) and others.

The £35 million network of ECMCs was set up in 2007 by Cancer Research UK, in partnership with the UK Departments of Health. The network consists of 19 centres operating under the umbrella of the NCRI. This initiative brings together laboratory and patient-based research to speed up the development of new therapies by evaluating new drugs and biomarkers, working towards individualising patient treatment. The ECMC awards provide infrastructure, staff and running costs to support translational research and early phase trials and these, together with our infrastructure funding of clinical units, are essential to underpin the delivery of CR-UK sponsored early clinical trials.

Late phase trials involve hundreds if not thousands of patients and are the mechanism whereby the long term safety and effectiveness of therapies are evaluated. The Charity's provision of resources both to CTUs and trial specific funding via CTAAC has, along with the DH funding for NCRN and NHS costs, placed the UK in a unique position with respect to late phase trials. The UK has clearly come a long way in recent years and with more than 10% of all cancer patients entered onto clinical trials, is almost certainly the largest recruiter per head of population to academic cancer clinical trials anywhere in the world. The US, by comparison, lags significantly at only 3.5% patient accrual.

Figure 4. Increase in Number of Clinical Trials Supported by CR-UK Since 1988

We have yet to see the effect of the significant increase in CR-UK funding of clinical trials that has taken place over the past 5-6 years (Figure 4). At the beginning of this decade, we were funding approximately five new trials per year. Recently, we have routinely funded more than 20 new trials per year. Assuming an average of 5 years of accrual and 3 years of follow up, our trials should start reporting in a significant way from 2011 onwards, by when our profile and impact in worldwide clinical research may well be the most significant of any country.

It is worth noting that a number of other funding schemes have become available in the last year to support academic cancer clinical trials, including the NIHR Health Technology Assessment funding stream, and the Efficacy and Mechanism Evaluation scheme being run by the NIHR for the Medical Research Council. Grants provided through these routes provide generous oncosts which make these attractive organisations to apply to for funding. However, these funding schemes will be required to meet applications in all disease areas. It is likely therefore that Cancer Research UK will maintain its current position as the major funder of academic cancer clinical trials in the UK, but it might be possible to reduce the number of trials funded each year, if funds become limited.

On the more negative side, industry recognises that the UK is a good place to do early trials but companies do not always choose to conduct larger trials in the UK because of cost, speed and bureaucracy. Increasingly, large Phase III trials are being taken off-shore, not least as the UK has relatively low uptake of novel medicines. We will keep up the pressure on Government and the Departments of Health to introduce cost- and clinically-effective new treatments quickly and equitably and to reduce barriers to research. This is discussed further in our five-year Charity strategy.

3.1.3 *Maintain and, where possible strengthen, a broad and balanced portfolio of world-class research in the UK directed at understanding the biology and causes of cancer*

The opportunities in basic science are as great as they have ever been and greater in terms of applicability. The UK already has considerable strengths in this area and the Wellcome Trust plans to increase its investment in this area significantly. We have a responsibility to ensure that the highest quality basic research in this country continues to provide the foundation for translational and clinical research into cancer. We must therefore maintain our funding in this area and also seek to partner more, or influence the way in which others invest in basic research. The next five to ten years offers the opportunity to greatly improve our understanding of gene-environment interactions.

During the years 2009-2014, our strategy is to:

- Maintain a strong portfolio of basic biology research as an essential part of Cancer Research UK's remit and demonstrate the impact of this research by showing how it ultimately links to clinical practice
- Continue to raise the quality of our basic research in both our Institutes and response mode portfolios
- Identify opportunities to increase our support for tumour biology, gene-environment interactions and model systems in preference to increasing spend on more fundamental biology
- Build on recent successes with genome wide association studies by supporting follow-up studies to understand the functional significance of key loci
- Hold a strategic workshop to explore how to make the best use of data emerging from genome wide association studies and how Cancer Research UK might participate in the International Cancer Genome Initiative
- Maintain, and if possible grow, an active portfolio of epidemiological research. In particular support the increasing application of molecular techniques to population studies.

This strategy underpins all of our Goals and in particular will help us to work towards the goal:

- we will understand how cancer starts and develops

What we will not do

- We will only fund research where the relevance to cancer has been sufficiently articulated
- We will not aim to provide comprehensive funding for research in basic biology
- We will not fund genome-wide analyses on cancer-types that are below the top 10 in terms of UK cancer mortality
- We will only participate in the International Cancer Genome Initiative if a small amount of additional CR-UK funding can add substantial value to the project.

Basic biology

Basic cell, molecular and tumour biology is the largest part of our research portfolio by some margin. It is also some of the most fundamental, curiosity driven research we support, and the idea of "planning science" in this area is inappropriate. Funding truly basic biology is an essential part of Cancer Research UK's remit. As noted in Figure 2 on page 6, we currently spend more than 50% of our total research funds on basic research. For the reasons already stated, we aim to maintain total spend on basic research at around 50% of the portfolio for the foreseeable future, although as MRC and Wellcome funding of basic research increases faster than ours over the next five years, our overall share of the UK effort in basic research is likely to fall. Just as there are other UK funders for basic research, so is there considerable funding

for clinical and translational research for cancer from other funders, most notably NIHR and the pharmaceutical/biotechnology industry. Therefore we feel that there is no great need for dramatic shifts in the balance of the portfolio over the next five years. Fundamentally, continued investment in basic research over the next five years will provide the foundation for discoveries that we will be able to translate for cancer patient benefit 10-15 years from now, especially when attrition rates are taken into account.

In maintaining our portfolio we need to ensure that our funding streams and processes are set up appropriately and we need to pursue a ruthless attention to scientific quality and innovation. This means finding the right balance between providing the freedom to pursue innovative research avenues without the constraints of regular review, and avoiding investing all of our funds in long-term commitments that will restrict our ability to fund exciting new research ideas as they emerge.

As our income has grown, our support for basic biology has grown too. We believe that our current level of support is about right and should be maintained. We have already made commitments which, over the next ten years, will expand the volume of basic research carried out in our institutes (see section 3.2.2). In Cambridge and Oxford we have new Institutes and four of our Institutes are at the core of new Centres (Oxford, Manchester, Cambridge, Glasgow).

Traditionally, our portfolio in basic biology has been world-leading, but we have recognised that there is the potential to increase quality further. By reducing the renewal rates of our programme grants, we have recently driven increases in the quality of our portfolio. We intend to maintain exceptionally high standards across both our Institutes and response-mode basic research and if there is a downward trend in available funds, we will raise the bar on quality in both. As noted in section 3.2.2, the quality bar for basic research in our Institutes will remain higher than through our response mode processes.

Although it is essential for us to fund the highest quality research, it is not critical, or indeed possible, for us to lead in all areas. We need to consider the global competition and decide how much to focus on particular topics. We need to consider what we can do uniquely well and where we are less strong we will not necessarily seek to add strength. However, given the funding available from other research funders in the UK, over the next five years we intend to increase our focus on tumour biology and model systems in preference to increasing spend on more fundamental biology.

Epidemiology

Just as our basic cell and molecular biology portfolio underpins our drug discovery and development activity, so epidemiological studies are crucial to what is an equally important area of translational research activity. Epidemiological research provides new leads for both behavioural and medicinal approaches to preventing, diagnosing or treating cancer.

Large-scale population studies are powerful tools for discovering behavioural and environmental risk factors for different types of cancer and the UK is well placed to undertake such studies. We have access to longitudinal medical records; national cancer registration exists; and the ethical framework is relatively favourable. Furthermore, we have world-leading cancer researchers in this area. Consequently a significant number of large studies in different cancer types have been carried out over the years, many of them supported by Cancer Research UK. Indeed, we have funded some of the largest studies into the causes and prevention of cancer ever undertaken, such as our work on smoking and HRT and our investment in the UK arms of the European Prospective Investigation into Cancer and Nutrition (EPIC), the largest ever study into diet and cancer. Epidemiological research also identifies new biological markers of disease for screening, diagnosis and prognosis.

Cancer Research UK will maintain and if possible grow an active portfolio of epidemiological research. The highest priorities in this respect will be to take steps to correct a workforce capacity and training deficit, and to support the increasing application of molecular techniques to population studies, so that we can better understand gene-environment interactions.

A key focus is the rapidly developing field of genetic epidemiology. Single nucleotide polymorphism (SNP) studies involve scanning the entire genome to identify subtle variations in our DNA that can affect our risk of developing cancer. Such genome-wide association studies (GWAS) represent significant potential for Cancer Research UK. Having invested early in this approach, we are now world leaders in this area.

However, moving from an association to identification of a 'causal' variant is often problematic and would be expected to require functional experiments. In addition such studies need to be very large, which precludes their application to rarer cancer types. A key achievement of the studies that Cancer Research UK has invested in to date has been the establishment of national and international consortia which have facilitated suitably large sample sizes. This is a highly competitive area and therefore requires a rapid response to applications. Over the next five years we intend to build on recent successes with GWAS by supporting follow-up studies to the breast, prostate, colorectal, lung and ovarian cancer GWAS that we have already funded. National and international consortia set up to undertake the original studies should be fully exploited in subsequent research.

Complementing these developments in our understanding of genetic predisposition to cancer, advances in technology have also stimulated major international collaborations to identify the complete catalogue of somatic genes involved in the development and progression of human cancers. The International Cancer Genome Initiative is a key example of this. We aim to convene a meeting of experts from the research community to consider whether, and if so how, Cancer Research UK should be involved in this project and to investigate potential strategies for using the data emerging from both GWAS and the International Cancer Genome Initiative.

One important issue relating to somatic cell genetics is intellectual property. We will aim to publish results from our studies as quickly as possible, but this will need monitoring. If this approach results in commercial entities not going on to develop diagnostics or tests then this policy will need to be revisited.

3.1.4 *Promote research in areas with the highest levels of unmet medical or research need.*

Although there has been significant progress in cancer diagnosis and treatment in recent years, there remain some areas with very high levels of unmet medical or research need. This includes common cancers such as pancreatic, oesophageal and lung cancer, which have particularly poor outcomes, populations with poor outcomes, and also research in the areas of surgery and radiotherapy, which has been allowed to decline in the UK.

During the years 2009-2014, our strategy is to:

- Foster research in pancreatic cancer and surgery through our Cancer Research UK Centres initiative
- Develop the recommendations emerging from the Disease Specific Review of oesophageal cancer and fund at least one major new initiative as a result of this, preferably in partnership with others
- Work with the NCRI, NCRN and ECMC Networks to promote increased research into radiotherapy

- Develop strategic recommendations in lung cancer by holding a Disease Specific Strategic Workshop in 2010
- Increase support for tumour-specific basic biology where opportunities arise

This strategy will help us to work towards the following Goals:

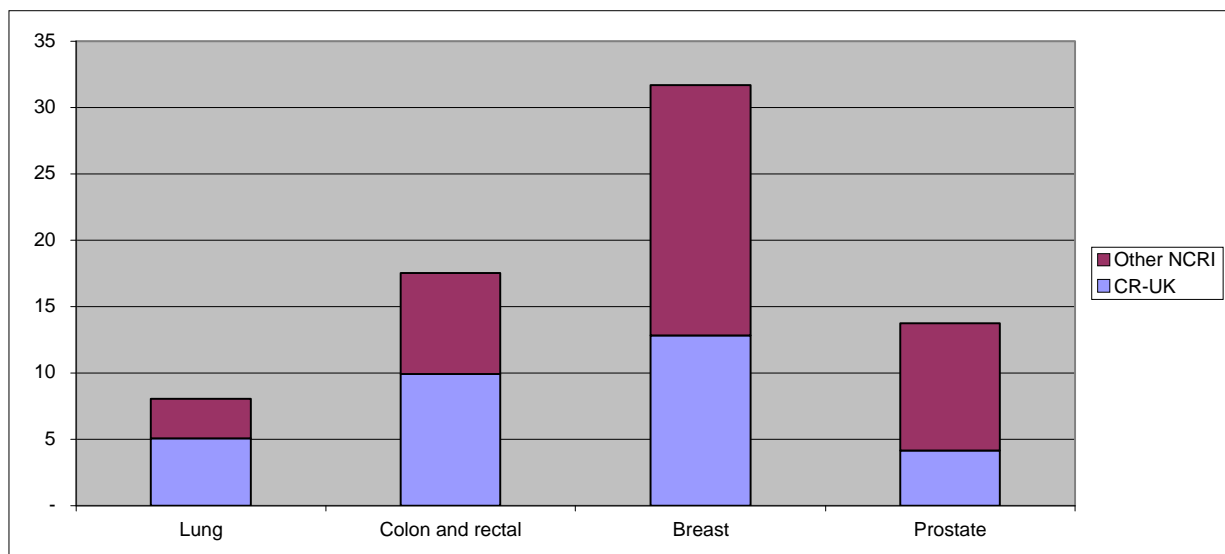
- Cancer will be diagnosed earlier
- More people will survive cancer

What we will not do

- We will not support research into supportive care, psychosocial oncology, discharge/return to normal life, living with cancer, or end of life care, despite the fact that these are also areas of unmet medical need. We will make concerted efforts to persuade other funders to support research in these areas.
- We will not undertake any further Disease Specific Reviews over the next five years, until we have progressed the initiatives described above and until it is clear we will have additional funds that we can allocate to other disease areas.

Cancer Research UK is the predominant funder of cancer research in the UK for the top four cancer types (Figure 5).

Figure 5. Spend^{1,2} on Disease Specific Research for the top four most common causes of cancer death³ by CR-UK and Other NCRI Organisations.

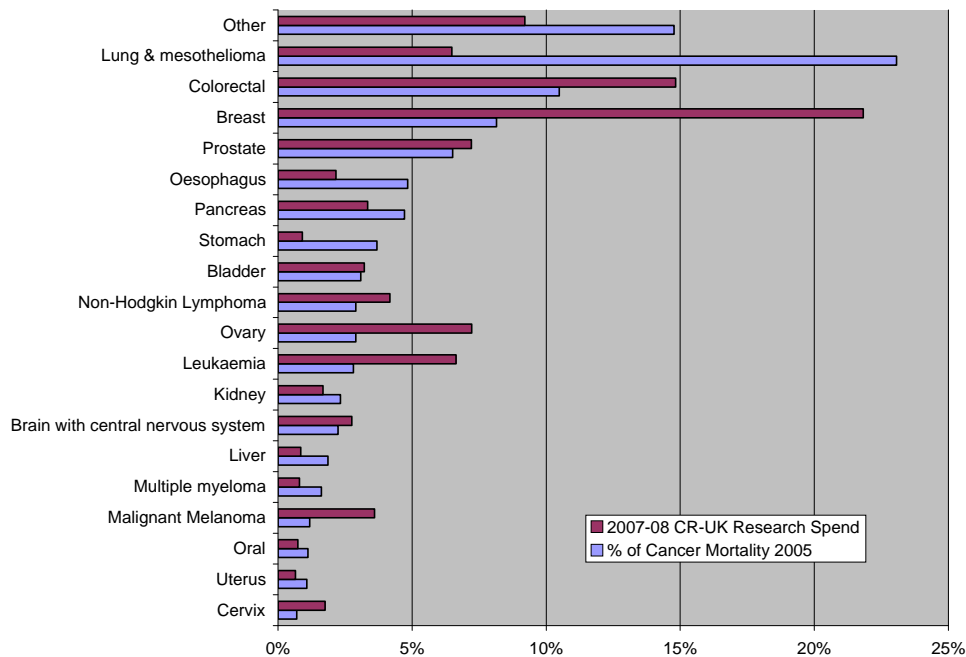


¹Spend in £m as of 1st April 2007.

²Spend for CR-UK/NCRI does not include apportionment of uncoded or all sites, and does not include infrastructure.

³Top four mortality according to latest available figures (2005).

Around 30% of our portfolio comprises research related directly to the four most common causes of death from cancer, i.e. lung, colorectal, breast and prostate cancer. But the next two most common causes of cancer death, oesophageal and pancreatic cancer, have a high incidence, poor prognosis, poor survival, yet our relative spend is very low (Figure 6).

Figure 6. Comparison of Mortality (2005) with CR-UK spend 2007/08

Over the next five years we will continue to support research into all cancer types. In addition, we will specifically promote research into lung, pancreatic and oesophageal cancers, provided this is of high quality. To identify how Cancer Research UK might make the greatest impact on these diseases, we have carried out Disease Specific Reviews in which we have consulted the international research community on pancreatic and oesophageal cancer. The main recommendation from the pancreatic review was for Cancer Research UK to establish up to three centres of excellence in pancreatic cancer and this will be taken forward through the Cancer Research UK Centres initiative (section 3.2.1). The oesophageal review identified several potential areas of future work and we will investigate the feasibility of these during 2008 and early 2009, with the intention of taking forward at least one of them, possibly in partnership with other funders.

In 2006, the NCRI published a report on lung cancer exploring why the investment in lung cancer research is much lower than for other tumours in relation to both incidence and mortality. A number of actions to facilitate lung cancer research were initiated and Cancer Research UK has contributed to some of these. Already, Cancer Research UK has significantly increased its investment into high quality lung cancer research over the last 2-3 years (e.g. GWAS in lung cancer and the SEARCH trial). There is some concern that the NCRI review, and subsequent actions, were not as productive as hoped and we consider that this is an area worth revisiting during the next five years. We will start by carrying out a Disease Specific Strategic Workshop of lung cancer in 2010 to identify potential opportunities for research.

Promoting research in specific cancer types is an ideal opportunity for us to develop partnerships with disease-specific charities, particularly since Cancer Research UK Centres will be the first port of call for emerging strategic initiatives. This is also the route through which we intend to reinvigorate academic surgery.

3.2 PROVIDE THE RIGHT ENVIRONMENT FOR RESEARCH

Cancer Research UK currently supports over 4,500 scientists, doctors and nurses throughout the UK through a variety of funding mechanisms (Table 1). We fund research carried out in our own research institutes, as well as awarding grants to researchers based in universities and hospitals. We are also in the process of establishing Cancer Research UK Centres across the country.

Table 1. Cancer Research UK spend by location (FY 2007/08)

<u>England</u>		<u>London</u>		<u>Scotland</u>	
Birmingham	£8.3m	GKT	£2.7m	Dundee	£6.7m
Brighton	£1.2m	ICR	£26.5m	Edinburgh	£6.4m
Bristol	£1.6m	Imperial	£9.2m	Glasgow	£18.2
Cambridge	£31.5m	LRI	£41.3m	Other	£1m
Leeds	£7.0m	QMUL	£11.9m		
Leicester ¹	£3.5m	UCL	£9.8m		
Liverpool	£1.6m				
Manchester	£16.7m			<u>Wales</u>	
Newcastle	£5.1m			Cardiff	£3.6m
Oxford	£26.8m				
Sheffield	£1.5m			<u>N. Ireland</u>	
Southampton	£3.6m			Belfast	£1.6m
Other	£96.2m			<u>Total Spend</u>	£343.5m

¹Includes CCLG

It is essential that we provide the right environment to stimulate world-class research. Establishing a UK-wide network of Centres will be a major part of this and will need to be integrated with our existing institutes. In addition to a balanced portfolio of research, we also need to leave room for bold initiatives that we cannot anticipate today. We need to make the processes of research funding and governance simpler, and it will be important to strike the right balance between monitoring research and trusting our researchers and Centres with more responsibility. We must also ensure that new reagents, knowledge, data and technologies are available to our research community.

The relationship and communications with our in-house Institutes and the wider research community needs to be improved. Our Institutes must deliver on ambitious projects as part of Cancer Research UK being able to demonstrate its progress and impact in the fight against cancer. We need to make clear linkages between the different areas of our research portfolio to ensure that full advantage is taken of all complementary activities and ensure that everything we support is exploited. This can be delivered in part through better processes and systems, but we also need to strengthen our mid- to higher-tier of research management.

We also need to think more broadly about cancer research to embrace the wider technologies that can enable and support progress in cancer research, for example biophysics and mathematics. Our Centres will encourage more cross-disciplinary and multi-disciplinary working from the research community and the proposed UK Centre for Medical Research and Innovation (UKCMRI) (see 3.2.2) provides an ideal opportunity to make this approach an integral part of one of our key Institutes.

There is a danger that we could lose our focus given our size and the sheer volume of projects we are supporting, as well as the rate of change within the organisation. We need to become better at stopping things and not proliferating too many initiatives. We must ensure that the

organisation can deliver its vision by providing the right level of support resources and infrastructure.

3.2.1 *Establish a UK-wide network of Cancer Research UK Centres to improve outcomes, engage the broader public and increase the knowledge flow from laboratories to patients and vice versa*

During the years 2009-2014, our strategy is to:

- Establish up to 20 Cancer Research UK Centres across the UK, which will:
 - Enhance cancer research in the UK
 - Ensure that cancer research feeds through to improved patient benefit and public health
 - Train the clinical and non-clinical research workforce of the future
 - Ensure a broad research coverage across the UK (geography, cancer types, modalities, research areas)
 - Expand public engagement, information provision and local fundraising
 - Be the first port of call for new developments and strategic initiatives instigated by Cancer Research UK
 - Offer an opportunity to develop new partnerships, for example to work with disease specific charities
- Ensure that at least 2-3 Centres develop pancreatic cancer as a core theme and at least 2-3 Centres develop surgical research as a core theme

What we will not do

- We will not provide infrastructure funding or training fellowships for CR-UK funded research other than in our Institutes and Centres.
- We will not implement the Centres initiative through a standard open-call response mode funding stream – each Cancer Research UK Centre will be different and so simple guidelines and a single model would not be appropriate

The aim of establishing Cancer Research UK Centres is to create a UK-wide network of long-term, sustainable centres of excellence in cancer. Cancer Research UK Centres will bring closeness and relevance to patients by systematically linking the research activities of the Charity with patient care and public engagement. This in turn will help to improve cancer outcomes, engage the broader public and increase the knowledge flow from laboratories to patients and vice versa.

We know that the incentives to becoming a Cancer Research UK Centre are strong. The process of visiting potential Centres to discuss our proposals has already been very helpful in bringing together key partners such as the NHS and Higher Education Institutions (HEIs). In the current climate, it is easier to engage the NHS and Hospital Trusts at a local level rather than at a national level. This suits us well as a Charity as we differ from other funders in needing to engage in every part of the country. We know that local research excellence can help to promote improved standards of care. Therefore it is critically important that our research is geographically spread across the UK if we are to achieve our Goals, within the overall constraint of research excellence. The corollary for potential Centres is that if the community does not engage in this initiative, Cancer Research UK infrastructure funding will be withdrawn.

A key element of Cancer Research UK Centres is that they will provide a stable environment for translational research and training, e.g. through local training accounts. We expect training accounts to be attractive for the research community in the face of the ebbs and flows of current medical training processes in particular. By the nature of their size, range of

specialities, and research interests integrated with clinical practice, Cancer Research UK Centres will be able to provide both a 'shop-window' for clinical research careers and a nurturing environment for training and career development.

Each Centre will work with us to develop its research strategy and all Centres will be encouraged to develop key areas of focus in which they can be world-class. These areas might be:

- tumour types, where basic research in these tumours parallels local clinical service priorities;
- treatment modalities, e.g. surgery, radiotherapy;
- research areas, e.g. genetic markers, imaging.

Cancer Research UK Centres and Institutes are the natural home for new strategic initiatives and we intend to make them the first port of call for new developments and strategic initiatives instigated by the Charity. Where appropriate, we will need to consider how successful initiatives can become national resources, not just local.

Cancer Research UK Centres and the Local Engagement and Development (LEAD) initiative offer the chance to make a simpler and clearer connection between research supported by Cancer Research UK, its people and their local community, thus demonstrating Cancer Research UK's local relevance. Local and community activities will provide a focus for greater integration and cohesion both on the research side and also for Cancer Research UK itself, for example enhancing the links between fundraising and research through Cancer Research UK Centres. This is discussed further in our Charity strategy.

Although we have stated that up to 20 Centres will be established, in practice this is unlikely to be more than 18 and a further 1-2 may take some more time before they are ready to be established. Furthermore, it is possible that over the next five years, some of the potential Centres in London may merge. We may therefore end up with a number closer to 15 than 20.

3.2.2 Continue to maintain a balanced portfolio of research in different venues, including our 5 core-funded Institutes.

During the years 2009-2014, our strategy is to:

- Ensure the development and implementation of well defined strategies for each of our core-funded Institutes that will be distinct, but coordinated with each other, particularly in terms of technologies and areas of world-class speciality
- Develop Institutes that are basic and translational in focus, to complement the clinical focus provided through Centres
- Work with the MRC, UCL and the Wellcome Trust to establish the UK Centre for Medical Research and Innovation (UKCMRI), incorporating our London Research Institute
- Build a new animal house at the Beatson Institute and support the Director in developing a drug discovery programme
- Contribute to the building of a chemotherapeutics centre at the Paterson Institute and support the Director in developing a drug discovery programme
- Maintain support for the ROB and ensure its continued development
- Roll centrally-provided Research Services into our Institutes
- Devolve responsibility for core services to the LRI and CRI to give them greater autonomy and to encourage greater flexibility and creativity

What we will not do

- We will not establish any new core-funded Institutes

- We will not fund research overseas, except where there is an exceptional strategic reason to do so

Cancer Research UK needs to be clear about why it has Institutes. When Cancer Research UK provides programme or project grants to Principal Investigators (PIs) in universities, it typically only pays for a proportion of the infrastructure and does not contribute the Full Economic Costs associated with the grant. In contrast, within our Institutes – especially the core-funded Institutes – we typically pay for most or all of the overheads. Institutes, however, do play an important role within the portfolio and we expect them to justify their additional costs over programme grants in universities through the added value they bring to the organisation. We also expect the standard of research in our Institutes to be of a higher quality than that of our programme grants. The principal reasons for maintaining Institutes within the portfolio are: to make a long-term attack on important problems not easily addressed through grants; to promote inter-disciplinary research; to undertake highly competitive, innovative and pioneering research; to provide a high-quality environment in which to train and develop the scientists of the future; to enable the UK to secure access to or to retain world-class scientists in a competitive field, who might otherwise stay overseas; and to establish and provide access for the local research community to world-class infrastructure, resources, services and / or unique facilities.

Each of the following distinguishing features is applicable to all CR-UK Institutes:

- support for a fixed number of scientific groups, e.g. if one group fails or leaves, the Institute can recruit a new one with guaranteed funding, subject to appropriate peer review, ensuring full occupancy of expensive space
- a Director appointed by or in consultation with Cancer Research UK, who has considerable autonomy in shaping the scientific strategy of the Institute and in recruitment of new scientific groups
- core infrastructure funded by Cancer Research UK
- PI salaries funded by Cancer Research UK
- PIs spend 90%+ of their time on science, rather than teaching, grant applications, etc.
- defined funding package / space / number of posts associated with each group (although we expect that up to 1/3 of research fellows and some students will be supported through externally-funded competitive fellowships)

Cancer Research UK has five 'core-funded' Institutes (Table 2), where the Institute is a self-contained entity and Cancer Research UK is by far the majority funder, and where if the Institute performs poorly at sequential quinquennial reviews, our primary response would be to seek to change the Director. In these Institutes, the overall scientific portfolio and strategy is determined and led by the Director. Also, within a core Institute, whilst a poorly-rated or failing group at quinquennial review would usually have its funding withdrawn, it might be retained at the discretion of the Director after discussion at the Institutes Committee. Clearly, there would need to be a convincing case as to why such a course of action was in the best interests of the Charity.

Given the key role of Institute Directors, it is important that the Charity is clear about its expectations of them. To date, Cancer Research UK has not had a policy on the length of tenure for an Institute Director, nor a policy to ensure continuity in the event that an Institute Director leaves the role at short notice. In future, the term of a Director will normally be expected to be two successive terms of five years and during the following, third term, the Director will be expected to move on to another role, except in exceptional circumstances. Furthermore, all Institutes will be expected to have a clearly identified Deputy Director. The individual in this role will not automatically assume the Directorship at the end of the current

Director's term, but they will be expected to assume responsibility if the Director leaves their role unexpectedly.

Table 2. Core-funded Institutes

Institute	Current No. of groups	Governance	Funding model	Last review	Future plans
Beatson Institute for Cancer Research (Glasgow)	17	Separate legal entity with own Board of Governors. Group leaders employed by Glasgow University	Majority of funding provided by CR-UK as an annual grant to the Director (allocation at Director's discretion). Approx 11.5% of total funding from other (non-CR-UK) sources	April 2008	Build new animal house. Develop drug discovery programme. When funding permits, expand to 22 groups.
Cambridge Research Institute (CRI)	17	CR-UK but some staff funded via University	Budget agreed as part of business planning process and allocation within this at discretion of Director	n/a (opened 2007)	Establish site specific programmes. Develop Cambridge Cancer Centre. When funding permits, grow to 21 groups and thereafter, when funding permits, open 3 rd floor and expand further
London Research Institute (LRI)	47	CR-UK	Budget agreed as part of business planning process and allocation within this at discretion of Director	July 2006	Move into UK-CMRI. Open P Block animal facilities at Clare Hall. Incorporate most of CR-UK Research Services.
Gray Institute for Radiation Oncology and Biology (ROB) (Oxford)	10 CR-UK (17 Total)	Embedded within Oxford University	Core infrastructure held by Director and programme grants held by PIs.	n/a (opened 2007)	Start to build translational links.
Paterson Institute for Cancer Research (Manchester)	14	Embedded within Manchester University	Given as an annual grant to the Director and allocation of resources at discretion of Director	2004	New chemotherapeutics centre (joint with Christie Hospital). Develop drug discovery programme. When funding permits, grow to 18 groups and thereafter, when funding permits, participate in new build for cancer research and expand further

There have been some significant changes recently in our Institutes - within the last two years alone, the CRI and ROB have both opened and the opportunity has arisen to relocate the LRI together with the MRC's National Institute of Medical Research (NIMR), and research groups from University College London (UCL) and the Wellcome Trust into the proposed UK Centre for Medical Research and Innovation (UKCMRI). These are decisions that are central to our five-year strategy and we have to ensure that our investment in these Institutes is part of a coordinated approach. With the appointment of our Chief Scientist we are now working towards a more clearly defined relationship between the research strategy of the Charity as a whole and that of its individual Institutes. It has become clear that for each of the Institutes, as with our Centres, interaction with the local community is of primary importance – more important than the interaction between Institutes themselves. Nonetheless, it is essential that Institutes coordinate well with each other, particularly in terms of strategic themes, technologies and recruitment of group leaders. The Institutes Committee, chaired by the Chief Scientist, provides

a good forum for this and, going forward, may also incorporate the Institute of Cancer Research (ICR).

There is a danger of long-term sclerosis in our institutes and so our strategy will be to encourage significant turnover. Institutes provide an important environment for training and we envisage a flow over time from our institutes to the university sector.

Running a successful research institute is dependent on a number of key factors, including a clear focus, world-class scientists, access to cutting-edge resources, technologies and facilities and processes for scientific interaction and collaboration. Critically, it is also dependent upon being able to maintain a level of autonomy sufficient to maximise creativity through flexible deployment of resources. Cancer Research UK achieves this very well at the Paterson and Beatson Institutes as well as at ROB. However, we could almost certainly enable a greater degree of flexibility at the CRI and LRI through greater devolution of authority and responsibility. The trade-offs are usually around maximising efficiency and control on the one hand and encouraging creativity on the other. Over the next year, we will seek to devolve more authority to the LRI and CRI by giving them control over their own budgets with respect to IS and facilities management. Finance and HR will remain as centrally managed functions, but with locally embedded resources. In the future, LRI and CRI will be allocated an annual budget each year, with complete autonomy delegated to the Director to vire spend between different areas, including capital expenditure and IS, in order to achieve the aims of the Institute. The corollary will be that no additional funding will be made available to an Institute during the course of a year.

Beatson

In April 2008, shortly after moving into its new £15m building, the Beatson Institute underwent a very successful quinquennial review. Although the Beatson has yet to reach its full potential, there has been a transformation since Professor Karen Vousden took up the Directorship in 2003. The Institute's performance is good and is expected to improve further. Furthermore, the ability of Cancer Research UK to turn the Beatson around has been seen internationally as a significant achievement. Key scientific themes for the institute are invasion and metastasis. Professor Vousden's strategy for the Institute is as follows:

- Establish an outstanding basic research programme into the cell biology of cancer
 - The regulation of cancer cell invasion
 - The regulation of cancer cell proliferation and growth
 - The regulation of cancer cell death and survival
- Identify critical components of these pathways as novel therapeutic targets and establish a programme of drug discovery
- Develop strong clinical links so that research can be translated into new therapies and diagnostic/prognostic tools

The goals for the institute in the next 5 to 10 years are to build its scientific reputation by recruiting and developing outstanding group leaders; continue to develop advanced technologies; build a new animal house; and build local and Scotland-wide relationships. The Beatson also aims to build its credibility as a place for translational work to take place. These goals will require strong recruitments and Cancer Research UK will support the Beatson in this. Although the Beatson is a separate charity, its Board of Governors is chaired by the CEO of Cancer Research UK and has a majority of CR-UK representatives.

A key aspect of Cancer Research UK's strategy in drug discovery (section 3.1.2) is to establish two major new programmes in small molecule drug discovery, centred on our core-funded Institutes. Space has already been identified at the Beatson Institute to house this initiative and

Professor Vousden is seeking to recruit a high calibre Director to lead the programme. Recruitment activity is coordinated with the Paterson Institute.

Cambridge

The Cambridge Research Institute (CRI), directed by Professor Sir Bruce Ponder, aims to create a new model for translational research. The core research themes are:

- Basic cancer biology, with a particular focus on epithelial cancers;
- New technology-based research, specifically molecular imaging, genomics, bioinformatics and biomolecular modelling;
- Clinical investigations, including tumour-specific research, experimental medicine based clinical trials and population-based studies in screening and prevention.

From its establishment in 2007, the CRI has functioned as a nucleus around which clinical cancer research activity in Cambridge has increased. Professor Ponder and Cancer Research UK's vision is to continue to build the expertise and infrastructure in Cambridge towards the establishment of a Cambridge Cancer Centre involving multiple partners working towards a common set of goals. This would include Cambridge University Hospitals NHS Foundation Trust, the Clinical School, the wider University, and other funders.

As a framework to translate advances in biology at the CRI through to the clinic, five programmes of site-specific cancer research will be established. These are likely to focus on prostate, lung, breast, ovarian and upper GI cancers. The site-specific programmes will feed into the related themes of imaging, population science and drug discovery within the local research community, and will draw in resources from other areas.

Paterson

The current Director, Professor Nic Jones, joined the Institute in 1999 and since that time the Institute has been seen internationally to have undergone a period of dramatic improvement. This view was reinforced by a successful Institute review in 2004; the next review is due to be held in June 2009.

The Paterson has developed strengths in basic and translational research with strong research efforts in cell proliferation and cycle control, in cell-environment interactions, in stem cell biology as well as world-leading expertise in pharmacology and biomarker development linked to clinical trials. Professor Jones is also seeking to recruit high calibre individuals to lead the small molecule drug discovery centre and a new initiative focused on animal cancer models.

The goal of the Institute is to not only continue to build its scientific strengths and reputation but also to support and facilitate world-class translational and clinical research. To this end the Institute, together with the University of Manchester and the Christie NHS Foundation Trust (CFT), formed the Manchester Cancer Research Centre (MCRC) in 2006. This integrates research across the three institutions. As a result the MCRC has galvanised researchers in Manchester to work in partnership to develop areas of research strength, to develop research infrastructure, to ensure close alignment of basic and clinical research and to coordinate research training.

A major boost to translational/clinical research will be realised through a joint CFT/MCRC initiative involving a £35m development. This will include a very significant expansion of the early phase clinical trial facilities (approximately 3-fold), making it one of the biggest such dedicated units worldwide. The development will form part of a cancer treatment centre that will include a chemotherapy delivery facility. Cancer Research UK has provided approximately £4.4m towards the development. It will be completed in 2010 and will reinforce Manchester as one of the premier sites in the world for conducting new phase I studies.

LRI/ UKCMRI

The LRI is Cancer Research UK's largest and most highly visible research institute and has become exceptionally productive in terms of high-impact scientific publications. Since the establishment of Cancer Research UK, the Director, Dr Richard Treisman, has organised the Institute's research portfolio around two central research themes, signal transduction and genetic integrity, which are central to our research goals, as they provide a number of key targets and understanding for developing improved treatments. The current portfolio addresses three broad areas:

- Genomic instability and the cell cycle
- Cell regulatory mechanisms
- Biology of tissues and tumours

The Institute, which currently operates on two sites, at Lincoln's Inn Fields and Clare Hall, underwent a very successful quinquennial review in summer 2006.

The development of the UKCMRI will afford Cancer Research UK the opportunity to create a world-leading institute for fundamental cancer biology, with the means and structures for translating this research for patient benefit much more quickly than has been possible historically. It is a unique opportunity to work with the other major UK funders of basic research, the Wellcome Trust and the MRC and to bring LRI researchers from both LRI sites into a single state-of-the-art laboratory. The new centre will also provide a catalyst for national collaboration and for training future generations of scientists. It will have access to a range of cutting-edge technologies as well as fostering interactions and creative ideas with world-leading scientists working in other areas of human disease, notably in infection and developmental biology. A particular goal of the UKCMRI will be to build links into the physical sciences, mathematics, computing and engineering, afforded by the involvement of UCL. Such cross-disciplinary research, together with new disciplines like systems biology and computational biology, will be essential if we are to make effective use of the huge volumes of data now arising from genomic and imaging methods.

A number of principles for the new Institute have been developed and will need to be incorporated into its management and governance structures:

- (i) It will be a single national institute with a coordinated scientific strategy and an outward looking agenda designed to interact and enhance the activity of other UK centres and Universities.
- (ii) It will share common resources between the partners located at the site in terms of major equipment and facilities.
- (iii) It will play a key role in developing outstanding research scientists, many of whom will be expected and encouraged to subsequently populate and lead research activity in universities throughout the UK.

It is important that the success and vigour of the LRI is not compromised during the period that the CMRI is being planned and built. One possibility we will explore over the next few years is to recruit UKCMRI-partner funded research groups into the LRI. This would both help to develop interactions with our funding partners and aid the effective transition to the new building.

A further change that will be implemented over the next year is that all of our centrally provided Research Services will either be closed or rolled into our core-funded Institutes (section 3.2.5). Most of the retained services will be rolled into the LRI.

ROB

The ROB was established in 2007 and has recently moved to part of a new purpose-built building which also houses other major academic groupings working in cancer, providing

excellent opportunities for collaborations with other cancer related groups. ROB is directed by Professor Gillies McKenna, an international leader in radiation oncology and biology.

The vision of the ROB is that it will:

- Be the leading radiobiology facility in researching new translational opportunities in this field, and in providing education for all types of Health Care Professionals in the understanding of Radiation Oncology and Biology.
- Be a state-of-the-art facility that is also easily modifiable to meet expected future technological applications

Major research areas are DNA damage and repair, signal transduction and the tumour microenvironment. These research areas will be supported by core facilities in imaging and radiation biophysics.

Non-core Institutes

Cancer Research UK also has one non-core Institute – the Gurdon Institute in Cambridge – which CR-UK supports jointly with the Wellcome Trust. The structure of the Gurdon was created around a fixed number of CR-UK or Wellcome Trust funded research groups (CR-UK funds up to 6 out of up to 18 groups). The Centre is managed on the basis of a democratic management group, consisting of the Senior Group Leaders, and currently chaired by a Wellcome Trust funded PI, Professor Jim Smith. Thus in contrast to the core-funded Institutes, although we pay some of the overheads and PI salaries, the overall research programme is not the responsibility of a formal CR-UK Director and, if the Institute were to perform poorly at a quinquennial review, we might more easily consider withdrawing support from some of the research programmes within the Institute. In addition, since the science is based around PI-led independent programmes, a poorly rated group at quinquennial review would not be awarded renewed funding. However, a significant number of very high quality research publications have emerged from the Gurdon and it is evident that the democratic nature of the management structure has been key to its success. We therefore would not wish to destabilise the Gurdon by attempting to align its governance structure with our core-funded Institutes, but rather view this as an exemplary structure worthy of consideration by potential Cancer Research UK Centres.

3.2.3 Create space for bold initiatives

During the years 2009/10-2013/14, our strategy is to:

- Establish the financial flexibility and funding mechanisms to allow CR-UK to take part in exciting new developments whenever they happen through a substantial strategic reserve held by the Scientific Executive Board (SEB)
- Introduce new initiatives by piloting them in our Institutes and Centres first, before considering how successful initiatives could become national resources

What we will not do

- We will not fund new schemes in perpetuity – new strategic initiatives will be short periods of ring-fenced funding.

True advances in science and medicine can only come from innovation and we need to provide an environment that will allow this to happen. This is not simply about new ideas in science but also about how science is done. Several of the world's largest science funding bodies are making radical changes in the way they assess research proposals. The US National Institutes of Health (NIH) for example, has recently announced that it will spend \$1bn over the next five

years on “high risk, high impact transformative research”; in spring 2008 the Bill and Melinda Gates Foundation unveiled a \$100m “agile, accelerated grant-making process” called Grand Challenges Explorations and the Royal Society is putting together a pilot scheme for a “blue skies” research fund.

While maintaining stability in our Institutes and Centres, we also want to have the agility to anticipate and respond to rapid developments. To do so, we must be prepared to take an innovative approach ourselves and be open to both new research directions and new funding models. We have already taken many steps in this direction over the past few years. For example, we have pioneered the field of snp analysis because we responded rapidly to this emerging area and had the financial flexibility to do so. Moreover, because we handled the procurement of external services from Illumina for these studies, we were able to negotiate highly preferential rates and access to the latest technology. We have pioneered the concept of Centres and have driven the development of Experimental Cancer Medicine Centres, CRT Discovery Laboratories, the Drug Development Office and innovations in sample collections and biomarker studies.

Over the next five years, we will ensure that we are in a position to fund other unexpected new opportunities that might arise in the future. We will continue to invest in ‘blue sky’ research through traditional routes, at the same time recognising that in some cases it may be better to take alternative approaches, such as commissioning research. Another new approach for Cancer Research UK would be to pose a ‘grand challenge’ in research. This could be highly motivating and would have the advantage that we could precisely define the desired outcome. An example of such a grand challenge could be focused around a precise clinical problem such as adverse normal tissue response to radiation, or false positives in colorectal cancer screening by Faecal Occult Blood (FOB) test. The challenge would then be to come up with novel tests that would solve these key clinical problems.

3.2.4 Continuously review whether we have the right governance and funding streams to meet the needs of our research strategy

During the years 2009-2014, our strategy is to:

- Ensure that all funding decisions take account of both quality and fit with Cancer Research UK’s strategic priorities
- Streamline research management and administration to provide simpler grant processes and significantly better information on portfolio and impact
- Develop a system and culture that will encourage PIs to act as entrepreneurs, with greater financial flexibility and more self-regulation
- Review our governance and funding streams in the light of this research strategy and implement changes to the remits of our Funding Committees accordingly
- Build a closer relationship between our overall Research Strategy and individual Funding Committees, through links between the Chairs of these committees and the SEB
- Explore whether we can devise changes to our review and/or promotion processes to encourage more cross-disciplinary and/or high risk research in Institutes and Centres

What we will not do

- We will strongly discourage expansions of scientific programmes, other than for younger investigators at the start of their careers.

We are currently undergoing a major change programme known as SMART (Science Management and Research Tracking) to create an efficient and cost effective application

process and awards management system that is user friendly for the research community. Importantly, it will also provide clearer, more immediate information on our research portfolio, allowing us to significantly improve our tracking of the outputs and outcomes attributable to all CR-UK research funding. This in turn will enable better informed and more transparent decision making.

While SMART will facilitate improved monitoring of the portfolio, this will not result in increased bureaucracy. We will move towards developing a system and culture that encourages greater self-regulation, enabling us to work in partnership with our investigators. For example there will be increased delegated financial responsibility and greater ability to flex budgets, within limits. Over the next year, we will move to enabling complete virement between different categories of spend within a grant instalment (between one and three years), other than major capital equipment. However, we will continue to retain the ability to reclaim funding if there are major periods of unfilled vacancies. Flexible virement will include expenditure on travel to conferences and salary increases / increments, which will enable us to essentially do away with the issuing of supplements and annual considerations of grant increases.

Historically we have not been as rigorous as we should have been about the quality of some of the research we have funded. We need to continue to address the fact that some of the research we fund in the UK is not as internationally competitive as we would like. We have made some progress recently by reducing the renewal rates on our programme grants. We will continue with a strategy of funding only research of the highest quality and greatest impact. We will strongly discourage expansion on programmes during renewals, other than for younger investigators at the start of their careers. Historically, programme expansions have taken up a disproportionate level of our overall growth in research funding and programmes that are too large limit our scientific and financial flexibility.

Our aim is to be the funder of choice for cancer research in the UK and to keep ourselves on the map globally as a leading funder of the highest quality research.

We offer a very wide range of funding opportunities to our researchers. Such diversity can appear to lack coherence, especially if we do not effectively publicise and promote the opportunities. We need to choose the right number of funding streams – too many is confusing for the community and results in individual streams not having the flexibility in terms of budget and strategy, too few results in the remit being very broad, which makes it difficult to make judgements across the committee's portfolio because there is insufficient parity between different fields.

Funding schemes are responsive to the research community by nature but we need to ensure that we maintain an appropriate structure and governance for our schemes that is relevant to today's research and yet facilitates strategic change. There is currently too much of a disconnect between individual committees and the organisation's research strategy. Producing this five-year Research Strategy will help to provide clarity to our Funding Committees about our strategic direction. As a result of SMART, this will be backed up by better quality, up-to-date information on our portfolio and impact in specific areas. We will also aim to build a closer relationship between the Chairs of our Funding Committees and our Scientific Executive Board.

One mechanism that we and others such as the NCRI have used to introduce strategic change is to issue calls for proposals, sometimes funded through a consortium, with ring-fenced money. This approach can successfully be used to pump-prime an area, but it is important that such schemes are limited to the period of time required to establish critical mass. Beyond this, funding in the area would be expected to compete with the rest of the portfolio.

We also need to capture much better and more timely data on the outputs and impact of our research portfolio. We will do this in 3 ways:

- Requirement to submit a publishable abstract before payment of the first instalment on a grant.
- Requirement to submit a short-form annual report in order to trigger the final quarter's payment of a grant in any year. This report to detail major discoveries and any publications (including those submitted).
- Requirement to submit a final report in order to trigger the final payment on a grant.

Finally, we will explore over the next few years whether we can devise changes to our review and/or promotion processes to encourage more cross-disciplinary and/or high risk research in Institutes and Centres.

3.2.5. Identify and provide access to the key new technologies and infrastructure that are needed to make the fastest progress in cancer research

During the years 2009-2014, our strategy is to:

- Pilot key new technologies in our Institutes or Centres
- Encourage our Institutes and Centres to use key new technologies as a catalyst for interaction with the local research community
- Explore opportunities to work with industry on emerging technologies
- Facilitate the outsourcing of research services, for example through centralised information or procurement of high-quality out-sourced research services
- Work with others to standardise sample collection, processing, storage and analysis
- Support tissue collections in areas where existing collections are inadequate
- Work with the NCRI and other partners to develop the informatics required to support and enhance cancer research
- Monitor the progress of onCore UK, ensuring that the next go/no go funding decision point is clearly delineated
- Undertake a strategic review of the informatics needs of CR-UK

What we will not do

- With the exception of onCore UK, we will not provide direct support for stand-alone tissue banks
- We will not provide centralised research services (other than the CRT Discovery Labs)

The pace of technological innovation is incredible and we must ensure that we respond appropriately. This will require some modifications to the models of research funding we have used in the past. Increasingly biomedical research is being carried out on a large scale in terms of the technology, the volume of data, and the extent of collaboration involved. As a consequence we need to provide mechanisms for the joint provision and sharing of technologies and data and we need to improve our engagement with the technology industry and with engineers. CR-UK is well placed to do both of these things.

Our aim is for our investigators to be able to focus on research and not necessarily on developing skills in techniques and technologies that could be easily and cheaply out-sourced. This also reflects our desire to see PIs as entrepreneurs and to give them more autonomy and flexibility in managing their research budgets. Centralised research services are no longer appropriate for an organisation the size of Cancer Research UK. Consequently we are in the process of transferring and/or closing down existing Research Services as appropriate. There are however, significant gains to be made through centralised procurement of out-sourced services. For example, Cancer Research UK has worked very successfully with Illumina in this respect. Centralised information on services that different research groups have out-sourced could also help to facilitate this approach.

We expect our Institutes and Centres to be our focus for innovation and so we aim to pilot key new technologies in these locations. This will also encourage multi-disciplinary working as access to key technologies will work as a catalyst for interaction with the local research community.

Tissue Resources

Tissue resources are key to all aspects of the basic, translational and clinical research conducted by CR-UK. In particular, tissue resources are central to the discovery and development of biomarkers of every type and to epidemiological studies.

In 2003, Cancer Research UK, in partnership with others, established a national cancer tissue resource. This resource is now known as onCore UK and is an independent charity, funded by Cancer Research UK (25%), DH England (50%) and the MRC (25%). Its remit is to establish tissue collections and tissue resources for cancer researchers and to support this through processes and standards. It also acts as a repository for tissue resources. OnCore UK's original remit was to address a gap in access to tissue resources, particularly in rarer cancers. This remit changed to samples associated with clinical trials, but onCore UK has recently reviewed its strategy and its remit is likely to change again.

Through membership of the onCore UK Board of Trustees at Executive Director level, Cancer Research UK will carefully monitor the progress of onCore UK. A set of milestones has recently been agreed by Cancer Research UK's Executive Board (EB) and SEB which delineate clear go/no go funding decision points for onCore UK.

In addition to onCore UK, Cancer Research UK currently has a commitment to a number of stand-alone tissue banks. Each of these tissue banks has a different model of tissue banking, although all experience similar issues. In addition, infrastructural requirements of tissue banking do not fit within the timeframe, structure or review processes that apply to standard Cancer Research UK Programme or Project awards. These factors, coupled with the lack of standard metrics with which to measure performance in a uniform way, mean that Cancer Research UK cannot be confident about the overall utility of a bank, and hence whether funding of these banks in this manner represents good value for money.

In future, with the exception of onCore UK, existing stand-alone tissue banks will no longer be directly funded by CR-UK. The infrastructure needs of existing CR-UK tissue banks will be met through ECMC funding or as part of the Cancer Research UK Centres initiative. Furthermore, the development of new tissue banks will not be independently supported by Cancer Research UK with the exception of one-off pump-priming support to allow the bank to reach a financially self-sufficient operational phase. Any new banks that are awarded pump-priming funding will be located in existing ECMC Centres or in Cancer Research UK Centres. We will also continue to support sample collections associated with clinical trials, funded by CTAAC.

At present, the needs of translational research are considered as being met for some of the more common cancers such as breast cancer. However, the need in other cancer types such as lung, prostate and some of the rarer cancers, may not be being met by the CR-UK funded resources currently available. CR-UK will consider support for tissue collections in areas where existing collections are inadequate.

We will also consider over the next year, whether Cancer Research UK should become a partner in the UK Biobank, a large-scale, long-term prospective UK population study, as we recognise that this represents a major potential future resource in cancer epidemiology, particularly if Biobank collects more phenotypic data relevant to cancer.

Informatics

Informatics has become increasingly important in the digital age as the ability to manage data effectively has lagged behind the pace of its generation. The development and implementation of electronic patient records in the NHS provides further opportunities for data linkage and research, and also adds to the challenges of standardization, data governance and confidentiality. Developments are currently taking place through the UK Clinical Research Collaboration (UKCRC) and NHS Connecting for Health which should help to coordinate bioinformatics in the UK in a way that it has not been before. The Research Capability Programme will link the research element of Connecting for Health with developments in the NHS and will also be coordinated with the Office for Strategic Coordination of Health Research (OSCHR) e-health Board. The establishment of the National Cancer Intelligence Network (NCIN), under the auspices of the NCRI, is also a major development that will link together existing data sets as a means of fostering further population and health services research. Cancer Research UK is helping to drive the further development of NCIN.

To maximise the benefits of funded research, Cancer Research UK must develop an organised and integrated approach to informatics. We have recently developed a data sharing policy and have made a significant contribution to the NCRI Informatics Initiative, which aims to maximize the impact of the results of research for the benefit of cancer patients, by ensuring that data generated through research and clinical care is accessible and put to full use by the cancer research community. To achieve this, the NCRI Informatics Initiative is developing an Informatics Platform which will provide an integrated research environment that will allow the cancer community to discover, access, share, analyse and re-use geographically disparate research data. Cancer Research UK will shortly be reviewing its own strategy in informatics in order to understand the informatics needs of our scientists, increase the accessibility of the data generated, develop and promote data standards, improve the ability to integrate data-sets and reduce duplication of research effort.

3.3 PROVIDE THE RIGHT PEOPLE FOR RESEARCH

A stimulating environment will facilitate research but research excellence depends fundamentally on supporting the right people. To achieve our goals, Cancer Research UK needs the best biomedical scientists, the best clinical researchers and the best biomedical and clinical research leaders. We must look to the future to ensure that we are training the workforce we will need up to and beyond 2020.

This means encouraging the best scientific researchers to focus on cancer research and it also means making strategic recruitments in areas where we have identified that there are gaps. In addition, many of Cancer Research UK's most successful researchers are moving towards retirement and we need to recruit, mentor and develop the next generation. We need to develop excellent schemes for training and career development, particularly in new and emerging areas of research. Our Centres and Institutes will play a key role in this, balancing the experience that accompanies stability with the fresh ideas brought about by turnover. With an increasing move towards large scale science, it is more important than ever to invest in and foster collaborations in the UK and across the world.

3.3.1 *Increase the number of international leaders in cancer research working in the UK*

During the years 2009-2014, our strategy is to:

- Attract world class young people with potential as well as established leaders in new fields of science to work in cancer research in the UK
- Make strategic recruitments from overseas in specific science areas e.g. imaging, animal models, small molecule drug discovery, epidemiology, into our Institutes and Centres
- Make strategic recruitments to drive clinical and translational research, to address the dearth of suitably qualified clinical and translational academics in the UK
- Streamline and clarify CR-UK support for senior academic salaries outside our Institutes, through our Centres
- Work with HEIs to encourage research independence at a younger age
- Establish senior strategic leadership within Cancer Research UK in the area of epidemiological, symptom awareness and early diagnosis, screening and medical prevention research
- Ensure that we plan for the succession of senior leaders in all areas
- Coordinate recruitment across the Charity

What we will not do

- We will not provide any more life-long Chairs in universities and hospitals
- We will not establish a Principal Research Fellowship scheme

Although we have had great successes with our fellowship schemes, Cancer Research UK, and indeed the UK as a whole, is not currently attracting sufficient senior level talent in cancer research. Despite continuous investment over many years by Cancer Research UK and its forerunners, there is a deficit in clinical scientist leaders nationally. We have sufficient oncologists and other consultants driving large scale clinical trials throughout the UK, as demonstrated by our global leadership in this area (other than in surgery and radiotherapy). However, clinician scientists working at the translational interface are few in number. Several Chairs in Oncology are formally or informally vacant and there are few candidates for Chairs of Cancer Surgery or Pathology. These problems are not peculiar to either cancer or the UK, and in part reflect an international phenomenon caused by pressures of service delivery, declining

rewards and increasing hurdles for academic clinicians, and changes in the medical workforce demographics.

This issue is not limited to clinical cancer research. Many of the leading non-clinical researchers are in or approaching the final decade of their careers and the number of “rising stars” currently in the system is unlikely to be sufficient to meet demand.

The decline in Government-supported science funding in North America, and the developing scientific communities of the Indian sub-continent and “Pacific rim”, provide an opportunity to recruit high quality non-UK resident senior cancer researchers. Furthermore, there is an increased willingness of scientists, particularly translational researchers, to move between the academic and commercial sectors.

Cancer Research UK has not, in the past, approached the recruitment of senior leaders in academic research in a coordinated way. As an independent funder with an excellent international reputation, we are in an ideal position to be able to create some very attractive opportunities for world-leading scientists. Over the next five years we will take a much more proactive and coordinated approach to the recruitment of international leaders in cancer research. We will move away from delegating this responsibility entirely to universities and Institute Directors, and instead will work with them to lead and coordinate recruitment. There are several areas in which we are intending to engage international leaders that have been identified in this research strategy, for example in epidemiology, small molecule drug discovery, imaging, and animal models.

It is important that we do not focus all of our efforts on recruiting established leaders as we also need to ensure that we have the next generation in line to succeed these people. Furthermore, this next generation more often constitutes scientists at the peak of their productivity. We need to take a broad approach, nurturing our existing talent through mentorship and talent management as well as making strategic recruitments from abroad, and recruiting to universities and hospitals as well as Institutes. We recognise, however, that we may have to support the recruitment and/or posts for a limited period if we wish to have strategic leadership in universities. This will be coordinated through our Centres.

We also need to clarify our approach to the support of senior/ PI salaries outside our Institutes, as this has been very opaque and unbalanced historically. In future, support for senior salaries must be aligned to the Centre strategy and will therefore be considered on a case-by-case basis in each Centre. As a general principle, we expect that it may be necessary to support 2-3 senior salaries in any one Centre for periods of time but these posts would not be life-long awards and would be more likely to support researchers at the clinical end of the spectrum. Where we support more senior salaries than this in our Centres, we will seek to implement a managed transition over the next 3-5 years.

A more strategic approach to succession planning at senior levels is also required in all areas. This is particularly evident in the area of “observational” epidemiology, in which there is a relatively small number of senior scientists, most of whom are close to retirement. There is a pressing need to ensure that a strong new cohort of independent PIs in observational epidemiology is developed over the next five to ten years.

An issue that exists in both the UK and the US is that the average age of well established, high performing group leaders has increased dramatically in recent years. In the UK this is partly due to a significant increase in funding for research which has not been paralleled by university funding, and universities have been under pressure to reduce the number of tenured posts. This is having an impact on the UK teaching environment. Cancer Research UK Centres could play a role in helping to address this issue and Cancer Research UK will consider how it might

work in partnership with universities to attract younger people into independent positions in cancer research.

3.3.2 *Continue to develop and maintain schemes for training and career development to ensure that the UK is developing a cancer research workforce for the future, pioneering the development and provision of relevant training in our Institutes and Cancer Research UK Centres*

During the years 2009-2014, our strategy is to:

- Maintain our current investment in training schemes, while modifying the existing portfolio where necessary
- Devolve studentships and CRTFs to training accounts in Centres
- Ensure that project grants for scientific research are awarded to new/younger investigators rather than the more established researchers
- Work in partnership where possible (e.g. with Royal Colleges, other funders)
- Ensure that the research community is aware of the training opportunities offered by the Charity
- Establish targeted short-term initiatives to stimulate specific research areas where there are gaps
- Develop mechanisms for senior or retiring researchers to provide mentorship for junior group leaders in Institutes and Centres
- Encourage talent management within our Institutes and Centres

What we will not do

- Apart from Centre and Institute outreach activities, we will not invest in schemes aimed at encouraging undergraduates or school pupils to pursue a career in cancer research. Our schemes will be focused at graduate level and above.

We need to ensure that we have the right schemes in place to develop the cancer research workforce for the future. At present we provide training and career development schemes in basic science, translational science, clinical research and behavioural research, but in future we will need to consider new interfaces. Generally our PhD and fellowship schemes in non-clinical research work well, but we have faced more of a challenge in the clinical arena.

Cancer Research UK is the major charity supporter of clinical training and career development in cancer in the UK. We provide potential support at many stages through the career of a clinical academic, from short-term bursaries aimed at junior doctors, through Clinical Research Fellowships aimed at middle grade (Specialist Registrar) doctors, to Consultant level doctors with Clinician Scientist and Senior Clinical Research Fellow positions. These provide full salary support and varying degrees of associated research support, rising with seniority. There has been a steady stream of applications, and awards made, for the Clinical Research Training Fellowships and Clinician Scientist Fellowships. However, we have struggled to award new Senior Clinical Fellowships. This is probably because the expectations for scientific development have been unrealistic and too much has been expected of Clinician Scientist Fellows at the time that they would be applying for a Senior Fellowship, after only three to four years of part-time post-doctoral research experience with one group member. We will therefore replace Senior Clinical Research Fellowships with the option to renew Clinician Scientist Fellowships after 4 years.

Building a critical mass in clinical research is something we have historically done well in centres and we need to maintain this approach. It is important that we provide continuity of support to allow our Centres to be flexible in a local sense about who they should be training. In this way Cancer Research UK will provide consistency in the face of a rapidly changing NHS.

For non-clinical research, we also have a comprehensive portfolio of non-clinical studentship and fellowship awards to facilitate career development. We have demonstrated a flexible approach to addressing specific skill shortages such as in medicinal chemistry and molecular pathology and we have recently initiated a Career Establishment Awards scheme to support the very best young non-clinical scientists who have just been appointed to their first HEFC-funded post. We need to keep a watching brief to ensure that other gaps or new areas are addressed.

PhD studentships and Clinical Research Training Fellowships provide the “feedstock” of the future cancer research workforce. Historically CR-UK has changed its approach to the provision of these positions a number of times. In an attempt to ensure only the best students are funded, most positions have been awarded competitively and centrally. However, this does not encourage the establishment of effective training programmes as universities do not know how many positions will be funded from one year to the next. It also does not maximise the opportunities for securing the best talent from across the UK. There is also the administrative burden, on the part of both Principal Investigators and the Charity of having to apply and process the applications for each individual studentship or CRTF position.

In future therefore, all PhD studentships and clinical research training fellowships will be allocated as training accounts to Centres (or as part of the core grant of Institutes), with positions available to be deployed across the entire spectrum of cancer research in each Centre. Where positions (e.g. CRTFs) are currently embedded within programmes, these will also in future be part of the Centre training account. It will be up to the Centre to establish appropriate training schemes which strike the right balance between training, apprenticeship and “pairs of hands” to conduct research. We also hope that by encouraging our Centres to develop world-class excellence in specific areas, they will begin to address the national shortage of high quality post-doctoral researchers in the university setting. Training accounts will be assessed as part of the triennial review of Centres. Senior level fellowships will continue to be awarded through competitive applications.

We recognise that new and younger investigators trying to establish a career in cancer research frequently find it difficult to attract funding. Historically in CR-UK, consideration of applications from new Investigators has been undertaken alongside those of established Investigators and this has resulted in a significant proportion of our project grants being awarded to established investigators. Over the next five years we will only award project grants from our Biological Sciences or Population Research Committees to investigators at an early stage in their career in cancer research.

Cancer researchers at a senior level have an important role to play in inspiring younger generations to pursue a career in cancer research. We will not invest in specific schemes to do this but we will expect our senior scientists to recognise their responsibility as role models and to increase their profile as such, for example by giving talks in schools on science/medicine as a career, or by giving lectures in medical schools. Cancer Research UK Centres and LEAD will help to facilitate this.

Cancer Research UK Centres and Institutes have an essential role to play in the training and development of cancer researchers. These two venues will be complementary in their approach – the stable environment provided through Cancer Research UK Centres will be balanced by the high turnover expected in Institutes. This will keep our Institutes ‘fresh’ with a regular influx of new talent, while also providing a natural flow of highly trained and motivated scientists from our Institutes to our Centres.

3.3.3 Continue to invest in and foster national and international collaborations to deliver the best research output

During the years 2009/10-2013/14, our strategy is to:

- Consider current and potential interactions with the pharmaceutical and biotechnology industries and develop relationships as appropriate
- Continue to invest in all collaborations that help us work towards our Goals
- Investigate the possibility of leading an IMI bid in animal models and/or biomarkers
- Examine the potential for broader Charity-level international partnerships

We recognise that everything we do is a part of a broader context and this is reflected in our Goals. The nature of science and research is changing and is becoming larger in scale. As cancer management becomes increasingly tailored to the individual, we need to investigate large populations in order to identify small but significant differences. This often requires national or even international collaboration.

Collaborating more extensively will allow us to provide access to larger and more expensive facilities and technologies. For some areas of research it is no longer possible or appropriate for the work to be funded by a single organisation. Partnerships will allow us to fund the type of science that would otherwise be beyond the scope of Cancer Research UK, or even the UK. There are also benefits for us in being involved in cross-disciplinary research because we can learn from other disease areas and take a more holistic approach to biomedical research.

Cancer Research UK is already involved in many partnerships and collaborations – for example with DH (ECMCs, imaging), EPSRC (imaging), MRC (UKCMRI, ROB, imaging), NCRI, NCRN, NPRI, UKCRC, NCIN, EORTC, Royal Colleges, universities and NHS Trusts. We intend to continue to invest in and foster all partnerships that help us work towards our Goals.

We must be aware that there are some risks associated with partnerships, for example the other party may withdraw from the agreement, it may be difficult to drive the initiative in the direction we want (particularly if there are multiple partners), and the IP agreements can sometimes be challenging. We need to ensure that we make best use of our partnerships and that we are vigilant about the possible dangers. We also need to guard against and work hard to avoid the DH and other research funders reducing their focus on cancer.

The provision of additional funds through the European Commission is currently a missed opportunity for Cancer Research UK. We have not secured EU funding to any significant extent in the past because the process of making EU applications is considered highly cumbersome and we have not approached it from an organisational perspective. However our aspirations in animal models and biomarkers are highly suited to the Innovative Medicines Initiative (IMI). This is a joint undertaking between Pharma and the European Commission to address bottlenecks in the drug development process and has a budget of €2bn. Leading an IMI bid could be an ideal opportunity for cofunding and for coordinating much more work across the UK and across Europe

We already have Charity-level relationships with the NCI and EORTC. In addition, individual researchers, universities and Institutes have collaborations with their counterparts across the world. Whilst not cutting across any of these existing relationships, we will explore, over the next year, whether the Charity should develop further international relationships and/or evolve its existing relationships with, e.g. NCI, NCIC, EU, IARC, Singapore, India, China etc.

We recognise that the pharmaceutical and biotechnology industries have a key role to play in the improvement of cancer care. In order to deliver on our Goals and our Research Strategy we

need to consider where there is greatest potential in interacting with industry beyond current arrangements and what the implications of such relationships might be for the Charity as a whole. This will be an important focus for us over the coming months.

Appendix: Glossary of Acronyms

Acronym

BDU	Biotherapeutics Development Unit
BHF	British Heart Foundation
CRI	Cambridge Research Institute
CRT	Cancer Research Technology
CRT DL	Cancer Research Technology Discovery Laboratory
CR-UK	Cancer Research UK
CCT	Centre for Cancer Therapeutics
CEO	Chief Executive Officer
CCLG	Children's Cancer and Leukaemia Group
CFT	Christie NHS Foundation Trust
CDP	Clinical Development Partnership
CRTFs	Clinical Research Training Fellowships
CSGs	Clinical Studies Groups
CTAAC	Clinical Trials Advisory & Awards Committee
CTU	Clinical Trials Unit
CRSC	Council Research Strategy Committee
DH	Department of Health
DC	Discovery Committee
DDO	Drug Development Office
ESRC	Economic & Social Research Council
EPSRC	Engineering & Physical Sciences Research Council
EORTC	European Organisation for Research & Treatment of Cancer
EPIC	European Prospective Investigation into Cancer & Nutrition
EU	European Union
EB	Executive Board
ECMC	Experimental Cancer Medicine Centre
FOB	Faecal Occult Blood
FY	Financial Year
GI	Gastrointestinal
GP	General Practitioner
GWAS	Genome Wide Association Studies
GMP	Good Manufacturing Practice
HTA	Health Technology Assessment Programme
HEIs	Higher Education Institutions
HRT	Hormone Replacement Therapy
HR	Human Resources

IS	Information Systems
IMI	Innovative Medicines Initiative
ICR	Institute of Cancer Research
IARC	International Agency for Research on Cancer
LEAD	Local Engagement & Development
LRI	London Research Institute
MCRC	Manchester Cancer Research Centre
MRC	Medical Research Council
NAEDI	National Awareness & Early Detection Initiative
NCI	National Cancer Institute (United States)
NCIC	National Cancer Institute of Canada
NCRI	National Cancer Research Institute
NCRN	National Cancer Research Network
NCIN	National Cancer Information Network
NHS	National Health Service
NIHR	National Institute for Health Research
NIMR	National Institute of Medical Research
NIH	National Institutes of Health (United States)
NPRI	National Prevention Research Initiative
NSC	National Screening Committee
NICR	Northern Institute for Cancer Research
OSCHR	Office for Strategic Coordination of Health Research
PI	Principle Investigator
RAGSU	Radiation & Genome Stability Unit
ROB	Radiation Oncology & Biology
3R	Reduction, Refinement & Replacement (re: Animal experimentation)
SMART	Science Measurement And Research Tracking
SEB	Scientific Executive Board
SNP	Single Nucleotide Polymorphism
SuPaC	Supportive & Palliative Care
UKCMRI	UK Centre for Medical Research & Innovation
UKCRC	UK Clinical Research Collaboration
UCL	University College London