Response: Future frameworks for international collaboration on research and innovation
May 2019

Summary

Nearly 50% of all UK cancer research involves international collaboration and evidence shows working with colleagues from overseas makes research more impactful[i] [ii]. Therefore, we welcome this review exploring approaches to support further overseas scientific co-operation. Tackling the biggest challenges in cancer requires a global approach. Cancer Research UK (CRUK) recognises this through our international research programmes which intentionally facilitate the creation of teams based in multiple countries working towards a shared goal. During a time when the UK is navigating its exit from the EU, it is essential that cross-border collaboration can continue, and that the UK promotes the excellence of its research base globally, so it can continue to attract scientific talent.

1. **A close partnership with the EU is vital to future international scientific collaboration.** Government should ensure there is a strong partnership between the UK and the EU on research including through securing UK access to Horizon Europe**.** These schemes help foster scientific cooperation and the UK has been a major contributor to them, especially in medical research. Horizon Europe will include a focus on improving cancer outcomes across Europe, so involvement of the UK cancer research community is even more important.

2. **It is critical the UK research base has strong foundations to retain and build on our scientific excellence.** The anticipated roadmap setting out how the Government will achieve its target for 2.4% of GDP to be spent on R&D by 2027 should be published without delay. Reaching this target at a quicker pace would be a positive signal to the global research community. The roadmap should set out how the UK will maintain scientific excellence and market itself globally. The UK's ability to attract, recruit and retain global scientific talent will underpin the delivery of these ambitions.

3. **The UK should take a strategic and innovative approach to international funding programmes that adds value.** The UK should develop the prestige and global recognition of its research grants and consider innovative approaches to facilitate and promote international collaboration and drive international research consortia. CRUK has substantial experience creating and participating in international research programmes which we have drawn on in our response.

1. A close partnership with the EU is vital to future international scientific collaboration

The UK's ability to access EU research programmes is uncertain. Therefore, it is pragmatic for UK Government to explore funding schemes which attempt to replicate the benefits of such programmes. However, EU framework programmes are already an embedded part of the research ecosystem - plans for Horizon Europe have been approved and we know with certainty it will run from 2021-2027[iii]. This means potential partners within the EU are already planning research projects around this framework. There is not the same certainty for potential replacements administered by the UK Government and others.

The EU contributes significantly to science investment in the UK. In addition to financial contributions, EU grants support vital collaborations and have global prestige which attracts the highest-quality researchers: In 2015, the UK received £40m investment in cancer research from the EU[iv]. EU investment in cancer research is also likely to grow during Horizon Europe as it will include a mission focused on cancer. Although CRUK does not receive any direct EU funding for research, in 2016/17, CRUK's institutes across the UK received around £6 million income from EU grants; this was more than 2.5% of their total research funding[v]. Furthermore, universities which have CRUK centres are currently supported by EU grants, totalling around £110 million in 2016[vi]. This funding provides crucial support

for individual labs and promotes important research collaborations between the UK and other EU countries. Horizon Europe's focus on cancer has the potential to enhance cancer research funding and collaborations across Europe, making involvement from the UK cancer research community even more critical.

Although collaboration will continue after Brexit, any limitations on the ability to work together could diminish the impact of science in the UK. Therefore, **Government should prioritise securing UK access to Horizon Europe**. The UK research community has played a collaborative role in Horizon 2020 and it should continue to shape the future of such programmes, so they align with UK priorities and are awarded on scientific excellence.

Beyond their financial benefit to researchers, EU grants offer prestige and promote global recognition owing to their competitiveness and broad pool of peer reviewers. Winning these grants therefore gives visibility to top-quality research and promotes multi-national collaborations. EU investment in science is also crucial to leverage further private investment, which brings benefits to counties across Europe: €4.4 billion invested in the UK through FP7 from 2007 to 2012, secured an additional €1.1 billion from other sources to meet total project costs of €5.5 billion[vii].

2. It is critical the UK research base has strong foundations to retain and build on our scientific excellence.

The UK has a reputation for world-class science. To maintain this reputation and increase the global standing of our research base, Government should continue to grow investment in science and build on ambitions in the Industrial Strategy. Achieving these ambitions would ensure the UK maintains and builds on it global reputation as a leading scientific nation that is a top-destination for scientists to work and train.

Government should publish the anticipated roadmap setting out how it will achieve its target for 2.4% of GDP to be spent on R&D by 2027 without delay. This should include measures to effectively market UK science globally and strengthen our research collaborations internationally including through international consortia, accommodating the recently published International Research and Innovation Strategy[viii], part of the wider Industrial Strategy. It would be a positive message to researchers across the world if the UK were to quicken the pace at which it meets the 2.4% target.

Government must design a post-Brexit immigration system that enables us to attract, recruit and retain global scientific talent at all professional levels, regardless of nationality, and facilitates collaboration with international partners. A mix of domestic and international scientific talent underpins the UK's world-leading position in the life sciences. At CRUK, 76% of post-doctoral researchers at our institutes are not originally from the UK. The same is true of half of our PhD researchers. The immigration system must also be responsive to the needs of researchers moving to and from the UK to work on shared projects. 72% of UK-based researchers spent time at non-UK Institutions from 1996 to 2012[ix].

3. The UK should take a strategic and innovative approach to international funding programmes that adds value

CRUK is involved in multiple international research and innovation programmes (summarised in **Appendix A**). Each of these has unique aims, benefits and models of operation. However, they all increase our ability to fund the best and most impactful science by expanding the pool of eligible researchers and supporting cross-border approaches to team science. They also enhance innovation and accelerate progress on major global challenges in cancer. We have drawn on our experience from these programmes to set out:

a) **The role of UK Government in enhancing international collaboration**
b) **The increasing importance of a global approach to research collaborations**
c) **How to ensure funding for international collaborations is efficient and effective**

a) The role of UK Government in enhancing international collaboration

UK Government should continue to develop the prestige and global recognition of its research grants and consider how these may facilitate and promote international collaboration and drive international research consortia.

Additional funding from Government to boost international collaboration is of course welcome. It is vital this is directed strategically to areas that will add value. There should be an ambition to develop funding schemes with a high status in the research community, such as Howard Hughes investigator awards. However, it would be a major challenge to replicate the prestige of some existing European grants at pace. For example, European Research Council (ERC) grants are acknowledged globally as some of the most prestigious research awards but it can take many years to build this reputation.

CRUK's Grand Challenge awards are attractive because of their transformative ambitions and scale - at £20m they are the largest independent cancer research grants in the world. These awards are taking on the toughest challenges in cancer through international, multi-disciplinary teams. They are also appealing to researchers because they are flexible and seek to minimise bureaucracy.

UK Government and associated bodies should create something unique, unbureaucratic and prestigious where there is demand for transformative funding, working collaboratively with a range of funding organisations. Coordination between funders ensures research initiatives are complementary and focus on the right priorities. A useful starting point would be mapping of existing funding arrangements to identify gaps and potential opportunities and to agree core global challenges. Mapping should include opportunities available to UK scientists as well as international funding opportunities administered by other national governments and overseas foundations.

CASE STUDY: CRUK GRAND CHALLENGE – PROFESSOR SIR MIKE STRATTON IS IDENTIFYING PREVENTABLE CAUSES OF CANCER

Challenge: Discover how unusual patterns of mutation are induced by different cancer-causing events

The environment we're exposed to and some of the things we choose to do, such as smoking or drinking too much alcohol, can increase our risk of cancer by damaging the DNA in our cells. This damage occurs in distinctive patterns – known as mutational 'fingerprints' – which are unique to the cause of that damage. So far, scientists have uncovered around 50 of these fingerprints that are linked to cancer, but they can only trace around half of them back to a specific trigger. Professor Sir Mike Stratton, from the Wellcome Sanger Institute in Cambridge, and his team are working with collaborators from the International Agency for Cancer Research in France to try to fill the missing gaps. Their aim is to find the cause of the 25 unknown fingerprints and then use the latest genetic technology to search for even more. The more cancer triggers and patterns the team can identify, the more lives can be saved by developing ways to monitor exposure to these triggers and the damage they cause, and by giving people the knowledge they need to help reduce their risk.

Government funding often has additional stipulations to charitable funding, including quotas on the amount of research that can be funded outside the UK. Therefore, building overseas partnerships to match-fund initiatives could be particularly important. Even though CRUK does not have these quotas we still regularly seek to partner and to match-fund on research projects. For example, partners for our Accelerators Award in Italy and Spain are well known and well-networked in these countries which facilitates the reach of these Awards. Partnering with other international organisations also enables us to leverage additional funding so more, potentially life-saving, research can take place. This highlights how international collaboration can boost investment in R&D.

UK Government should consider consortia approaches to funding internationally with involvement from a range of UK and international organisations. This could reduce the impact of any quotas on the amount of international research funded and boost the prestige of any schemes in overseas territories if a well-respected national organisation is part of such a consortium.

To boost scientific capability and attract researchers to the UK, new research entities that reflect global endeavours could be created. CERN and the European Bioinformatics Institute represent existing models that the Government could look to replicate for other research areas.

Any approach taken to develop programmes aimed to foster multi-national scientific co-operation should seek guidance and peer review from the international research community. For example, international advisory panels could be established at the onset of funding schemes (CRUK establishes these panels for a range of our programmes).

The UK Government could also seek to maximise the benefit of any international arrangements through creating a global network of scientists involved in associated projects. This would encourage additional collaboration that shares ideas, enhances researcher mobility and creates global advocates. We have ambitions to achieve this through CRUK's Grand Challenge programme.

b) The increasing importance of a global approaches to research collaborations

Cancer is on the rise globally, with 18.1m people diagnosed in 2018, and deaths projected to rise from 9.6m to 13m worldwide by 2030[x]. Consequently, awareness and prioritisation of cancer as a major global health challenge has risen. Governments, research funders and NGOs are taking joined up action to strengthen cancer prevention and control through international research collaborations, policy and systems development, and increased investment.

Supporting initiatives to alleviate the global health burden of cancer should be a consideration when developing schemes to fund international cancer research collaboration. This is a consideration in CRUK's approach to our international research partnerships.

International research collaboration continues to accelerate, and emerging scientific nations are increasing their investment and outputs in research and innovation. In recognition of this, CRUK recently launched a joint strategic funding partnership in India. We are working with the Indian government's Department of Biotechnology (DBT) to fund research on affordable, accessible approaches to cancer. A bilateral Advisory panel has been established to identify 7 core research challenges for this initiative and both funding partners will invest £5m over 5 years.

We are also beginning to collaborate with Low- and middle- income counties (LMICs), who are disproportionality affected by the rising cancer burden. For example, our International Cancer Prevention Programme funds research in 28 LMICs. One of the aims of the programme is to reduce tobacco-related disease and deaths in LMICs where 80% of tobacco related deaths occur, by reducing tobacco use and preventing youth uptake. The programme has a focus on fiscal policy research as this is the policy tool that has the biggest impact to help governments make appropriate policy decisions to reduce tobacco prevalence.

c) How to ensure funding for international collaborations is efficient and effective

When identifying potential partners, consideration needs to be given to the feasibility of collaborating with another country (or countries). Consideration should be given to:

- Aligned regulation, standards, policies and processes: these are necessary to ensure that research collaborations can take place. For example, aligned ethical standards for using animals in research is essential in funding projects as part of CRUK's Grand Challenge Programme – all teams abide by UK regulations and applications are assessed by the NC3Rs.

- Open access and knowledge/data sharing: the ability to share knowledge and data between the partner countries is necessary to the success of international research.
- People and building relationships: scientific collaboration relies first and foremost on relationships between researchers. CRUK's Accelerator Award includes funding of collaborative multi-institution training programmes for funded researchers (e.g. lab secondments). There also must be meaningful patient and public involvement where relevant - each CRUK Grand Challenge application has a public and patient engagement plan assessed by a patient panel[xi].

Many of our international research partnerships are relatively new and we are constantly evaluating, adapting and iterating how we run them to ensure they are working optimally and meeting their intended aims. There are many features consistently mentioned as key in making them successful:

Early shared priority setting: It is vital that partners agree on what the core global issues are and that this is clearly articulated in an agreement. This should be mutually beneficial to all partners.

Clear aims, strategy and governance: once priorities have been set, clear aims should be defined for the partnership and a coherent strategy developed, agreed and shared. For example, our Grand Challenge awards aim to address the biggest questions in cancer and so require the world's brightest minds to come together both across borders and across disciplines. These largescale ambitions are reflected in the large scale of these awards – at £20m they are the largest independent cancer research grants in the world. To fulfil the assessment criteria for Grand Challenge, teams must be proposing something unique and transformative that cannot be achieved without collaboration. The governance of the partnership also needs to be clear and transparent to ensure success. Any strategy should be monitored and evaluated regularly.

Clearly agreed funding model: For any partnership to be successful requires sufficient funding and aligned funding models or processes. In the International Cancer Benchmarking Programme (ICBP), partners pay a contribution into a central funding pot based on the population size of their country to make it fair. The funding needs to be centrally held and flexible enough to support the highest quality research in a way that can genuinely lead to impact. In our experience, problems can arise if there is no central flexible funding model, meaning time and resource can be wasted if national funders decide not to proceed.[xii] This issue can be avoided if there is central funding that can be spent across all the countries, or if national funders are involved at an earlier stage. Our Accelerator Award does not have a centrally held funding pot but a Funding and Collaboration Agreement between the three national funders is integral to its smooth operation. Our Grand Challenge is administered directly through CRUK. However, to increase the number of projects we fund and therefore our impact, we leverage additional funding through partnering with other funders such as the Dutch Cancer Society. We have found funding partnerships are much more likely to be agreed if the potential partner is involved early. As part of the funding model, there also needs to be clear and transparent currency agreements (e.g. fixed exchange rates).

Time and processes to initiate and build relationships: Any funding model should allow time and expenditure for researchers to come together to build relationships and for good collaborative ideas to emerge that are worthy of funding. The Grand Challenge Expression of Interest phase is a good example - all shortlisted teams receive comprehensive feedback and we provide up to £30,000 for these teams to develop their ideas further. This funding is used to enable the team to get together to work on their proposal including to cover travel and meeting costs. Therefore, collaboration is fostered even before they are fully funded.

Appendix A – Some of CRUK's international partnerships

We have drawn upon the following CRUK international partnerships to develop this response.:

Grand Challenge
Cancer Research UK's Grand Challenge is the most ambitious cancer research grant in the world - a series of £20m awards seeking international, multi-disciplinary teams willing to take on the toughest challenges in cancer - providing the freedom to try novel approaches, at scale, in the pursuit of life changing discoveries. We have now funded seven exceptional teams. In the most recent round, we received 134 expressions of interest from 513 institutes in 41 countries - 72.4% were led by international (non-UK) researchers. From the 10 shortlisted teams we were able to fund 3 programmes which include 33 scientists in 6 countries and involved 7 patient advocates.
Further information: www.cancerresearchuk.org/grandchallenge

Accelerator Award
Our international Accelerator Award is funded through a partnership between CRUK, AIRC (Associazione Italiana per la Ricerca sul Cancro) and FC AECC (la Asociación Española Contra el *Cáncer)*. Awards of up to £5m are available over 5 years to encourage cross-institutional collaboration to accelerate translational research through the development of tools, platforms and skills (resources) that form the foundations of such research. The PI must be based in either the UK, Italy or Spain with certain affiliations to a partner organisation. In the first international round, 6 awards were funded with 3 led by a PI based in Italy, 2 by UK-based PIs and 1 led by a PI in Spain.
Further information: http://www.cancerresearchuk.org/funding-for-researchers/our-funding-schemes/accelerator-award

International Cancer Benchmarking Partnership (ICBP)

The International Cancer Benchmarking Partnership (ICBP) is a unique and innovative collaboration that brings together clinicians, policymakers, researchers and cancer data experts. It aims to measure international differences in cancer survival and, crucially, identify factors that might be driving these differences. The partnership includes 22 jurisdictions across 8 countries and 3 continents, including: Australia (New South Wales, Victoria and Western Australia), Canada (Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland, Nova Scotia, Ontario, Prince Edward Island, Quebec and Saskatchewan), Denmark, Ireland, New Zealand, Norway, Sweden and the United Kingdom (England, Northern Ireland, Scotland and Wales).
Further information: www.cancerresearchuk.org/icbp

International Cancer Prevention Programme (ICPP)
One of the aims of Cancer Research UK's (CRUK) ICP is to reduce tobacco-related disease and deaths in low- and middle- income countries (LMIC) by reducing tobacco use and preventing youth uptake. The programme supports LMIC governments to implement the Framework Convention on Tobacco Control (FCTC) with a particular focus on increasing tobacco taxes to reducing tobacco affordability. The programme works in partnership with International Development Research Centre (IDRC), Canada and the American Cancer Society (ACS), and also supports The WHO FCTC Knowledge Hub on Tobacco Taxation located at the University of Cape Town, and the Framework Convention Alliance.
Further information:
http://www.cancerresearchuk.org/sites/default/files/international_tobacco_control_programme_external_v05_no_crop.pdf

India-UK Cancer Research Initiative
Working with our strategic funding partner, the Indian government's Department of Biotechnology, we have launched a bilateral research programme that focuses on 7 core research challenges under the theme of affordable approaches to cancer. This aims to forge new research partnerships that build on the strengths of the Indian and UK research communities.

Introductory questions from call for evidence:

1. What is your name?
Zoe Martin
2. What is your email address?
Zoe.martin@cancer.org.uk
3. Are you responding as an individual or on behalf of an organisation?
Organisation
4. If responding on behalf of an organisation,
a. What is your organisation?
Cancer Research UK
b. What type of organisation are you?
Other - Charitable research funder
5. What region of the UK are you predominantly based in?
Other – UK-wide
6. We have obligations under freedom of information laws and there is more information on this below. For the purposes of these laws, would you like your response to be confidential? (Required)
No

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[i] https://www.ohe.org/publications/exploring-interdependencies-research-funders-uk
[ii] http://www.cancerresearchuk.org/sites/default/files/main_report_v8.pdf
[iii] http://europa.eu/rapid/press-release_STATEMENT-19-2163_en.htm
[iv] This includes all grants given to cancer-specific and cancer-related research. NCRI analysis using data derived from the Global Grants Award Database and corresponding Dimensions Software platform, provided by UberResearch. Based on conversion rate of 1 GBP:1.17 EUR
[v] Funding data reported directly to us from CR-UK institutes, including the Francis Crick Institute. Based on conversion rate of 1 GBP:1.17 EUR
[vi] Self-reported data from universities at current CR-UK centre locations. Includes total award of active grants in August 2016
[vii] Department for Business, Innovation and Skills, 2013, Leverage from public funding of science and research
[viii] HM Government (2019), International Research and Innovation Strategy, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/801513/International-research-innovation-strategy-single-page.pdf
[ix] Elsevier, International comparative performance of the UK research base, 2013
[x] https://gco.iarc.fr/today/data/factsheets/cancers/39-All-cancers-fact-sheet.pdf
[xi] https://www.cancerresearchuk.org/funding-for-researchers/how-we-deliver-research/grand-challenge-award/panels
[xii] International Rare Cancers Initiative (IRCI), 5 year progress report (2017) http://www.irci.info/wp-content/uploads/2017/12/irci-progress-report-newsletter_2017.pdf