



Health Promotion, Policy and Economics

We have pioneered the development of methods to assess the cost-effectiveness of health interventions, and we carry out innovative research on health promotion and understanding behaviour change (e.g. in relation to smoking cessation and breastfeeding promotion programmes).

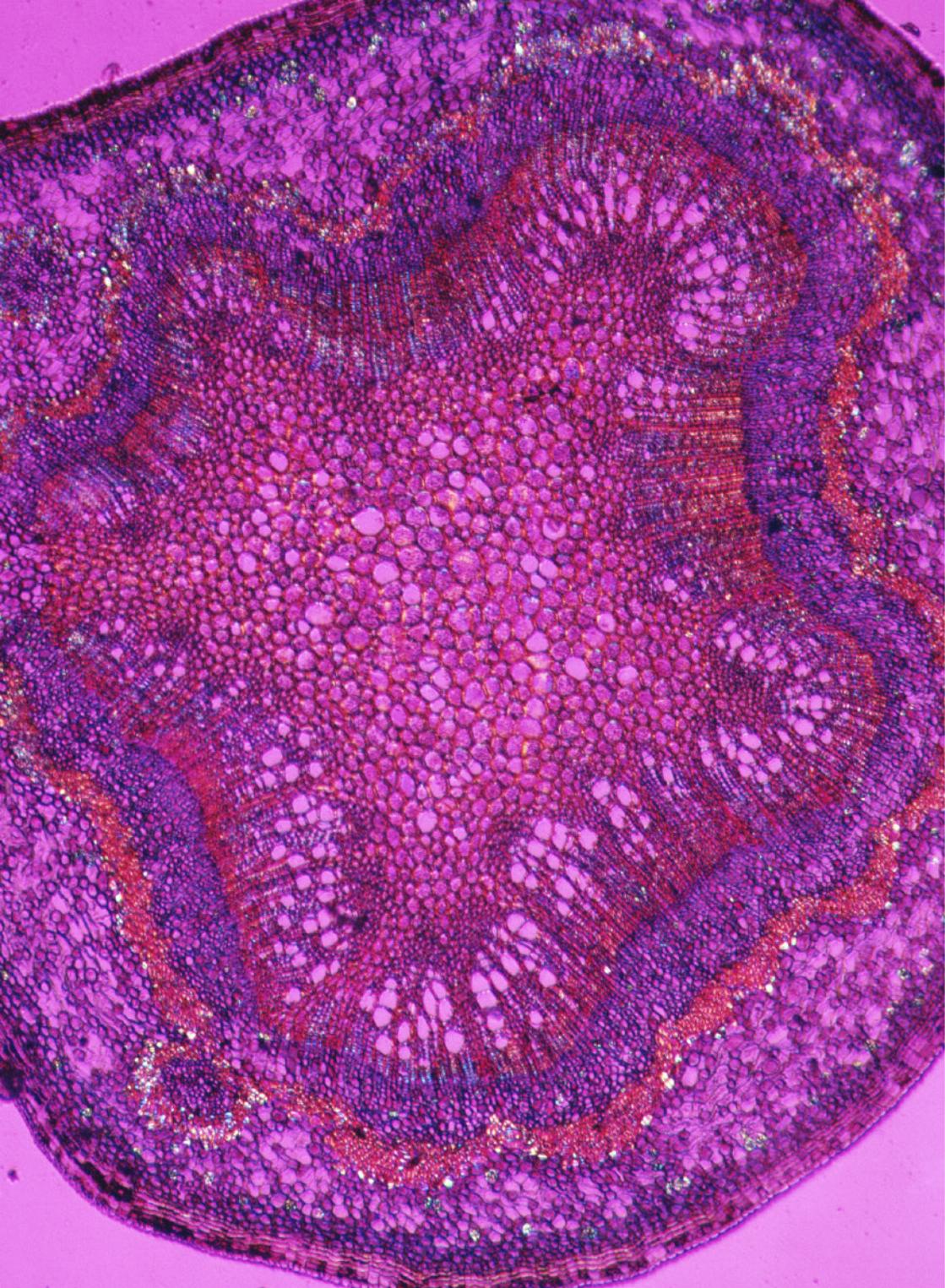
Case Study 1: Development of Techniques for Assessing the Impact from Health Research

Brunel's Health Economic Research Group's (HERG) research on developing and applying techniques for assessing research impact (payback) has been funded globally since 1993 by various funding organisations, to demonstrate to policymakers and the public how their investments in research benefit society. Our research has wide-reaching impact. First, internationally, health research funding bodies have adopted and adapted the Payback Framework in their evaluation strategies. In 2020 the framework was highlighted in a WHO review of ways to strengthen health research systems. Second, many stakeholders have made extensive use of the findings of payback studies when lobbying for public expenditure on health research. Governments, public research funding bodies and medical research charities, from the UK to Australia, use the findings to inform decisions regarding the levels and distribution of health research funding. Our research has been used by the UK Academy of Medical Sciences and others to advocate the embedding of research activity research within health systems, and to understand and reduce the time-lag between early research and its translation into improved healthcare. Time-lag research is also being used to analyse the rush to develop a vaccine for COVID-19.

For more details, please contact: Professor Stephen Hanney
email: Stephen.Hanney@brunel.ac.uk

"The pioneering research from Brunel is very helpful to us in Alberta and across Canada in developing ways both to demonstrate the societal benefits of our health research and embed it into the healthcare system. Ultimately, the aspiration is that this work will help us optimize the impact for Canadians and globally."

Dr Kathryn Graham, Executive Director – Performance Management & Evaluation, AI (Alberta Innovates), Canada



Environmental Toxicology

Our research explores how harmful chemical mixtures in the environment can disrupt hormonal processes and should be considered as global health hazards. Working with regulatory bodies we have developed a new approach to assessing the risks of these environmental pollutants.

Case Study 2: Better Health and Environmental Protection from Harmful Chemical Mixtures

Hundreds of synthetic chemicals contaminate our food and water. Brunel's research has shown the harmful cumulative cocktail effects of low levels of contaminants in food and water, previously thought to be safe. The active translation of these results into European chemicals legislation ensured a sound basis for including multiple chemical exposures in risk assessment. By working with the European Food Safety Authority, Brunel demonstrated a viable approach to grouping chemicals for mixtures risk assessment. Our research has led to a totally new approach to grouping chemicals for mixtures risk assessment. This will influence maximum residue levels for toxic pesticides in food in Europe, leading to better protection of consumers against increased risks of harm multiple pesticide residues present in the majority of food items.

For more details, please contact: Professor Andreas Kortenkamp,
email: Andreas.Kortenkamp@brunel.ac.uk



Cancer and Cell Biology

Our cell and molecular biologists are striving to understand the mechanisms that keep our cells healthy, and how these can be disrupted; e.g. in cancer through the chromosomal aberrations that can arise as a consequence of exposure to radiation.

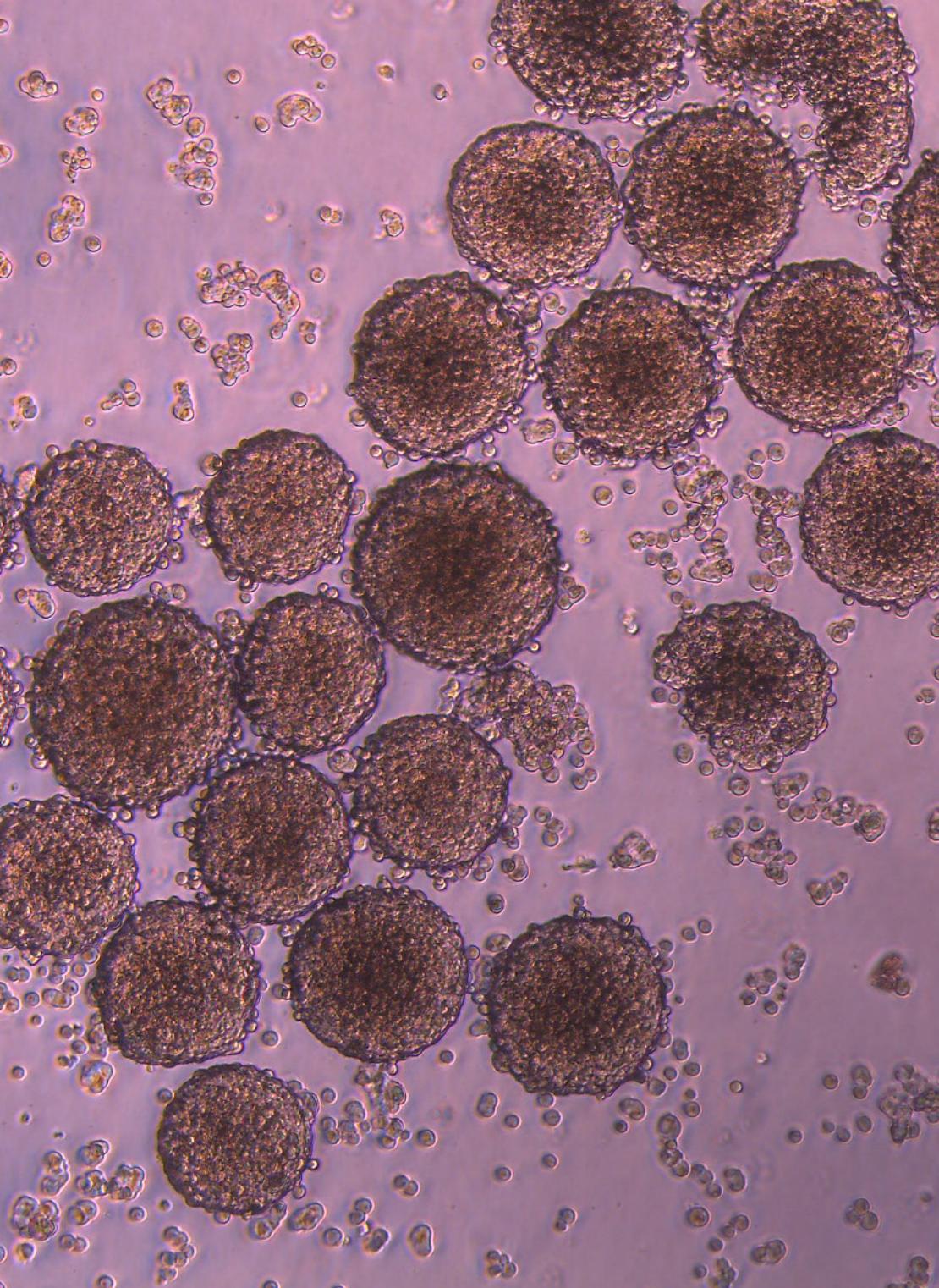
Case Study 3: Health Effects of Radiological and Chemical Agents

The British Government undertook a series of atmospheric nuclear weapons tests at various sites in Australia and the South Pacific between 1952 and 1958. Associated with these tests was an experimental programme in which radioactivity was dispersed into the environment. There has been ongoing concern as to whether veterans of these programmes (~20,000 servicemen) could have received sufficient radiation exposure to cause genetic damage (changes to the DNA). This concern extends to whether they might also have passed on genetic alterations to their children, thereby potentially affecting their family's health. The Brunel research team, funded by the Nuclear Community Charity Fund are analysing if there is any chromosomal evidence of historical exposure of veterans and if there are any genetic alterations in their children. The study's outputs will provide important new information enabling an evaluation of the potential risks to health. The knowledge gained will also contribute to improving our understanding of possible impacts on the future health of radiation-exposed populations more broadly.

For more details, please contact: Dr Rhona Anderson,
email: Rhona.Anderson@brunel.ac.uk

"It has been a long-held belief amongst the British nuclear survivor community that much higher levels of poor health are prevalent within their offspring. The research may help this community to better understand their potential genetic heritage and facilitate more informed life choices."

Tony Jeffery, Chairman, Nuclear Community Charity Fund



Genetics and Genomics

Our researchers use sophisticated laboratory techniques and "big data" analytic methods to examine genetic influences on health and disease, and assess the safety of novel gene therapies.

Case Study 4: Screening for Gene Therapy Safety and Efficacy

Pharmaceutical companies including GlaxoSmithKline (GSK), Novartis, Astra Zeneca and Pfizer are investing heavily in gene therapy virus technology, bringing several new products to market to provide treatments for acquired diseases and genetic disorders including cancer. However, no standardised platform has been available to test vector safety. Following the unexpected development of leukaemia in several children treated with gene therapy the Brunel team developed a method to test the safety of the gene therapy vectors. The Brunel team, with colleagues from UCL, KCL, GeneWerk, and NMI in Germany, won the Small Business Research Initiative InMutagene CRACK-IT Challenge, funded by the National Centre for the Replacement, Refinement and Reduction of Animal Research, sponsored by GSK and Novartis. The team generated the first human induced pluripotent stem cell (iPSC) directly from a cell based platform that evaluates the safety of gene therapy products.

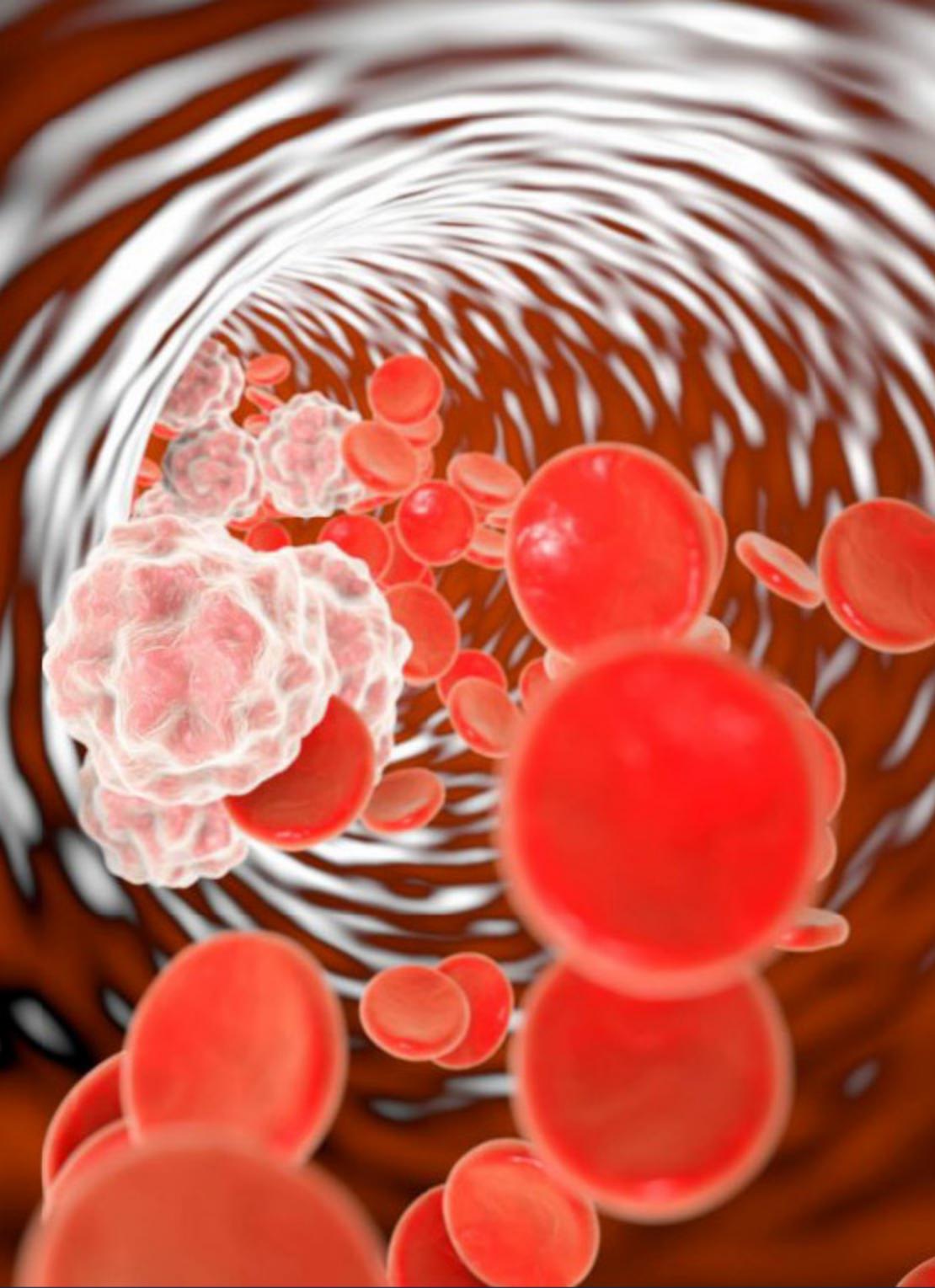
The technology will also enable pre-treatment screening to identify individual patient tolerance to gene therapy and profiling of vector side effects.

With patents filed, TestaVec Ltd, a spin-out of Brunel University London, will enable researchers and industry to bring their products safely into the clinic.

For more details, please contact: Dr Mike Themis,
email: Mike.Themis@brunel.ac.uk

"The InGetox platform is an exciting new model developed by Brunel University London, UK and GeneWerk, Germany with the potential to offer safety profiling of gene therapy vectors before entering the clinic"

Silvana Libertini, Laboratory Head of PreClinical Safety, Novartis, Basel, Switzerland and Jan Klapwijk, Director of Pathology at GSK, UK



Inflammation and Immunity

To enhance human health, we are using multidisciplinary approaches to explore the inflammation and immune processes involved in cardiovascular diseases – with a focus on identifying targets for drug development and diagnosis, leading to improved prevention and treatment.

Case Study 5: Innovative Drug Discovery for Sickle Cell Disease

Strokes are a leading cause of mortality and the main cause of adult disability. During a stroke, blood supply to parts of the brain becomes limited, causing cell death. This complex response involves blood vessels, chemical mediators and immune cells (termed "inflammation"). Ongoing or worsening inflammation further damages the brain. Reducing, and ideally eliminating inflammation (termed "resolution") is critical to stroke recovery.

Funded by the Royal Society-Wolfson Foundation, the Brunel study of one player of resolution: formyl peptide receptor 2 ((Fpr2/ALX) G-protein coupled receptor (GPCR) located on the surface of many cell types in the body), has shown that targeting Fpr2/ALX in mice limits brain damage during a stroke and improves the outcome. These data are particularly relevant to high-risk stroke individuals, e.g. patients with Sickle Cell Disease (SCD), a disorder affecting red blood cells. This project will focus on investigating whether targeting Fpr2/ALX, which resolves inflammation, can limit brain damage during a stroke in SCD. Data generated may provide new therapeutic possibilities for drug discovery programmes.

For more details, please contact: Professor Felicity N.E.Gavins,
email: Felicity.Gavins@brunel.ac.uk



Human Well-Being, Development and Ageing

We carry out pioneering multi-disciplinary research on factors affecting well-being and health across the lifespan, including child development, mental health and issues affecting older people. Our research examines the importance of physical activity and sports participation, religious and spiritual beliefs, cultural factors, inequality, rehabilitation and educational interventions.

Case Study 6: Enjoyable and Affordable Exercise Devices for Stroke Survivors

Every 5 minutes someone in the UK has a stroke, many being left with persistent problems in using their hand and arm, post-stroke. Treatments that work best require lots of practice, and movements which must be repeated many times. Engaging the individual to put in sufficient practice to make a difference is a challenge, given NHS resources, and the boredom of doing repetitive exercise.

For the last 3 years, a Brunel team alongside Neurofenix (www.neurofenix.com) and stroke survivors have been undertaking a research programme to provide a solution. We have developed a portable innovative training device (the NeuroBall) that allows all-in-one arm training through uniquely designed rehabilitation computer games displayed on an iPad or laptop.

We have tested the NeuroBall in the lab, and in participants homes in a non-randomised intervention study funded by Innovate UK. The NeuroBall was found to be safe, enjoyable, and easy to use. Next, we plan to test the device in a Stroke Association / MedCity funded feasibility RCT, in a stroke unit and during the first few weeks back at home.

For more details, please contact: Dr Cherry Kilbride,
email: Cherry.Kilbride@brunel.ac.uk

“The [NeuroBall] is brilliant. I think it's for anybody who's got disability. I like the games... The games are challenging but they're good games. I like everything about it.”

Paulina, who participated in the project and benefitted from the new training device developed by Neurofenix and Brunel in coordination with Innovate UK



Biomedical Technology

Our Biomedical Engineering research is interdisciplinary, using the skills and knowledge of academics from Engineering and Life Sciences. Research and development are being conducted in different areas including diagnostics, cardiovascular mechanics, organ-on-a-chip, prosthetics and diabetes. This has led to the development of smart devices for rapid screening, monitoring, diagnosis and therapy of diseases at the point of care and/or in laboratory settings.

Case Study 7: Assessing the Combined Effects of Preventable Factors on Breast Cancer

Lifestyle factors and environmental contaminants, including endocrine disrupting chemicals (EDCs), play a role in breast cancer development, but human studies linking EDCs to cancer are often inconclusive. This is mainly because EDCs are studied individually and in concentrations that don't match our day to day exposure. This project, funded by Breast Cancer UK, examines the impact of mixtures of endocrine disrupting chemicals and saturated fats (that may result from a high fat diet) on the early stages of breast cancer, using an exciting new three-dimensional breast cancer model system known as "Breast-on-chip" (3D cell culture). This method of culturing different types of breast cells more closely, mimics how breast cells behave in the body and provides a representative alternative to current laboratory and animal-based methods. The project aims to provide guidance for chemical regulation and a framework for further public information and practical advice on ways to reduce exposure to factors that contribute to breast cancer risk.

For more details, please contact: Dr Elisabete Silva,
email: **Elisabete.Silva@brunel.ac.uk**



Digital Health

We have the expertise in digital health areas such as: Bioinformatics, Computational Medicine, Medical and Health Data Analytics, Modelling and Simulations, Immersive Data Visualisation, Assurance, Security, Provenance of Medical Data, Multi-Sensorial Technologies for Medical Applications and Data Driven Health Service Productivity. The Brunel Partners Academic Centre for Health Sciences (BPACHS) in partnership with The Hillingdon Hospitals, NHS Foundation Trust and Central & North West London NHS Foundation Trust (CNWLFT) has already developed plans for innovative digital health research platforms.

Case Study 8: Simulation and Modelling for COVID-19 Response Planning for NHS Trust

The Brunel Digital Health team has been working with the National Health Services (NHS) on its response to the COVID-19 pandemic on three main fronts. We developed the hyperlocal simulation of the spread of COVID-19 at the building level, within London Boroughs and subsequent admission impact to hospitals. COVID-19 transmission pattern is simulated using Agent-Based Simulation (ABS) models extracting OpenStreetMap for demographics of the area, latest COVID-19 research assumptions and NHS reporting. Localised transmission results are coupled to our discrete-event simulation (DES) models of resource utilisation within specific hospitals in the area. Our pioneering work has supported the NHS in North West London in their planning for a range of post-lockdown and release scenarios.

For more details, please contact: Dr David Bell,
email: David.Bell@brunel.ac.uk

"We are fortunate to have worked with Brunel University, particularly during the COVID-19 response. Having access to data scientists, skills and techniques to support NHS planning and response have been invaluable."

Ms Sonia Patel, Chief Information Officer, NHSX