



Medical
Research
Council

Economic impact of MRC funded research

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Case studies include those adapted from REF2021 submissions, attributed to MRC funding.



MRC funded research has extensively contributed to the UK economy, giving rise to spin-out companies and medical products worth billions of pounds. These investments have produced significant breakthroughs which have saved millions of lives and improved health in the UK and around the world.

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Foreword by the Executive Chair



Professor Patrick Chinnery, MRC Executive Chair

Over the last decade, MRC funded discovery science has pushed the frontiers of biomedical knowledge whilst driving economic growth and advancing human health. Our own funding schemes have accelerated the translation of our discoveries in close partnership with NIHR, medical charities and the commercial sector. MRC has empowered a large proportion of UK spinouts in the biomedical sector and every £1 we invested through our translational schemes has leveraged £5.30 from industry. A powerful benefit for the UK economy arises from the increased longevity and productivity of the population resulting from new health interventions. Dame Carol Black's 2008 review of the impact of illness in the UK asserted that "the annual economic costs of sickness, absence, and worklessness associated with working age ill-health are estimated to be over £100 billion". Informing health policy, as well as the development of more cost-effective therapies that lower NHS expenditure also provide significant benefits for the UK economy.

Although the financial benefits from fundamental discoveries can sometimes take decades, sales of the Intellectual Property generated from MRC-funded research has had near-immediate economic impact. For example, QuellTx, established in 2019, entered a collaboration with AstraZeneca by 2023 with upfront payment of \$85 million and potential payments of up to \$2 billion. Our successes have flourished across the United Kingdom, contributing to local prosperity through the creation of new jobs. An instance of those successes is Immunocore, arising from research at the MRC Weatherall Institute of Molecular Medicine in 2007. The company has remained UK based, created 500 new jobs, raised over £1 billion in external investment, and recorded £194 million in sales in 2023.

We are proud of what we have achieved over the last decade, and based on our track record, I am confident that MRC will make an even stronger contribution to UK growth the years to come, addressing major health needs in our ageing society.

Introduction

The following report provides a selection of examples of the powerful economic impacts arising from MRC's long history of supporting discovery science. These demonstrate the financial successes, economic efficiencies, and health improvements arising from MRC-funded research. There are many avenues for economic impact which have been evident from previous research, providing confidence that we will see similar if not greater impacts in the future, from the research funded today.

These avenues include, but are not limited to:

- Revenue from health interventions translated from discovery science
- Spin-outs created to develop intellectual property associated with healthcare
- Jobs in the healthcare and biomedical research sectors
- Contributions towards the growth of the healthcare private sector
- Lowering health care costs for the UK

- Creation of non-therapeutics businesses which support health research in the public and private sector

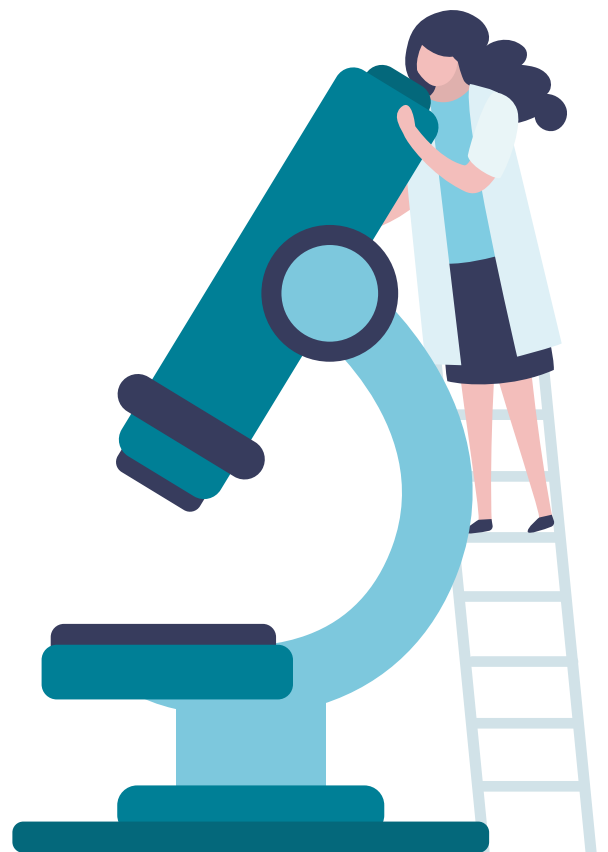
It is important to note that this report is not, in any way, a complete or comprehensive list of impacts that have arisen from MRC-funded research. These examples were gathered to represent the breadth of avenues of economic impact, for which economic impact has been documented. There are hundreds, if not thousands of awards funded by MRC which have contributed to the economic wellbeing of the UK. It has not been possible to complete an economic impact assessment for the vast majority of the outputs of MRC funding. Additionally, it is impossible to trace or record all the contributions of knowledge and investment that may have led to the outcomes described. The Annex provides references for supporting documentation and individual project or MRC institution funding contributing to the impact. The funding partners are noted where known.



Economic impact arising from understanding biological mechanisms

Knowledge arising from fundamental discovery science provides a deeper understanding of disease mechanisms and identifies mechanisms against which treatments can be developed. However, it can take many decades for this knowledge to translate into health interventions. These then need to be tested, approved, and adopted for human use. The maturation of these discovery science breakthroughs have resulted in the broadest impacts on health and on business profits.

For example, discovery science funded by MRC over the decades has established foundations for a wide range of treatments for previously untreatable conditions. If we consider profitable, game changing health interventions of today from research discoveries of the 1960s to 80s, we readily recognize the impact of monoclonal antibodies, which today are the basis of highly targeted drugs for a variety of immune diseases and cancers, and of previously unknown delivery systems for gene therapies tackling gene-based health conditions.



Harnessing the disease targeting power of humanised monoclonal antibodies

The methods for isolating and engineering monoclonal antibodies were first developed by researchers from MRC's Laboratory of Molecular Biology (LMB) in the 1960s and subsequently characterised over the following decades. The breakthrough technique for 'humanising' mouse monoclonal antibodies in the late 1980s and 1990s provided the opportunity to use these molecules to treat human disease. These discoveries have been recognised through Nobel prizes in 1984 and 2018 for MRC LMB researchers. Medical products arising from these breakthroughs have [contributed billions to the UK economy](#) and have enabled innovative treatments in a wide variety of disease conditions. More than 100 monoclonal antibody-based drugs have been licensed since the first was approved in 1985. These drugs currently account for nearly a fifth of the annual new drugs approved by the US Food and Drug Administration (FDA), with an average of ten approvals per year. Furthermore, the number of monoclonal antibodies entering the clinic is [rapidly increasing](#).

The MRC recently commissioned [research](#) to explore the reach of monoclonal antibody therapies which highlighted that more evidence was needed to fully document the health impact, but it is clear that monoclonal antibody drugs have [transformed certain cancers](#) from being labeled a [terminal disease to a chronic condition](#). They have also dramatically altered the treatment of autoimmune disorders such as rheumatoid arthritis (RA), moving the [treatment](#) away from merely relieving symptoms to [better targeting](#) and disrupting its pathogenesis.

By 2013, it was estimated that revenues from monoclonal antibody products licensed or in spin-outs reached nearly \$75 billion. Current estimates put this market at over \$230 billion expecting to rise to \$679 billion by 2033.

Examples include:

- i. HUMIRA® (adalimumab treatment for rheumatoid arthritis), was the first humanised monoclonal antibody to gain regulatory approval. The initial work was carried out by Cambridge Antibody Technology, a spin-out company created to develop the discovery research carried out at MRC LMB with later collaboration from Abbott Laboratories, now AbbVie. HUMIRA was approved for sales in 2003 and became the world's top selling medicine by 2014. AbbVie went on to market the drug with sales of more than \$176 billion from 2014 to 2023. AbbVie estimated that a cumulative 1.4 million people had been treated with HUMIRA by 2021. In 2018, the NHS reported that HUMIRA was prescribed to more than 46,000 patients in the UK for serious conditions such as RA, inflammatory bowel disease, and psoriasis and represented the largest spend on a single medication that year¹.
- ii. Campath-1H (alemtuzumab), another early monoclonal antibody treatment, was initially developed for chronic lymphocytic leukemia and multiple sclerosis by the MRC-funded Therapeutic Antibody Centre (TAC). The cumulative global sales were ~£268 million between

2010 and 2012. 6% of this income was retained in the UK; it was divided between the UK Universities involved in the initial development, BTG and GSK for their work in the translation of the monoclonal antibody into a health treatment. TAC combined efforts from researchers from MRC LMB and Cambridge Pathology Unit funded by MRC to develop the [promising monoclonal antibody candidates into treatments](#). The IP was purchased by Genzyme and the product further developed through a series of pharmaceutical companies who funded the work to move the treatment through the FDA approval process. In 2012, Sanofi acquired Genzyme and surrendered the license for chronic lymphocytic leukemia treatment to allow alemtuzumab to be licensed as a treatment for MS. Rebranded as Lemtrada, use of alemtuzumab for treating MS had net sales of €2.2 billion between 2014 and 2022².

- iii. Tysabri (natalizumab) is now widely used to treat patients with highly active relapsing remitting multiple sclerosis and owned by Biogen. Biogen reported sales of \$22.1 billion between 2012 and 2023. While the original breakthrough discovery of the therapeutic potential of monoclonal antibodies was made by MRC researchers in Cambridge, researchers around the world have built on that work isolating many antibodies

with clinical efficacy. Canadian research results in 1995 indicated natalizumab as a potential treatment for MS in mouse models. Clinical trial work to demonstrate the effectiveness of Tysabri and determine guidelines for treatment with Tysabri was carried on by researchers from UCL funded by MRC, NIHR, the MS Society and Wellcome³.

It is worth noting that monoclonal antibodies are expensive treatments and present a significant cost to the NHS. However, the deep understanding of how monoclonal antibodies work arising from the original MRC funded research have allowed the identification of biosimilars which can offer better value. [In 2018, the NHS reportedly saved £324 million](#) in the previous financial year by switching from using ten expensive medicines to better value and equally effective alternatives.

Understanding of molecular biology mechanism to inform cancer treatment approaches

Each year, around 393,000 people in the UK are diagnosed with cancer. On average someone in the UK is diagnosed with cancer at least every 90 seconds. The costs of cancer can be felt at an individual level; [work by Macmillan](#) has shown that most (83%) cancer patients incur an average cost of £570 per month as a result of their illness. It can also be felt in the national economy: [Oxford University estimate](#) the cost of cancer to the economy is £7.6 billion a year due to premature deaths and time taken off work.

MRC has supported molecular biological research for many decades with the intent to understand the mechanisms of disease, including cancer. Below is an example of exploiting the knowledge of fundamental mechanisms of cell replication to provide therapies for a variety of cancers.

Research at Sheffield University, and later at Oxford University, funded by MRC resulted in a breakthrough discovery of the relationship between PARP (poly (ADP-ase) polymerase) and homologous recombination which has been fundamental to the development of 18 cancer therapies. PARP inhibitors proved highly effective treatment for some cancers. One of a family of PARP molecule inhibitor treatments, Lynparza, exceeded sales of \$2.6 billion in 2022. Four of the PARP family of inhibitors that have been developed as cancer treatments are attributed to the original Sheffield patent: Lynparza, Niraparib, Rucaparib, and Talzaparib. Lynparza was sold to KuDos and subsequently developed and marketed by AZ which bought out KuDos in 2005. Then in 2018, Merck/MSD bought 50% of Lynparza for \$8.5 billion and demonstrated its efficacy for other cancers. AZ has also sublicensed other Sheffield PARP candidates to GSK (Niraparib, \$577 million in 2022 sales) and Tesaro (talazoparib, Pfizer acquired Tesaro for \$5.1 billion in 2019) and to Clovis (rucaparib, \$164 million in 2023 sales)⁴.

Exploiting the cellular machinery to provide health interventions through replacement of lost or missing proteins: gene therapies

- i. Gene therapy approaches to life-limiting genetic immune conditions developed by Professor Gaspar and funded by MRC have been successfully translated by the UCL spin-out Orchard Therapeutics. In January 2024, Orchard Therapeutics was sold to Kyowa Kirin in a deal worth up to \$477.6 million⁵.
- ii. Nightstar Therapeutics, a spin-out to develop gene therapy approaches to diseases of the retina developed by Professor MacLaren, became the world's largest retinal therapy company which sold to Biogen in a deal worth >\$800 million in 2019. MacLaren's research has been supported by MRC since 2013⁶.
- iii. In a therapy developed from Professor Nathwani research which was initially funded by MRC, Hemgenix was found to be effective and safe for reducing bleeding episodes in patients with the severe genetic blood-clotting disorder haemophilia B. In 2020, CSL Behring struck a deal to pay \$450 million up

front plus up to \$1.6 billion in milestones for the Hemgenix IP. In 2022, the US FDA approved Hemgenix as the first gene therapy for haemophilia B, which has a one-time treatment that costs \$3.5 million. In a statement, the company said that even at a cost of \$3.5 million, Hemgenix could save the US healthcare system \$5 million to \$5.8 million per person treated because in the US, the treatment of an adult with haemophilia B averages \$700,000–800,000 per year⁷.

Other health interventions in use today arising from MRC supported discovery science

- i. MRC funded investigations made significant contributions to the early development of anti-TNF alpha therapies. These were spun out for further development to the Oxford Kennedy Institute of Rheumatology (MRC funded) which licensed use of these therapies for a variety of conditions. The global market for anti-TNF alpha antibody therapies has grown from \$24.4 billion in 2011 to approximately \$43 billion in 2023⁸.
- ii. One of the key anti-virals in HIV multi enzyme therapy NNRTI arose from MRC funded work at Oxford University in 1998. Sales from the leading HIV antiviral product which contains NNRTI was \$1.8 billion in 2022⁹.
- iii. WinBUGS and the many data science software solutions that it stimulated are providing substantial economic value, estimated to be in millions of US dollars for many areas of business including the pharmaceutical industry and enables invaluable analysis of clinical data to optimise patient treatment and care. WinBUGS enable an endless diversity of data science through automation of computational calculations required for statistical learning. It was developed by the researchers at the MRC Biostatistics Unit between 1996-2000 when the lead researchers moved to Imperial College and further developed the analytical interface. The wide-reaching value of this early research around data science is evidenced by examples of its users:

The Director and Principal Statistician for systematic reviews and meta-analysis projects at Evidera PPD (provider of evidence-based solutions to demonstrate the real-world

effectiveness, safety, and value of biopharmaceutical and biotechnology products from early development through loss of exclusivity), writes: "WinBUGS and its descendants has greatly facilitated our application of the most advanced statistical methods to the challenging problem of indirect comparisons between treatments (of pharmaceuticals). Providing such inferences and evidence is mandatory in more and more settings, and the commercial value to Evidera PPD for those projects has been in the millions of dollars, leading to many submissions (and approvals) for our clients."

The Head of Advanced Methodology and Data Science (AMDS) group, Novartis Global Drug Development, writes: "WinBUGS and related projects have undoubtedly had an enormous impact on the efficiency, cost-effectiveness and economic value of drug development benefiting the pharmaceutical R&D process at Novartis but more importantly benefiting patients across the world."

This analytical tool has saved lives and improved wellbeing in the UK and globally. National Institute for Health and Care Excellence (NICE) used WINBUGS or its related software in 26% of its clinical guidelines between 2013 and 2017. An example is the CG178 guidelines for diagnosis of people with severe mental illness which used WinBUGS as the main tool for the statistical evaluation of the evidence. The implementation of this guideline benefitted ~55,000 people through early intervention resulting from early diagnosis¹⁰.

Decreasing health care costs through improving diagnostics, honing existing treatments, and informing health policy

- i. One of the most powerful pieces of diagnostic equipment developed in the last 50 years has been Magnetic Resonance Imaging (MRI). For example, use of MRI on Thalassaemia patients has reduced mortality by 70% in the UK. [Professor Mansfield was awarded the Nobel prize for his work on magnetic imaging.](#) Professor Mansfield and development of MRI methodology was strongly supported by MRC, STFC and EPSRC in the 1980s. The market size for MRI equipment was valued at \$7.08 billion in 2022 rising to \$11.5 billion in 2023¹¹.
- ii. Tobacco use is the single greatest cause of preventable illness and death in the UK. In the 1950s, MRC funded Professor Richard Doll's research demonstrating the danger of cigarette smoking and providing evidence for national and global health policies discouraging smoking thereby saving millions of lives. More recently, underpinning data supplied by MRC funded UK Centre for Tobacco and Alcohol Studies (UKCTAS), was pivotal to the UK governments' decision to legislate 'standardised packaging' for tobacco products implemented in May 2017. The standards on packaging were adopted by WHO and other nations around the globe. The Department of Health and Social Care estimated a net benefit to government of £25 billion ten years post-implementation¹².
- iii. Abiraterone, with reported sales of \$12.8 billion between 2018 and 2023, has transformed the care of prostate cancer. Through discovery science research in the 1990s and clinical trials begun in the 2000s, abiraterone efficacy as a cancer treatment has been identified, refined and translated into therapy through decades of research funded by MRC, Cancer Research UK (CRUK), Wellcome, NIHR and prostate research charities. Between 2011 and 2018, abiraterone was approved in combination with prednisone/prednisolone in 105 countries. In the NICE approval granted in 2012, it was estimated approximately 2,500 patients in England and Wales



with metastatic Castration Resistant Prostate Cancer would benefit from the marketing authorisation of abiraterone. More than 500,000 men worldwide will have received treatment with abiraterone. It is estimated that this has given them >300,000 extra life years. The treatment was fully developed and evidenced through the STAMPEDE trial, initiated in 2003 and hosted by MRC Clinical Trials Unit¹³.

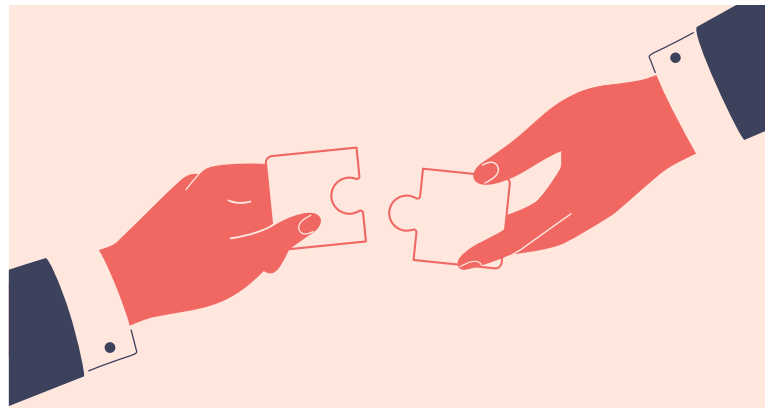
- iv. Millions of pounds are saved in NHS costs and productive life improved through reduction in cancer radiation therapy. The START trials supported by MRC, NIHR and CRUK demonstrated the effectiveness of shorter courses of radiation therapy. The START Trials were conducted with £1.8 million research funding from 1997-2008 and have saved the NHS and wider economy between £162 million and £216 million since 2009. In 2012, at least 25,000 women benefitted from this revised therapy programme representing a saving in patient and companion time and expense for the wider economy of £8 million each year. The recommended shorter radiation therapy has been adopted as standard international practice since 2015. Healthcare systems also benefit from reduced treatment costs. The switch from 15 to 5 fractions for women with breast cancer became an internationally recommended standard in May 2020 for breast cancer radiotherapy. Full implementation is expected to save the NHS £40 million annually¹⁴.
- v. In the early 2000s, sequential MRC and NIHR CLOTS trials provided solid evidence that there was no additional clinical benefit to the then standard use of compression stockings for

stroke patients. This resulted in national and global practice change by 2012. A secondary project funded by MRC showed that the decrease in use of these stockings saved the NHS £7 million and 320,000 nursing hours. The reduction of 65,000 UK patients per year needing stocking treatment saved UK £1.3 million per year and NIHR estimated a savings of £140 million over 20 years¹⁵.

- vi. Decades of research at the University of Edinburgh on the rapid diagnosis and treatment of stroke have resulted in NHS savings of £1-2.2 billion between 2013-2020. In 2014, published Edinburgh Neuroscience research estimated that faster imaging vs. delayed brain imaging in suspected stroke would result in a total of 6,000 more quality-adjusted life-years (QALYs) for the 135,000 people who experience a stroke per year in the UK, i.e. 6,000 more years of better quality life for patients who have a stroke each year in the UK. Adoption of the guidance based on Edinburgh Neuroscience research has led to NHS savings between £156-312 million per year. The inclusion of immediate CT scanning after acute stroke has been translated into practice nationally and internationally, resulting in marked reductions in the time between hospital admission and CT scanning and therefore diagnosis and treatment. Additionally, Professor Wardlaw's survey of UK practice revealed that rapid non-invasive carotid imaging in patients with a transient ischaemic attack, compared with the slow and more invasive carotid imaging methods, is calculated to have prevented about 1,760 strokes per year in the UK and saved the NHS around £30 million per year¹⁶.

Innovation in collaboration with industry

- i. MRC has supported the [Division of Signal Transduction Therapy \(DSTT\)](#) and its strong relationship with the pharmaceutical industry at the University of Dundee for 25 years. It is widely regarded as a model for how academia should interact with industry: a unique, completely integrated drug discovery facility for small molecule drug discovery to bridge the gap between academic research and pharmaceutical development. An example of highly successful interaction with industry is seen in was the identification of PROTACS, a new class of drugs that target disease-causing proteins for degeneration (TPD). This work has changed the direction of commercial drug discovery prompting over \$3.5 billion in investment in this approach by companies such as Roche, Pfizer, Merck, Novartis and GSK. The spin-out Amphista raised £6 million investment in 2020 to further develop TPD therapeutics; in 2023, Bristol Meyer Squibb invested £30 million in a collaboration with Amphista with up to \$1.25 billion in performance-based milestone payments. Another highly productive DSTT industry collaboration with GSK developed the BRAF protein kinase inhibitor, Dabrafenib (Tafinlar), which saw \$1.7 billion in sales in 2022 as an anti-tumor treatment. Tafinlar was sold by GSK to Novartis as part of an oncology portfolio for \$16 billion in 2014¹⁷.
- ii. Small molecule drug therapy development has been progressed through the spin-out Heptares Therapeutics, incorporated in 2007, following early discovery stage work by Nobel Laureate Professor Richard Henderson based at MRC LMB. The



- promising results of a number of Heptares candidates attracted a deal worth up to \$400 million in 2015 when the company was sold to Sosei. One of the candidates, a neuropsychiatric treatment, was sold in 2021 in a deal worth up to \$2.6 billion to Neurocrine Biosciences¹⁸.
- iii. Funding from MRC supported a research partnership between University of Brighton and Biocompatibles UK (BUK) through the 1990s. The value of the novel biomaterials developed is evidenced in the £177 million sale of Biocompatibles in 2011. Data provided by the Brighton researchers underpinned the enhanced wearability of the Proclear family of lens which now have sales of ~\$300 million per annum¹⁹.
 - iv. A collaboration with ALK Denmark and Professor Durham of Imperial College demonstrated the efficacy of sublingual tablet delivery of immunotherapy to combat allergic reactions. ALK sells the product developed through this collaboration as Grazax, relief for hay fever. Sales have steadily grown and in 2022 rose to \$503 million annually. The research took place between 1992-2010 with FDA approval in 2019²⁰.

Spin-outs evolving into UK companies and creating jobs

- i. Immetacyte is a University of Manchester spin-out, linked to MRC funded research, created to provide high quality CAR-T cell manufacture. In 2018, it saw £5.8 million in turnover and had grown to 40 employees in Manchester. In 2020, Immetacyte merged with Instill Bio for \$172 million. By this time, Immetacyte's cell manufacture facility had grown to 150 UK based employees. This facility continues to serve the global cell and gene therapy market which is expected to reach \$11.96 billion by 2025²¹.
- ii. IXICO, medical imaging solutions for CTs and diagnosis, was listed on the Alternative Investment Market (AIM) of the London Stock Exchange in October 2013. In 2020, the company, which employed 78 full time staff members, reported a full year revenue of £9.5 million, an order book of £21.7 million, and a four-year compound annual growth rate of 33%. MRC funding underpinned the development of the techniques and applications of the imaging solutions at King's College London from 2012-19²².
- iii. Bicycle Therapeutics, formed in 2009, is based on the research of Professor Sir Greg Winter and Professor Christian Heinis at MRC LMB. The company focuses on combining the advantages of small molecules and antibodies to develop new unique class of drug. The resulting molecules are known as bicyclic peptides or Bicycles[®]. In 2016, Bicycle Therapeutics entered into a collaboration with AstraZeneca potentially worth \$1 billion, to exploit the potential of bicyclic peptides to treat solid tumour cancers. It raised \$61 million in an IPO in 2019 and as of 2023 has a turnover of £20.3 million and employs 266 staff²³.



- iv. The strengths in cancer biology and immunology in the founding institutes of the Francis Crick Institute, funded by MRC, CRUK and Wellcome, have led to the formation of three spin-out companies to commercialise potential cancer therapeutic approaches (Gamma Delta Therapeutics (GDTx), Adaptate (spun out from GDTx in 2019) and EnaraBio). £82,000 of flexible funding from the MRC Confidence in Concept scheme was used to develop a method for the isolation and culture of $\gamma\delta$ T cells, a potentially transformative cancer immunotherapy. This work strengthened the foundations for GDTx. In 2017 GDTx received significant investment (\$100 million) from Abingworth and Takeda Pharmaceuticals to deliver allogenic immunotherapies based on the unique properties of the $V\delta 1+$ subset of $\gamma\delta$ T cells. These therapies are aimed at improving patient outcomes and survival rates in haematological malignancies and solid tumours. In 2021-22 Takeda exercised its options to acquire both GDTx and Adaptate for an undisclosed amount. At the time of acquisition, the two UK-based spin-outs employed a total of 70 staff²⁴.
- v. Firbrofind Ltd was spun out from University of Newcastle research supported by MRC to provide anti-fibrotic drug testing. In 2020, it became a Newcastle based company with 10 local employees. The service had already generated £2.3 million in income by 2019. In 2020, it attracted £1.6 million in contracts, and companies using the Fibrofind technology saw 100% rise in their stock price. MRC funded the early antifibrotic drug research and proof of concept research for the spin-out²⁵.
- vi. Biostatistics was established in Cardiff to undertake product development of a novel biomedical research tool, DRAQ, arising from Professor Smith's research from 1997-2000. Since 2008, the product has generated more than \$3.2 million in sales, created jobs in Cardiff, and funded research positions at Cardiff University. DRAQ is used in over 3,500 research, pharmaceutical and clinical organizations globally. DRAQ was developed within projects, funded by MRC, Biotechnology and Biological Sciences Research Council (BBSRC) and Engineering & Physical Sciences Research Council (EPSRC), to explore new molecular probes for use in life science research²⁶.

Investment in spin-outs generated to translate MRC supported health interventions of the future

We can see a substantial contribution to healthcare and the economy from MRC supported research completed in decades past. This pipeline of knowledge and concepts is being added to every year. Indications of the potential new health breakthroughs of the future are evidenced by the investments attracted by emerging IP in the biopharma sector. New products arising from MRC funded research continue to be developed and are taken up by the private sector as promising candidates for future health products.

As an example, in the last two years 10 spin-outs have attracted over half billion pounds (£527 million) in upfront investment from venture capitalists or other companies to support commercialisation of the IP.

A sample of spin-outs created to translate MRC funded research attracting investment, 2022-2023:

- Beacon therapeutics \$118.5 million²⁷
- F2G \$100 million, up to \$380 million²⁸
- Quell Therapeutics \$85 million, up to \$2 billion²⁹
- AviadoBio \$80 million³⁰
- Tenpoint Therapeutics £57 million³¹
- Tay Therapeutics \$50 million³²
- AstronauTx £48 million³³
- Nucleome Therapeutics £37.5 million³⁴
- Prospectum diagnostics \$36 million (\$120 million raised since inception)³⁵
- Constructive Bio \$15 million³⁶

This report has highlighted a selection of examples from MRC's long history of funding knowledge generation showing the powerful economic impacts, financial successes, and job creation that is made possible through spin-out and IP development. MRC's ongoing strategic support for translation has proved highly effective in accelerating establishment of productive spin-outs for the future, assessed by independent evaluator Ipsos Mori:

- [MRC Translational Research 2008-2018 \(2019\)](#)
- [Development and growth of spin-outs from MRC research \(2024\)](#)



Annex

1. <https://www.humirapro.com/about-humira>; Impact case study : Results and submissions : REF 2021; MRCCS0423, MRCCS3601, MRCCS3592; MRC Institute and underpinning research funding and MR/M004600/1: £400k.
2. Sales of Campath (Lemtrada) derived from Sanofi annual reports <https://www.sanofi.com/en/investors/reports-and-publications> ; Website providing the cumulative sales of Campath 2010-2011; [Campath gets pulled to clear the way for higher-priced Lemtrada | Fierce Pharma | Fierce Pharma](#); REF Case study search; Impact case study : Results and submissions : REF 2021; Sanofi annual report; MRCCS3579, MRCCS2958; MRC Institute and underpinning research funding and G1100114; £1M.
3. <http://www.forbes.com/sites/matthewherper/2013/02/06/biogen-to-buy-elans-tysabri-rights-for-3-25-billion/> "Last year (2012), Tysabri sales were \$1.6 billion, up 8% from 2011."; By July 2013, over 115,000 patients had been treated (<https://doi.org/10.7759%2Fcureus.3093>); <http://dx.doi.org/10.1007/s11910-013-0408-6>; [https://doi.org/10.1016/0165-5728\(94\)00165-k](https://doi.org/10.1016/0165-5728(94)00165-k); <http://dx.doi.org/10.1056/NEJMoa044397>; REF Case study search; MRCCS0216; MRC Institute and underpinning research funding.
4. <https://www.astrazeneca.com/content/dam/az/PDF/2022/fy/Full-year-and-Q4-2022-results-announcement.pdf>; Specific killing of BRCA2-deficient tumours with inhibitors of poly(ADP-ribose) polymerase | Nature; Milestones in cancer (nature.com) Cited as a milestone in cancer research for personalized therapeutics.; [GSK told to pay higher royalties to AZ on Zejula sales | pharmaphorum](#) ;[GSK completes acquisition of TESARO, an oncology focused biopharmaceutical company | GSK](#); [FDA sends CRL to Clovis in last-gasp bid for Rubraca nod \(fiercepharma.com\)](#)); MRCCS3792; Results and submissions : REF 2021); MRC Institute and underpinning research funding.
5. <https://www.ukri.org/who-we-are/how-we-are-doing/research-outcomes-and-impact/mrc/mrc-funded-discovery-science-underpins-gene-therapy-cures/>; [Girl with deadly inherited condition is cured with gene therapy on NHS | NHS | The Guardian](#); <https://www.pharmaceutical-technology.com/news/kyowa-kirin-acquires-orchard/>; MRCCS5393; MRC funding G0600773, G0802483, G0501468/1, MR/K015427/1, G0501969/1, MR/L012855/1, 2006-2018; £4.2M and Institute and underpinning research funding.
6. <https://icl-ref-dryad.maxarchiveservices.co.uk/index.php/h-biogen-completes-acquisition-of-nightstar-therapeutics-for-approximately-800-million-pdf>; MRCCS3723; MRC funding MR/N00101X/1, MR/K007629/1, MR/V027557/1: total £1.5M and underpinning research funding.
7. <https://www.nejm.org/doi/full/10.1056/nejmoa1407309>; (<https://www.globenewswire.com/news-release/2020/06/24/2052987/0/en/uniOure-Announces-License-Agreement-with-CSL-Behring-to-Commercialize-Hemophilia-B-Gene-Therapy.html>); <https://www.scientificamerican.com/article/3-5-million-hemophilia-gene-therapy-is-worlds-most-expensive-drug/>); MRCCS4204; MRC fnding G0502121/1, G0902219/1,MR/L013185/1, MR/L022842/1: 2007-2022; total £5M and underpinning research funding.
8. <https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?id=3898>; <https://pipelinereview.com/index.php/2012042647751/FREE-Reports/TOP-30-Biologics-2011.html>; <https://www.thebusinessresearchcompany.com/report/tnf-alpha-inhibitor-global-market-report>; MRCCS0319; MRC Institute and underpinning research funding.
9. "Among combinations including a NNRTI, Odefsey (which contains rilpivirine) was the leading product, with sales of \$1.8 billion in 2022": <https://doi.org/10.1038/d41573-023-00205-7>; <https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1468-1293.2012.01029.x>; <https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?id=6605>; MRCCS2896, MRCCS0337; MRC funded Dr David Stuart, one of the lead researchers, throughout his career, 6 awards since 2008 and Institute and underpinning research funding.
10. <https://www.mrc-bsu.cam.ac.uk/software>; <https://onlinelibrary.wiley.com/doi/10.1002/sim.3680>; <https://icl-ref-dryad.maxarchiveservices.co.uk/index.php/h-impact-on-nice-evaluations>; <https://results2021.ref.ac.uk/impact/8CBBAE84-5793-43EA-AC9B-DDE8DD459844?page=1>; <https://www.nice.org.uk/about/what-we-do/into-practice/measuring-the-uptake-of-nice-guidance>; <https://www.nice.org.uk/guidance/cg178/evidence/full-guideline-pdf-490503565>; MRCCS0313, MRCCS3313; MRC funding: 'Modelling complexity in biomedical research', PI: N Best, 01/04/99-31/03/04, 'Computational Tools for Bayesian Bioinformatics', PI: Lunn, 6/10/03-30/9/06, total £600k and Institute and underpinning research funding.
11. <https://www.fortunebusinessinsights.com/industry-reports/magnetic-resonance-imaging-mri-equipment-market-100087>; MRCCS0142; MRC Institute and underpinning research funding.
12. <https://bmjopen.bmj.com/content/4/2/e003757>; https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/403493/Impact_assessment.pdf; <https://bmjopen.bmj.com/content/4/2/e003757>; <https://www.who.int/publications/i/item/9789241565226>; <https://www.legislation.gov.uk/uksi/2015/829/contents/made>; MRCCS3768; MR/K023195/1; MRC funding (UK Centre for Tobacco and Alcohol Studies award), £2.7M and underpinning research funding.
13. <https://doi.org/10.1056/nejmoa1014618>; <http://dx.doi.org/10.1056/NEJMoa1014618>); <http://dx.doi.org/10.1056/NEJMoa1702900>); <http://www.stampededtrial.org/>; MRCCS3303; MRC Clinical trial and underpinning research funding.

14. <https://results2021.ref.ac.uk/impact/B606D59D-AEE3-45DB-A1CA-F18276FE2B95?page=1>; <https://www.thelancet.com/journals/lanonc/article/PIIS1470-2045%2813%2970386-3/fulltext>; <https://www.nice.org.uk/guidance/ng101>; <https://www.nih.ac.uk/news/one-week-course-of-radiotherapy-could-benefit-women-with-early-stage-breast-cancer/24680>; MRCCS0188, MRCCS3319; MRC Clinical trials and underpinning research funding.
15. <https://www.ed.ac.uk/clinical-brain-sciences/research/completed-studies-trials/clots-stroke-trials>; <https://doi.org/10.1111/j.1747-4949.2011.00684.x>; [https://doi.org/10.1016/s0140-6736\(09\)60990-9](https://doi.org/10.1016/s0140-6736(09)60990-9). [Corroborates cost savings in the UK.]; MRCCS0192; MRC funding G0400069-E01/1, G0800803/1: total £2.3M and Clinical trials and underpinning research funding.
16. <https://doi.org/10.1161/strokeaha.109.557017>; <https://doi.org/10.1161/01.str.0000143453.78005.44>; <https://doi.org/10.3310/hta18270>; Impact case study : Results and submissions : REF 2021; REF Case study search; MRC funding G0400069-E01/1, G0901333/1: total £389k, and MRC Clinical trial and underpinning research funding of the lead researchers at Edinburgh University and more broadly.
17. 2020 Global market report by Roots Analysis ; <https://www.dundee.ac.uk/stories/first-milestone-achieved-multimillion-dollar-collaboration>; <https://www.fiercepharma.com/marketing/novartis-targeted-cancer-drug-combo-goes-tumor-agnostic-new-fda-approval> ; <https://results2021.ref.ac.uk/impact/B2AC7052-C479-4FD6-8E9D-7A28D2149F52?page=1>; MRCCS3684; MRC Infrastructure and underpinning research funding.
18. <https://soseiheptares.com/news/57/129/Sosei-Acquires-Heptares-Therapeutics-for-up-to-USD-400-million.html>; https://soseiheptares.com/uploads/news/id794/2022.09.02%20Informa%20Pharma%20Intelligence%20Awards%202022_vF.pdf; MRCCS0335; MRC funding, Prof Winter has been supported by MRC throughout his career as part of LMB Institute funding and underpinning research funding.
19. https://www.sec.gov/Archives/edgar/data/711404/000119312511343993/d238160d10k.htm#tx238160_20; https://www.annualreports.com/HostedData/AnnualReportArchive/c/NYSE_COO_2021.pdf; MRCCS0195; MRC/SERC/DTI/DOH funding (1995-1997);total £360k and underpinning research.
20. <https://onlinelibrary.wiley.com/doi/10.1111/j.1365-2222.2010.03462.x>; MRCCS3225; MRC funding (3 grants) G0601303/1, G0400503/1: total £850k.
21. Cell Therapy Catapult Awards Major Contract to Cellular Therapeutics Limited to Accelerate WT1 Clinical Programme - Cell and Gene Therapy; Home - Instil Bio; Global Cell and Gene Therapy Market to Reach \$11.96 Billion by 2025 (prnewswire.com); Impact case study : Results and submissions : REF 2021; MRCCS3581; MRC funding MR/K500732/1: 2012 total 183k and underpinning research funding.
22. <https://ixico.com/assets/Investors-Finance/Heading-Investors/IXICO-financial-documents/AIM-Admission-Document.pdf>; <https://results2021.ref.ac.uk/impact/D2CED0A5-B51F-434E-9441-D42AB040E7BC?page=1>; MRCCS3328; MRC funding MR/K006355/1: total £7.3M and underpinning research funding.
23. <https://www.investeurope.eu/about-private-equity/private-equity-and-venture-capital-success-stories/bicycle-therapeutics/#:~:text=Venture%20capital%20investment%20and%20support,in%20new%20immuno%20oncology%20therapeutics.>; Bicycle Therapeutics announces broad partnership with AstraZeneca to develop bicyclic peptides (Bicycles®) | Bicycle Therapeutics; MCSCS0566, MRCCS0637; MRC funding, Prof Winter has been supported by MRC throughout his career as part of LMB Institute funding and underpinning research funding.
24. <https://www.investeurope.eu/media/6617/gdt-abingworth-case-study.pdf>; MRCCS0801, MRCCS4752, MRCCS5679; MRC funding: MR/P021964/1, MC_PC_17179 £600k and MRC Infrastructure and underpinning research funding.
25. Impact case study: Results and submissions: REF 2021; MRCCS3545; MRC funding MC_PC_1410, MR/K001949/1, MC_PC_13071, MR/R023026/1: 2013-2019 total £4.1m and underpinning research.
26. <https://www.biostatus.com/Company-Information/>; 2012 RSC award winner: <https://www.rsc.org/prizes-funding/prizes/archives/industry-academia-collaboration-prize/>; <https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=3419> ; MRCCS2913; MRC funding G9526470/1, G0301154/1: total £600k 96-2010 and underpinning research.
27. <https://www.ox.ac.uk/news/2023-06-12-beacon-therapeutics-spun-out-syncona-and-oxford-raises-96-million-retinal-gene>; <https://www.synconald.com/news-and-insights/news/beacon-therapeutics-launches-with-96-million-120-million-to-develop-a-new-generation-of-gene-therapies-for-retinal-diseases-resulting-in-blindness/>; MRCCS4996; MRC has funded Professor MacLaren's work since 2013 (4 awards) and a breadth of underpinning research.
28. <https://www.shionogi.com/global/en/news/2022/05/e-20220516-2.html>; <https://www.manchester.ac.uk/discover/news/university-spinout-in-major-partnership-to-commercialize-treatment-for-invasive-aspergillosis/>; <https://www.life-sciences-europe.com/news/f2g-ltd-70m-financing-group-forbion-capital-partners-2001-120308.html>; MRCCS4195; MRC funding MR/S019898/1: 2019-21 £260k plus 10 awards for related research for other investigators on the project and underpinning research.
29. <https://www.ucl.ac.uk/news/2023/jun/ucl-spin-out-quell-therapeutics-joins-forces-astrazeneca-2billion-deal>; <https://quell-tx.com/>; MRCCS4976; MRC funding supported this work from 2009-25 >£2M (e.g. G0701703/1, G0700149/1, G0902209/1) and underpinning research.

30. <https://aviadobio.com/aviadobio-raises-80-million-in-series-a-financing-to-advance-neurodegenerative-gene-therapy-platform/>; <https://www.lifefarc.org/news/2021/lifefarc-invests-in-new-gene-therapies-neurodegenerative-diseases/>; MRCCS2664; extensive MRC funding for lead researchers and underpinning research (e.g. G0500289/1).
31. <https://www.ucl.ac.uk/news/2023/jul/ucl-spinout-tackling-eye-disease-announces-ps57m-launch>; <https://www.businesswire.com/news/home/20230712349327/en/Tenpoint-Therapeutics-Launches-with-70-Million-Series-A-Financing-to-Reverse-Vision-Loss-Through-Engineered-Cell-Based-Therapeutics-and-In-Vivo-Reprogramming>; MRCCS4984: MRC funding of 5 awards to lead investigators 2010-21, >£5.3M and underpinning research.
32. <https://www.dundee.ac.uk/stories/spinout-agrees-potential-50-million-deal>; <https://taytherapeutics.com/>; MRCCS4776; MRC funding MC_PC_15036 (2016-18), £700k, and underpinning research.
33. <https://ukdri.ac.uk/news-and-events/astronautx-raises-48m-in-series-a-financing-to-create-new-treatments-for-alzheimers>; <https://astronautx.bio/news/>; MRCCS5365; Extensive MRC funding for lead researchers and underpinning research.
34. <https://www.imm.ox.ac.uk/news/nucleome-therapeutics-raises-oversubscribed-ps37-5-million-series-a-financing>; <https://nucleome.com/>; MRCCS4214; MRC funding MC_UU_00016/14; MC_UU_00029/3; MR/N00969X/1; MR/R008108/1 2016-22, >£1.4M, and underpinning research.
35. <https://oxford.shorthandstories.com/innovation-perspectum/index.html>; MRCCS0435; MRC funding support for Biobank and infrastructure provided the human data and technology (G0700796) and underpinning research.
36. <https://www.cambridgenetwork.co.uk/news/constructive-bio-launches-15m-seed-investment-re-engineer-biology-creating-new-classes-enzymes>; <https://constructive.bio>; MRCCS2870; The lead investigator has been supported by MRC at LMB for much of his career (2012-25) and MRC funding over the last 6 decades has supported most of the underpinning research discoveries.



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