

MANCHESTER
1824

The University of Manchester

**BUSINESS ENGAGEMENT
AND INNOVATION**

Faculty of Biology, Medicine and Health

WHERE
INDUSTRY
and
ACADEMIA
MEET

Facts and Figures

Faculty of Biology, Medicine and Health

£25M

 attracts the 4th highest amount of research income within the HE sector from UK industry, approaching almost £25m¹

1st

Higher Education Funding Council for England (HEFCE) Knowledge Exchange Benchmarking ranks the University first for formal spin offs



UK's largest single-site university



the leading centre for industry sponsored clinical trials in the UK



Faculty ranked **1st** for Allied Health Professionals in Dentistry, Nursing and Pharmacy

1st

27

in the top 30 Universities worldwide, the top 8 in Europe, and ranked sixth in the UK²

8

6

8th

Reuters ranked us 8th Most Innovative University in Europe³

Faculty of Biology, Medicine and Health: 3 schools (Biological Sciences;

Medical Sciences; Health Sciences); **9 strategic research domains** Applied Health; Cancer; Cardiovascular, endocrine, and metabolic sciences; Cellular and development systems; Digital Health; Evolution, systems, and genomics; Infection, immunity, and repair; Neuroscience and mental health; Platform sciences and technologies; **annual budget of > £300m.**

manages **£122m in annual research income; 3,200 staff, 120 degree programmes,**

11,000 students, 88% employability rating for graduates

More than **100+**  spin out companies based on UoM research; bespoke tailored commercialisation and IP support from the University of Manchester Innovation Factory

1. Higher Education Statistics Agency (HESA) 2018-19 - £24,492,000

2. QS World University Rankings - <https://www.topuniversities.com/university-rankings/world-university-rankings/2020>

3. <https://www.reuters.com/article/rpbt01002019/reuters-top-100-europes-most-innovative-universities-2019-announced-idUSKCN1S60PA>

Research.

Collaborate.

Innovate.

Manchester. A city of firsts. A city with a history of being at the forefront of technical and scientific invention and innovation, coupled with social progress and an ambition to shape the future.

The University of Manchester sits at the heart of this story, with a rich tradition of world leading academic excellence translating into real world impact.

INTRODUCTION + BUSINESS ENGAGEMENT AND INNOVATION

The University attracts almost £25m¹ in research income from UK industry, putting us in elite company, with only our Russell Group counterparts Cambridge, Imperial and Oxford attracting more.

We're in the top 30 Universities worldwide, the top 8 in Europe, and are ranked sixth in the UK².

Reuters ranks us the 8th Most Innovative University in Europe³.

The 2014 Research Excellence Framework (REF) judged 83% of our research activity as either 'world leading' (4*) or 'internationally excellent' (3*), placing us 5th in the Research Fortnight power rankings.

The Times Higher Education Impact Rankings, the only global performance tables that assess universities against the United Nations' 'Sustainable Development Goals', places us 3rd in the world.

Our 2020 Graduate Employability Rankings place us in the top 10 Universities in Europe, and top 5 in the UK.

Collaborating with the Faculty of Biology, Medicine, and Health (FBMH) can help you make your mark locally, regionally, and globally.

Bringing in £122m a year in total research income the Faculty supports academics and industry to partner together on world leading research and innovation, helping develop collaborative opportunities for SMEs and multi-nationals alike through a wide range of programmes and initiatives.

The Business Engagement Team act as a 'one-stop shop' for advice, support and signposting on all aspects of collaboration – from collaborative research, consultancy, Knowledge Exchange, through to commercialisation and Intellectual Property – developing strong links between academia and industry helping to build the Greater Manchester city region as the place to do business in the biomedical, life sciences, and healthcare sector.

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3. <https://www.reuters.com/article/rpbtop1002019/reuters-top-100-europes-most-innovative-universities-2019-announced-idUSKCN1S60PA>

Why Manchester?

We know the value of working together, of taking a 'Team Science' approach. Through collaboration, our internationally renowned research has made a positive impact on society by generating jobs and wealth, creating new therapies and treatments, improving patient outcomes and influencing global public health. We are proud of our long-standing, mutually beneficial relationships with industry and have a proven track record of delivering successful projects with external organisations.

It is an exciting time for innovation in Greater Manchester.

Located at the heart of the Oxford Road Innovation Corridor, we are uniquely placed to link our skills and expertise with partners such as Bruntwood, Manchester Science Partnerships (MSP), Manchester University NHS Foundation Trust (MFT), MIDAS (Manchester's Inward Investment Agency), the Business Growth Hub, and the Greater Manchester Combined Authority.

The devolution to Greater Manchester of the region's £6bn Health and Social Care budget represents a unique opportunity. We are a key partner in Health Innovation Manchester; a collaboration between academia, local government, the NHS and industry that helps facilitate faster uptake and diffusion of novel solutions aligned to public health need, bringing our discovery scientists and healthcare experts closer together to further encourage translational thinking. Through our research and industry links, we have the ability to directly impact the lives of the 2.8 million people living across the region, and beyond.

Together with MFT we host the £28.5m National Institute for Health Research Biomedical Research Centre (BRC). Part of Health Innovation Manchester, the BRC is pioneering new research into musculoskeletal disease, hearing health, respiratory disease, dermatology and three cancer themes (prevention, radiotherapy and precision medicine).

We're the leading centre for industry sponsored clinical trials in the UK. MFT hosts the leading local NIHR Clinical Research Network for patient recruitment to commercially funded portfolio trials, with 45,000 patients per year, and has consented over 300 patients into Phase 1 cancer studies, generating over £1m in commercial revenue to date.

Our partnership with The Christie, Europe's largest single site cancer hospital, where 14,000 new patients are seen every year, in addition to those seen in previous years requiring ongoing treatment or follow-up, places us as a world leader in cancer research. Together with MFT and nine commercial partners, Manchester hosts the Innovate Manchester Advanced Therapy Centre Hub (iMatch). The consortium is focused on scale-up of activity in advanced therapy medicinal products, aiming to improve access for patients, ensuring efficient and safe delivery through integration of sample collection, development of electronic sample traceability, and tracking systems utilising novel digital implementation.

Our strength in Precision Medicine research has attracted more than £96m in grant income in the past five years from the Medical Research Council (MRC), Engineering & Physical Sciences Research Council (EPSRC) and Industry, with a major focus on immune mediated conditions including hosting three MRC Stratified Medicine Consortia (Rheumatoid Arthritis, Psoriasis and Systemic lupus erythematosus). Our expertise is further strengthened by our collaboration with QIAGEN to develop a global genomics campus for innovation, life sciences, translational science and molecular diagnostics. This has seen the launch of APIS Assay Technologies and will anchor QIAGEN's European Centre of Excellence for Precision Medicine and global hub for diagnostics development in the City.

Uniting the MRC funded Clinical Proteomic Centre (the largest clinical proteomics centre in Europe) and Molecular Pathology Node, Manchester is home to the Stoller Biomarker Discovery Centre. The Centre aims to find protein markers in the blood that could be used to stop patients being given treatments which won't improve their condition, helping doctors to prescribe the right treatment for the right patient as early as possible.

The University also co-ordinated the £20m Department of Health funded 'Connected Health Cities' programme, a ground breaking Learning Health System approach that put informed consensual use of citizen's health data at the heart of delivering data driven healthcare improvements.

The Faculty Offer

Our Vision

Drawing on and harnessing the entrepreneurial tradition of The University of Manchester to attract and evolve industry partnerships for scientific and health impact.

The University of Manchester is the UK's largest single-site university, and within the Faculty of Biology, Medicine and Health we undertake multidisciplinary research through collaborations with partners worldwide to tackle some of society's most pressing problems.

Home to over 2,000 researchers, the Faculty's size and scale enables unparalleled interdisciplinary inquiry, with world-leading minds from the University collaborating with industry to discover new ways forward.

Working with the Faculty gives you access to world-leading academics across an array of research domains. Building on our research expertise and aligning these with the commercial world as well as the UK Industrial Strategy and UKRI, we aim to harness our full potential for industry collaborations.

Home to the UK's first proton beam treatment and research facility.

We are committed to undertaking world leading research into the discovery of novel biological, psychological and social mechanisms; developing new approaches to prevention and early detection of disease; and developing next generation person-centred therapies, interventions and care pathways.

Research conducted within the Faculty has influenced international guidelines on the use of antibiotics in oral health and reduced unnecessary antibiotic prescriptions. Our research into asthma and chronic pulmonary disease has resulted in improved treatment of airways diseases, for example our ground breaking work on antifungal therapies for people with severe asthma. We've helped change national policy on school dental screening programmes, and Faculty academics delivered the world's first trial of Argus II bionic eye implants, a revolutionary treatment which is restoring sight to thousands of patients.

THE FACULTY OFFER + BUSINESS ENGAGEMENT AND INNOVATION

New approaches to endocrine therapy for breast cancer in postmenopausal women, developed within the Faculty, has increased the duration of survival of women with advanced breast cancer, reduced relapse rates, improved survival after surgery for early breast cancer, and prevented disease in women at high risk.

Home to the UK's largest medical school.

As part of the Manchester Cancer Research Centre we're one of only two designated major centres supported by Cancer Research UK. Pioneers in the use of 'liquid biopsy', the future of cancer diagnosis and monitoring, we are also home to the UK's first proton beam treatment and research facility.

The new multimillion pound Christabel Pankhurst Institute for Health Technology will maximise our strengths in digital health and advanced materials to discover innovative health and care solutions.

Our industry collaborations deliver mutually beneficial partnerships between researchers and businesses that champion innovation, promote business growth, and demonstrate real world impact.

For more information:

<https://www.bmh.manchester.ac.uk/connect/business/>

Case Studies

ManTRa DX – a major advance in personalised cancer care

SkinBiotherapeutics – helping skin to heal and better protect

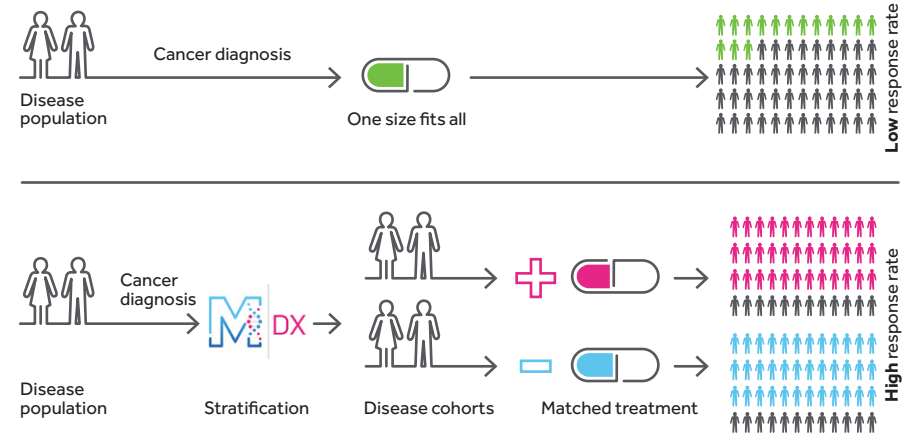
MIRA Rehab and Keep On Keep Up (KOKU) – preventing falls through fun and fitness

Clin-e-cal and Rafi-tone – reducing anxiety for children with asthma

SenTraGor – a breakthrough in detecting ageing cells

Biocomposites – a novel collagen soft tissue wound model

Crawford Healthcare – new ways to treat chronic wounds



ManTRa DX

Innovation

ManTRa DX, a diagnostics development company originating from the Department of Translational Radiobiology, delivers a major advance in personalised cancer medicine.

Solid tumours with low levels of oxygen – hypoxia - are associated with resistance to treatment and a poor prognosis. There is currently no way to measure the level of hypoxia in tumours in routine clinical practice.

ManTRa DX provides tumour-site-specific gene expression signatures to assess hypoxia. The test is able to stratify patients receiving various treatments for solid tumours and predict those patients who would benefit from targeted treatment.

Impact

While specific genetic alterations provide a route to personalisation, tumour hypoxia provides a global picture of resistance. Around a half of solid tumours will be hypoxic, which reduces the efficacy of surgery, radiotherapy and many chemotherapeutic agents. Conversely, there is likely to be an enriched population with low tumour hypoxia with increased efficacy. One focus of ManTRa DX will be on hypoxia suppression of immune and DNA damage responses because developing inhibitors of these processes are fast-growing markets. It is a powerful tool in choosing a patient population, where modern targeted therapies are more likely to work, improving the chance of a drug being approved.

The initial offering will be to demonstrate the feasibility of a clinical service delivery for head and neck cancer (ManTRa DX H+N) in collaboration with the Greater Manchester healthcare infrastructure. This has potential to provide benefit to hundreds of cancer patients, developing an exemplar for a translational pipeline for world-class research.

Clinical trials often fail due to unselected patient recruitment, and as such ManTRa DX will also target (bio)pharmaceutical companies who have immunotherapeutics and DNA damage response inhibitors in clinical development.

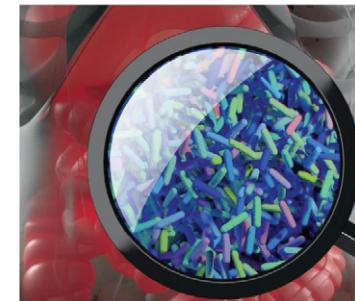
Ultimately, this diagnostic tool has the potential to lead to improved patient outcomes, personalised therapies, fewer failed trials and the application of novel drug treatments, reduced diagnostic spend, and improved patient pathways, as well as deeper understanding of various cancers.

SkinBiotherapeutics

Innovation

SkinBioTherapeutics applies University of Manchester research discoveries made on the activities of lysates derived from probiotic bacteria when applied to skin. The SkinBiotix® platform can improve the barrier effect of skin models, improve repair and reduce bacterial load, with multiple applications for skincare and cosmetics.

The positive effects of probiotics in gut health are well known; they help strengthen barriers, heal wounds, and prevent pathogens from invading. Professor Cath O'Neill (Professor of Translational Dermatology) and Professor Andrew McBain (Professor of Microbiology) set about developing probiotic extracts that would work in creams, gels and lotions that target three specific skin healthcare sectors - cosmetics, infection control and eczema. Extracts of probiotic bacteria in skin models have been shown to increase the skin's barrier integrity to retain moisture better, protect the skin from infection and to increase the rate of skin healing in response to injury. In each of these areas SkinBioTherapeutics plans to exemplify its technology in human studies.



Impact

Spun out of the University in April 2016, the company debuted on the London Stock Market in April 2017, raising £4.5 million on the Alternative Investment Market, seeking to license out its programmes at an early stage to bigger companies with the specialisms and expertise to commercialise them.

Since listing, the company has agreed a deal to licence the product at scale, completed a human study design, and been granted patents in Australia, Russia, and New Zealand. Recently, SkinBioTherapeutics announced a Commercial and Manufacturing Agreement with speciality chemical company, Croda Plc – the first commercial deal involving the SkinBiotix™ technology.

MIRA Rehab and KOKU

Innovation

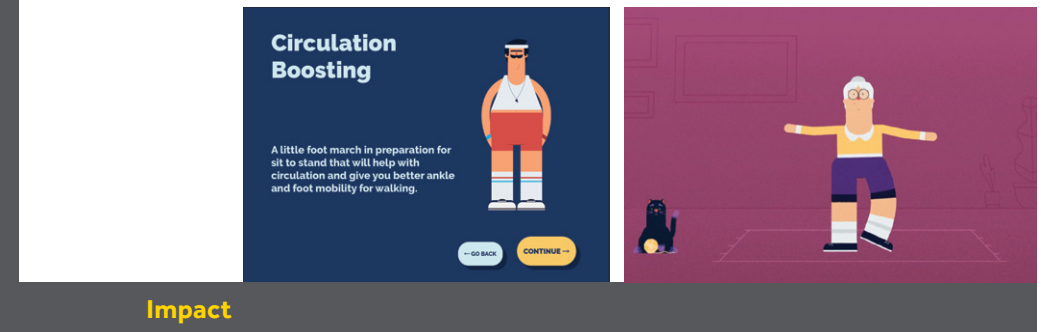
Exercise is known to improve strength and balance, but many elderly people are unable or reluctant to attend physiotherapy classes. Working with industry, the University of Manchester has helped develop novel interactive digital health solutions.

“ It's particularly relevant for older adults concerned about their risk of physical decline and wanting to remain independent at home, but it's also helpful for therapists and care home staff looking for interactive ways to engage older residents, or people concerned about ageing relatives or friends who may be at risk of falls or frailty.”

Dr Emma Stanmore

Falls are the main cause of accidental injury and death in older people, with the annual cost to the NHS estimated at over £2.3 billion. Studies have shown that strength and balance based exercises reduce falls by up to 42%, yet levels of exercise are generally low without therapist input.

Dr Emma Stanmore has collaborated with industry, clinicians and patients, to develop and clinically test 'Exergames' to improve balance and function in older adults. As well as creating the games to be safe, engaging, and feasible for use in group or home settings, the team also designed and tested cloud-based remote monitoring systems to allow clinicians to track patients' progress and prescribe personalised treatments.



Impact

In conjunction with MIRA (a software platform that turns physical and cognitive exercises into clinical Exergames), the team evidenced that Care Commissioning Groups can save up to £84,000 per year (one MIRA unit can be used by up to 20 people). They also demonstrated increased confidence in their mobility and ability to perform everyday tasks. The team is currently running a Burdett Trust funded project to implement Exergames on rehabilitation wards with some 4000 patients at Trafford Hospital (part of Manchester University NHS Foundation Trust) currently benefitting from the treatment.

Recently, Dr Stanmore partnered with Manchester Improving Medicine with Innovation and Technology (MIMIT), Manchester University Hospital Foundation Trust, Innovate UK, the Economic and Social Research Council (ESRC) and Manchester based company Reason Digital to develop the 'Keep On, Keep Up' (KOKU) platform. Following in-depth testing with over 100 adults aged 65 and over in sheltered housing facilities in the UK, the app provides benefits in that it does not require clinicians to assess, oversee or monitor its use due to its novel self-assessment descriptors and user-centred design. Physios can use it to support treatment and care home staff can use it to prevent falls in their frail populations.

Based on health behaviour change theory and incorporating the OTAGO/ FaME falls prevention exercise intervention programmes, the app provides personalised strength and balance exercises with an animated in-app trainer called, 'Wilf'. It also uses health literacy games to increase awareness of home safety, importance of hydration, and ways to improve bone health and nutrition.

Feasibility trials in Greater Manchester and Nottingham have found that KOKU has high usability with trends in improved outcomes (e.g. balance, health status and confidence) after six weeks of independent use. Clinical trial are continuing in Austin, Texas and Copenhagen, Denmark. It has been certified and approved by NHS Digital and is GDPR and safety compliant.

Clin-e-cal and Rafi-Tone

Innovation

Children with breathing problems such as asthma can find using spacers a source of anxiety, making it difficult for treatment to be administered properly. Combining the latest technology with a dose of fun and colour, Rafi-Tone has been shown to make spacer use more enjoyable.

"It had an immediate impact on Rafi when we first used it late one night. Instead of crying through his inhaler treatment, he took it quietly and calmly, saying 'That was great Dad, can we do it again tomorrow?'"
 Professor Tariq Aslam

Professor Tariq Aslam, Consultant Ophthalmologist at the Manchester Royal Eye Hospital and Professor of Ophthalmology and Interface Technologies at the University of Manchester, invented Rafi-Tone (Respiratory Aid For Inhalers) after his son Rafi suffered with breathing problems. The app transforms the use of the spacer into an entertaining visual aide. The game unlocks if the medication is inhaled correctly by the child with the help of a whistle-tone in the spacer detected by the app. This 'releases' Rafi, an onscreen character who fights off cartoon-style baddies!



Impact

Clinically tested at Royal Manchester Children's Hospital, and working with the University's Intellectual Property team and with established industry name Clement Clarke International - a leading respiratory device manufacturer who helped ensure the final arrangement would work with modern devices – Rafi-Tone is University of Manchester spin-out company Clin-E-Cal's first product. It works in conjunction with the 'Flo-Tone' mask which attaches to the Able Spacer (also made by Clement Clarke).

Rafi-Tone's success led to a formal partnership arrangement with Clement-Clark – where they have been influenced by our research to incorporate a whistle tone within their new spacer devices – leading to an increase in sales of around 2,000 products per month. The company has opted to incorporate this specific tone into all paediatric masks making them all compatible with detection by the Rafi-Tone app. Rafi-Tone is classified as a medical device accessory under the Medical Device Regulation (EU) 2017/745 and has a CE mark to demonstrate it conforms to the regulations. It is available in a number of countries and is in the NHS Apps library.

SenTraGor

Innovation

Developed at the University of Manchester, SenTraGor is a breakthrough technology that helps detect ageing cells, boosting the understanding of the role of senescent cells in age-related disorders, including cancer.

“ Cellular senescence is causally linked to ageing and has been implicated in a variety of age-related diseases such as cancer. But up to now, detecting senescence was problematic and infeasible in most widespread biological material. Our method provides unheard-of advantages over any other available senescence detection products. It's widely applicable, straightforward and specific. It will also help researchers make new breakthroughs into the causes of diseases, including cancer, as there will be a more effective understanding of phenomenon of cellular senescence.”
Professor Paul Townsend

Understanding senescence - the condition or process of deterioration with age – is vitally important when dealing with a variety of age-related illnesses and disorders. Until now, a major problem in the field of senescence was the absence of a reliable marker to specifically detect these cells. SenTraGor™ reagent is a unique compound that detects senescent cells in every biological sample with high specificity, sensitivity and accuracy, through an antibody-enhanced technology.



SenTraGor™

Antibody - enhanced detection of Senescent cells



Impact

SenTraGor™ reacts with lipofuscin granules that have been shown to accumulate during the senescence process, and SenTraGor™ staining allows the detection of senescence in any biological material. Direct visualization of senescent cells can be achieved in all archival tissue specimens (formalin-fixed paraffin-embedded) and cells from biopsies or cell cultures. With the help of the University's technology transfer, commercialisation and intellectual property company, the University of Manchester Innovation Factory (formerly UMI3), SenTraGor was initially licensed in a deal valued at €1.5 million. The agreement saw SenTraGor provided to research institutions, diagnostic labs, clinics and companies looking for new therapies and offering wider wellbeing services to the public.

Biocomposites

Innovation

Working with Biocomposites, we developed a novel collagen soft tissue wound model that helped inform treatment of Diabetic Foot Ulcers.

“ The collaboration with Biocomposites has allowed us to apply our expertise in cell biology and microbiology to an important real world problem, and develop a new way to test a novel intervention which may have significant impact in the clinical setting.”

Dr Bianca Price

“ Working with the University of Manchester has provided the company with deep insight into the treatment of infected DFUs and other related conditions, as well as valuable and robust scientific data, which will benefit future commercial product development.”

Sean Aiken, Clinical Research Director, Biocomposites



Diabetes has major implications for public health. Diabetic foot ulcers (DFUs) affect 20% of patients, with around half of these becoming infected, increasing the risk of amputation.

The company wanted to investigate the potential use of calcium sulfate beads to release antibiotics directly into infected tissues to determine how effective this would be in clearing bacterial biofilm. Existing in-vitro models were costly and of limited relevance to human soft tissue, so were not suitable for testing in detail the performance of their technology.

Our team, led by Dr Bianca Price, developed a novel collagen soft tissue wound model that uses collagen as a substrate for biofilm growth and incorporates serum to mimic the biochemical complexity of a wound environment - effectively an infected wound in a dish. The antibiotic loaded material was applied to the wound model which enabled the team to measure how far the antibiotics had penetrated the tissue, how they reacted to the simulated wound environment and their effectiveness in killing robust biofilms.

Impact

The project increased Biocomposites' understanding of infected DFUs, and provided valuable data to show the enhanced efficacy of locally released antibiotics when combined with the right carrier material. This has provided important data to inform their ongoing product development, with Dr Price's team being approached by other companies in the wound care sector who want to use the model to test movement and efficacy of antimicrobials released from medical devices. The success of the collaboration saw Dr Price awarded Bionow's 'Promising Technologist of the Year'.

Crawford Healthcare

Innovation

A patented new silver-based wound dressing, KerraContact Ag, has delivered significant patient benefit treating chronic wounds that did not previously respond to traditional dressings, preventing the need for amputation.

Over 5,000 major limb amputations take place each year in England with many cases not responding to traditional antibiotics due to chronic wounds. Knutsford-based Crawford Healthcare wanted to explore how unique forms of silver might be applied to problems such as antibiotic resistance in chronic wounds but lacked the in-house knowledge to make sufficient progress independently.

Support came from our cross-disciplinary expertise in Life Sciences and Materials. Working with Professors Sarah Cartmell, Brian Derby and Andrew McBain, and progressing through several Innovate UK Knowledge Transfer Partnerships, we supported the development of new, validated, product streams on areas such as pressure relief dressings, effects of silver in wound healing and electrospinning of materials. Three products containing Silver Oxysalts were developed as well as launching a new wound debriding product.

KerraContact™ Ag



Impact

KerraContact Ag became a key product line for Crawford Healthcare, and gained FDA approval in ground-breaking time, enabling rapid expansion in the US market, helping generate more than \$2.5M in global revenue and selling to over 20 countries worldwide. The company received the Queen's Award for Enterprise in 2016. Crawford was acquired by Acelity in June 2018, which in turn was acquired by 3M in October 2019.



Research Expertise

Faculty of Biology, Medicine and Health

Cancer Sciences

Cardiovascular Sciences

Cell Matrix Biology and Regenerative Medicine

Dentistry

Developmental Biology and Medicine

Diabetes, Endocrinology and Gastroenterology

Evolution and Genomic Sciences

Human Communication, Development and Hearing

Infection, Immunity and Respiratory Medicine

Informatics, Imaging and Data Sciences

Medical Education

Molecular and Cellular Function

Musculoskeletal and Dermatological Sciences

Neuroscience and Experimental Psychology

Nursing, Midwifery and Social Work

Pharmacy and Optometry

Population Health, Health Services Research and Primary Care

Psychology and Mental Health



Whether you're an international blue chip, an ambitious SME, or a charity with an eye for innovation, a business engagement partnership with The University of Manchester and our academics in the Faculty can have a significant impact on your organisation.

Engagement with the Faculty can take a variety of forms, with just a selection of mechanisms below.

Student projects, sponsored PhDs, and recruitment

Facilities sharing

UKRI funded translational projects

Clinical trials through the University of Manchester Clinical Trials Unit

Relationship Incubators and Knowledge Transfer Partnerships

Co-commissioned and co-produced research, including consultancy

Commercialisation and support from the University of Manchester Innovation Factory

Continued Professional Development (CPD)

Strategic Framework Agreements

We welcome any enquiry and the Faculty Business Engagement team will discuss your requirements with you to see how best we can collaborate.

See www.bmh.manchester.ac.uk/connect/business/ for contact details.

BUSINESS ENGAGEMENT AND INNOVATION

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