

Clinical Innovation Accelerator (CIA)

Project Portfolio
2022



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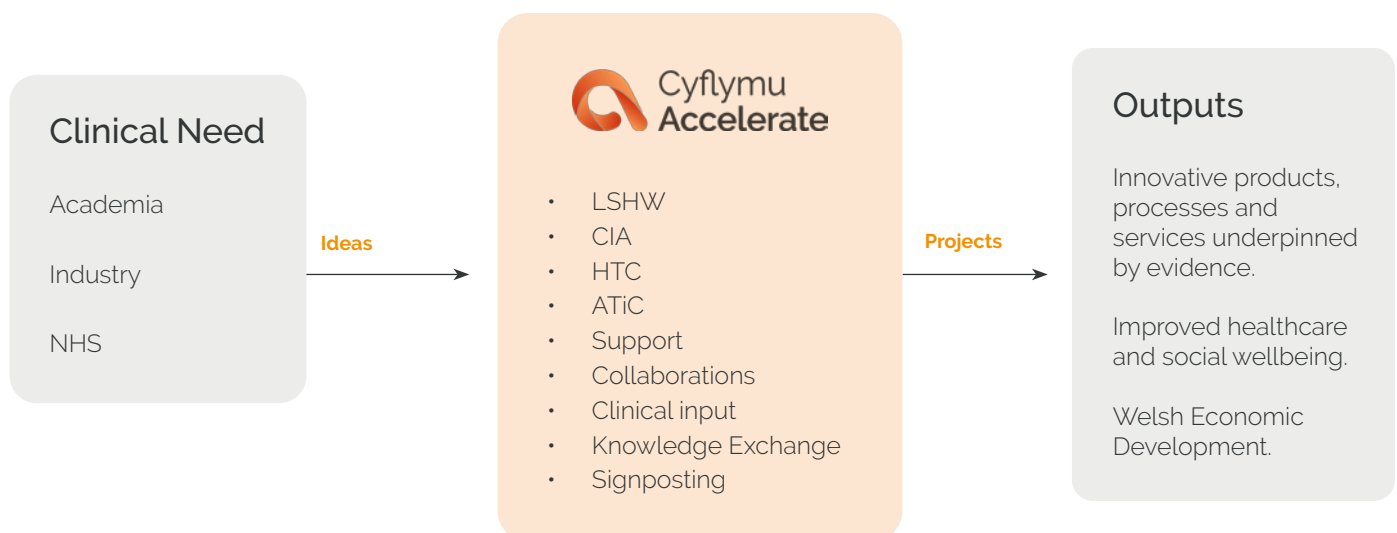


Accelerate

Accelerate is a ground-breaking support programme aligned with the Wellbeing of Future Generations Act and A Healthier Wales. Part funded by the European Regional Development Fund through the Welsh Government; it has been responsible for delivering innovative healthcare solutions pan Wales.

Accelerate has focused on facilitating the translational pipeline from the identification of 'real' healthcare needs, through to the delivery of evidence-based innovation. This has been enabled by collaborations between clinicians, industry, academia and the third sector, and led by the Life Sciences Hub Wales and three partner universities across Wales.

The Clinical Innovation Accelerator's successful and proven model enables agile innovation that embraces collaborative working, delivers health and care improvement and primarily, Welsh economic development. The developed infrastructure supports increases in employment, new enterprises, development of new products, services and partnerships with local and national businesses.



The types of project supported into delivery include:



Promoting well-being



Sustainable practices



Diagnostics



Technology



COVID



General healthcare

Partners



Hwb Gwyddorau Bywyd Cymru
Life Sciences Hub Wales

Life Sciences Hub Wales



Swansea University
Prifysgol Abertawe

Swansea University, Health Technology Centre,
Swansea University



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Assistive Technology Innovation Centre,
University of Wales Trinity St David



Clinical Innovation Accelerator, Cardiff University

For further information on Accelerate:

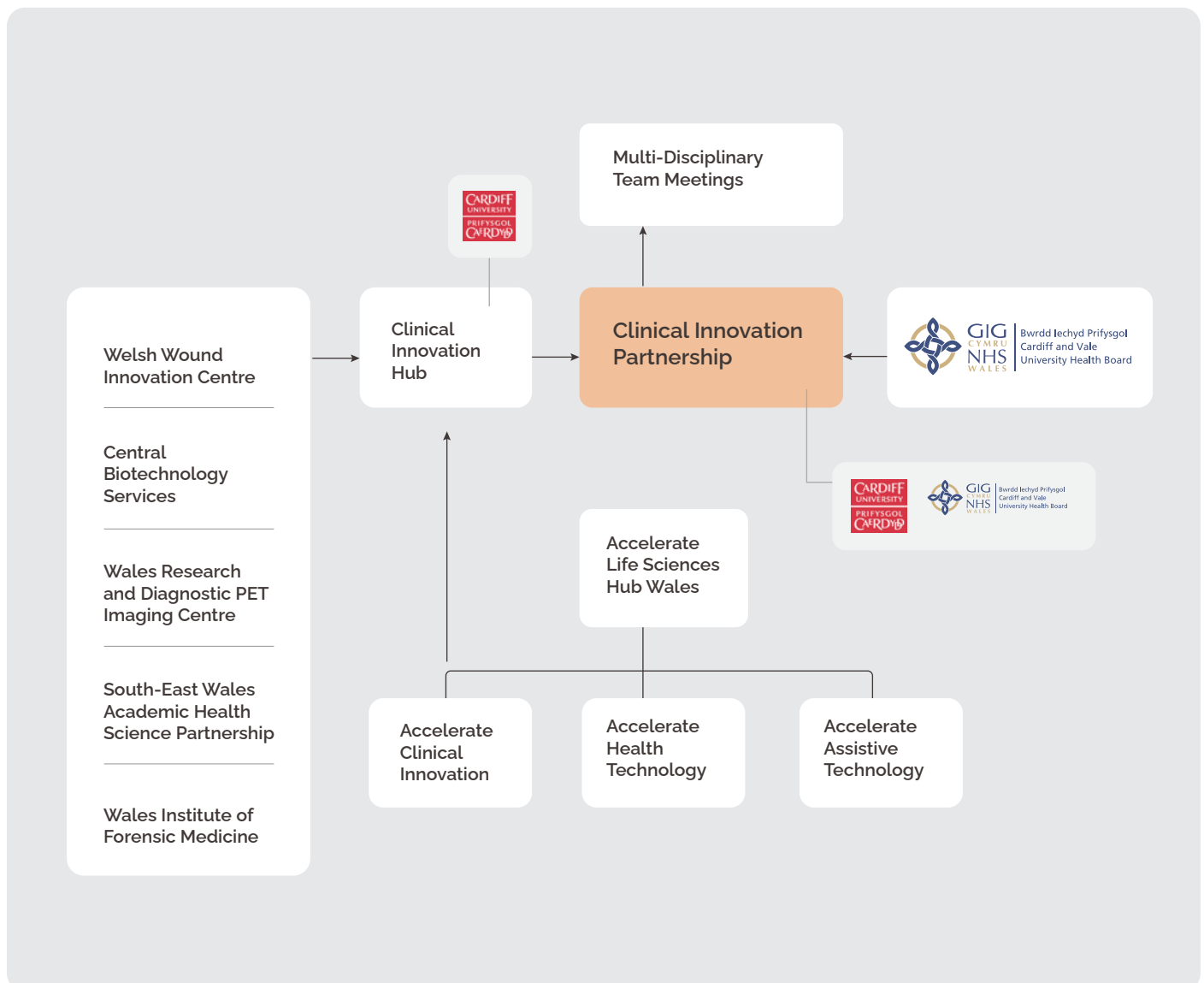


<https://lshubwales.com/innovation-support/accelerate-wales>



Clinical Innovation Accelerator

Cardiff University's School of Medicine plays host to one of the Accelerate partners; the Clinical Innovation Accelerator (CIA). The CIA sits within the Clinical Innovation Hub and is supported by the Clinical Innovation Partnership between Cardiff University and Cardiff and Vale Health Board.



CIA has provided expertise in accelerating the delivery of clinically focused innovation through an experienced team of professionals with capabilities derived from academia, project management, research, health economics, engagement, industry, innovation and clinical practice. Close working relationships with academic experts, NHS Health Boards, and industrial partners, has enabled new ideas to be focused into real world clinical/healthcare practices and procedures, aided through a user-centric delivery model. Adopting a user-needs approach to building projects underpins the likelihood of future sustainability and enhances the pathways to impact.

Outputs generated from CIA led collaborations have been realised through a range of platform and pilot-based projects, ranging from changes in clinical and sustainable healthcare practices, to the development of artificial intelligence applications, evaluations, and new product development. An array of data has been generated which may inform research-driven innovation beyond the initial projects. This includes an abundance of increasingly important real-world data, including patient-reported outcome and experience measures.

In response to the COVID crisis, CIA has demonstrated its situational relevance and responsiveness by contributing extensively to the essential COVID work being delivered through Cardiff University's category 3 laboratory. This has been actioned via the support for research associates to undertake this time sensitive work within Cardiff University's dedicated facilities.

CIA's contribution to the Accelerate Programme has enabled distinct opportunities to realise and accelerate novel, innovative solutions, through effective research, development and innovation-focused collaborations. This work is underpinning a legacy of evidence-based healthcare innovation, delivering on Welsh government priorities, and supporting lasting impact across life sciences and health and care services in Wales. Through these effective collaborations, the sharing of expert knowledge, resources and processes is bolstering the translation of innovative ideas into sustainable solutions bringing value to Wales.



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🐦 @AccelerateCIA

📄 <https://www.cardiff.ac.uk/medicine/research/clinical-innovation>

Outcomes and Impact

CIA has enabled the potential to translate innovative ideas into new technology, products, processes and services for the healthcare sector and commercial enterprises to grow, prosper and drive economic growth in the life-science sectors. In doing so CIA have demonstrated the strong demand for an innovation support mechanism which provides academic input, dynamic project management and support for industry partners, social enterprises and health boards. Evidence of this has been demonstrated by a shared commitment to risk and reward across collaborating partners. CIA's collaborative model increases resilience for projects and their partnership organisations, broadening options, engagement, ownership, increased opportunity, flexibility and overall project sustainability.

CIA's enhanced platform for innovation compliments and aligns with funding and partner priorities;

- **European Regional Development Fund** - Cross Cutting Themes metrics evidenced throughout all of CIA's projects can be cross-referenced to supporting the delivery of the Cardiff University Staff Well-being Strategy 2020-2023, the United Nations Sustainable Development Goals, and the Well-being of Wales:2021.
- **Cardiff University** – 2021 REF returns were submitted with six University Schools and projects will contribute to future REF impact case studies. The project engagement has widened academic activity and enhanced staff and student skill sets and experience. 9 CIA projects promoted social cohesion, equip communities with the right skills and lead towards a green recovery for Wales. All CIA projects (47) increased engagement and knowledge exchange with industry and strategic partners, development of partnerships, empowerment to conduct high-quality research with impact. CIA's contribution fully aligns with The Way Forward (2018-2023; recast COVID-19) and its sub-strategies for Civic Mission, and Research and Innovation.
- **NHS and University Health Boards** – CIA enabled the delivery of meaningful integrated projects that align with the Well-being of Wales. Delivery of quality improvement initiatives and advancement of technology, product, processes, and services. Importantly CIA has supported collaborative projects with Innovation teams within Health Boards, which has enabled efficient management of projects to strengthen Health Boards' Innovation strategy.
- **Welsh Government** – the social, cultural, environmental and well-being of the community is at the forefront of change, identified is a need for services to transform the way we do things, A Healthier Wales. At the forefront is sustainability, environmental impact and a reduced carbon footprint, CIA has supported a number of projects that focus solely on impact and improvement in these areas, The Well-being of Future Generations (Wales) Act 2015.
- **Local Authorities** – all CIA projects address health challenges as well as delivering Welsh economic benefits, including job increases and new start-up companies, to address significant socio-economic, demographic and health challenges/opportunities within local regions and Wales. The development of the life sciences and health sectors addresses the challenges of an ageing population and growing demand amidst resource constraints, with a focus on innovation based on digital and assistive living technologies. Health and Care Strategies, The Well-being of Future Generations (Wales) Act 2015.
- **Third Sector Organisations** – CIA delivered several multipartite projects supporting small Welsh charities and not-for-profits, enabling them to gain high quality independent evidence on efficacy and social value of novel intervention programmes for improving mental health and social wellbeing of people in their communities. Charity-oriented projects had strong socio-economic and environment conservation imperatives, were optimally aligned to the Well-being of Future Generations (Wales) Act, and A healthier Wales Plan, featured significant collaboration with local health and social care providers, and fostered significant job creation with expansion of charities activities and outreach.

Project Case Studies



General Healthcare



Diagnostics



Technology



Sustainable Practices



COVID



Promoting Wellbeing



Cyflymu
Accelerate



AN INNOVATION CASE STUDY

THE USE OF A NOVEL TRACHEOSTOMY TUBE SUPPORT VEST

PROJECT DURATION: 9 months

PARTNERS: Brodwaith Cyf, Cardiff University, and Cardiff and Vale University Health Board.

PROJECT AIM: To undertake a preliminary evaluation of the use of a tracheostomy support tube vest to support patient mobilisation in the intensive care unit

OVERVIEW

A tracheostomy is one of the most frequently performed procedures in the intensive care unit (ICU). Reasons for performing such a procedure include: addressing upper airway obstruction, improved oral hygiene (secretion management), and the need for prolonged ventilation. The procedure involves placing a tube into an artificially created hole or stoma in the windpipe (trachea). Tubing is used to connect the tracheostomy tube to a mechanical ventilator.

Early mobilisation of patients is viewed as an important practice for improving a patient's outcomes and wellbeing. For mechanically ventilated patients it is particularly important to promote mobilisation, as they have an increased risk of Intensive Care Unit Acquired Weakness. Patients who can be supported to mobilise, can continue to be ventilated using a mobile ventilator.

However, early mobilisation within the ICU needs issues to be overcome such as, sufficient trained staff to support safe patient mobilisation, and managing the ventilator tubes. A Welsh company, Brodwaith Cyf, have worked with staff at Cardiff and Vale University Health Board (CVUHB) to design and manufacture a prototype vest to secure the tubing in place.

Initial feedback from ICU staff suggests that this vest appears to hold the ventilator tubes in place without the need for staff to manage them when patients are mobilising. However, this needs to be established with a variety of different patients and staff, and, across different size patients. To inform a change in practice, there is a need to establish an evidence base, and the purpose of this Accelerate supported project is to undertake a preliminary evaluation.

The prototype tracheostomy tube support vest



EXPECTED OUTCOMES

- A new product and/or suggested modifications for Brodwaith Cyf
- Potential change in clinical practices within ICU
- Improved procedures for patient mobilisation resulting in increasing patient comfort and confidence
- Upskilling of staff in using this new tool
- Preliminary data to seed future work
- Peer reviewed publications



POTENTIAL FUTURE OUTCOMES

- Clinical and academic case studies
- Future collaborations between industry, academic, and clinical partners
- Potential for a definitively powered clinical trial
- Rollout of an innovative tool across NHS Wales ICUs and into the community environment
- Improved patient outcomes, for example increased independence in community settings

Accelerate is supporting a Cardiff University researcher, Brodwaith Cyf, and CVUHB staff to undertake this preliminary evaluation in the intensive care units of two hospitals in Cardiff. This pilot work will explore the usability of the prototype vest across different patients and staff. Observations, focus groups and questionnaires with the staff involved in patient mobilisation will help to determine any necessary alterations to the vest, and support the decision on whether this vest has clinical appropriateness. Where appropriate, patient/ family feedback will also be collected.



AN INNOVATION CASE STUDY

EXPLORING A THERAPEUTIC APPROACH FOR ADENOMATOUS POLYPOSIS SYNDROMES IN 3D INTESTINAL ORGANOID CELL MODELS

PROJECT DURATION: 18 months

PARTNERS: Cardiff University and Cellesce Ltd

PROJECT AIM: To generate and validate 3D intestinal organoid cell models for a therapeutic approach to adenomatous polyposis syndromes

OVERVIEW

Familial adenomatous polyposis and MUTYH-associated polyposis (FAP and MAP) are inherited syndromes that predispose patients to adenomatous polyps and a high risk of colorectal cancer. Trials of therapeutic agents have so far been largely ineffective. Standard treatment is particularly invasive: a colectomy followed by regular, upper gastrointestinal surveys of the duodenum.

This project responds to the need for a robust platform to transform drug screening and enable a targeted therapeutic approach. Organoids are 3D, multi-cellular clusters derived from patient biopsies that recreate the spatial organisation and biology of the original patient's tissue. They are in effect, "mini-organs", providing a 3D model more relevant to human pathology than 2D cell lines.

Accelerate is supporting a collaboration between Cardiff University academics (Inherited Tumour Syndrome Research Group) and Cellesce, a Welsh BioTech company, to establish an in vitro, pre-clinical organoid model of FAP and MAP syndromes. Cellesce has developed a patented bioprocess for the expansion of human derived organoids at scale, aimed at high throughput compound screening in the pharmaceutical industry and for academic research.

Accelerate backing will enable the collaborators to generate new 3D intestinal organoids, derived from FAP and MAP patient tissues, and grow them at scale for commercialisation. This work will underpin the validation of the organoid model as an effective platform for drug screening for both inherited and sporadic intestinal cancers.

Whole-mount immunofluorescence staining of duodenal organoids derived from a patient with FAP. Stained for cytokeratin (red) and nuclear DNA (blue).
Image: Cardiff University.



EXPECTED OUTCOMES

- Use of innovative technology to generate a novel model to elucidate the mechanisms of disease
- Development of organoids which could transform in vitro pre-clinical drug screening, leading to improved, specifically targeted treatments with the potential for personalised medicine
- A new commercial product
- Generation of data for peer reviewed publications
- Academic and industry based case studies



POTENTIAL FUTURE OUTCOMES

- Future collaborations between industry and academic partners
- Seeding of future funding opportunities
- Economic growth based on a commitment to expansion through research, development and innovation

"The Accelerate support with Cellesce enables the Cardiff University Inherited Tumour Syndrome Research Group to build upon its track record of genetic discovery research and translation of its findings to pre-clinical and clinical trials of novel targeted treatment," said Professor Julian Sampson. "This presents a fantastic opportunity to improve care for patients with inherited tumour syndromes and to further develop innovation in precision medicine in Wales."

"This project aligns well with the Accelerate aims by combining academic expertise with pioneering commercial research and innovation in a common enterprise," commented Paul Jenkins, Cellesce's Chief Executive. "Not only do we collectively expect to improve patient outcomes but also build on the notable place of organoids in drug discovery for cancer."

AN INNOVATION CASE STUDY

INVESTIGATING THE USE OF EPOXY- TIGLIANES AS NOVEL ANTI-BIOFILM THERAPEUTICS FOR A RANGE OF WOUND HEALING AND ANTI-INFECTIVE APPLICATIONS – AN INNOVATION CASE STUDY

PROJECT DURATION: 16 months

PARTNERS: QBiotech and Cardiff University

PROJECT AIM: To develop novel therapeutics derived from the Queensland rain forest, in the treatment of antibiotic-resistant bacterial infections and chronic skin wounds

OVERVIEW

The use of antimicrobials to inhibit growth or kill microorganisms/microbes, has had a significant impact upon worldwide health improvements. However, the inappropriate use of antimicrobial drugs such as antibiotics, has led to microbes adapting and developing resistance. This is known as antimicrobial resistance (AMR), and can occur in bacteria, viruses, fungi and parasites.

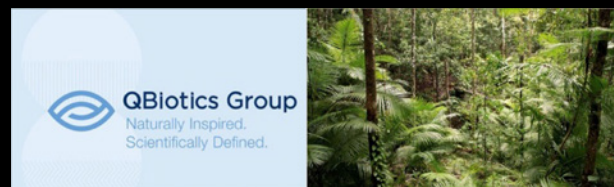
A collective of these microbes can lead to a formation of a biofilm, whereby the microbes stick to each other and adhere to a surface. Bacterial biofilms are associated with around 80% of chronic infections and non-healing wounds in humans, and these "sticky" biofilms provide a resistance against drugs such as antibiotics. To mitigate this, therapeutic interventions have explored ways to prevent or disturb the formation of biofilms and facilitate drug delivery into these biofilms. Advances in this field are helping to address a significant clinical problem, which ultimately improves the outcomes for patient with complex wounds and chronic infections.

Queensland's tropical rain forest is home to a variety of indigenous species of tree. This project examines the role of novel therapeutics derived from products of this tropical environment (epoxy-tiglianes) and explores their anti-biofilm action.

Accelerate is supporting the delivery of this collaborative project between QBiotech and the Advanced therapies Group and the Division of Infection and Immunity at Cardiff University.

The project is being delivered through the clinical and academic expertise from Cardiff University working in parallel with the industrial expertise of QBiotech. This team will undertake the work needed to explore the mechanism of action behind the leading compound (EBC-1013) in breaking down antibiotic-resistant biofilms and boosting the immune system of the skin. Such work is anticipated to accelerate the development of appropriate therapies.

Originating from Australia, QBiotech are the industry partner in this Accelerate project.



Images courtesy of
www.qbiotech.com <https://www.cardiff.ac.uk/research/impact-and-innovation/research-impact/rainforest-helps-treat-patients-chronic-wounds>



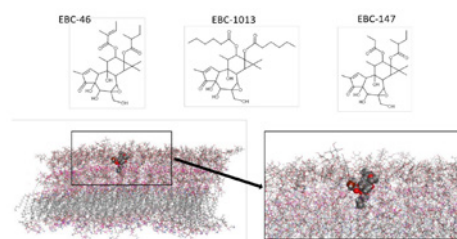
OUTCOMES

- Defined mechanisms of action of EBC-1013 at a molecular and cellular level
- Integration and connections within the Welsh life-science ecosystem - facilitating expansion into Wales
- Opportunities for further collaboration between project partners
- Case studies
- Peer reviewed publications



FUTURE IMPACT

- Market advantage to QBiotech with support of new IP filing
- Improved understanding of mechanism of action to support licensing and regulatory discussions
- Regulatory approval of EBC-1013 for use to improve the healing of chronic wounds will potentially have huge impact on patient care
- Reduction of unnecessary animal experimentation in development of their "pipeline"
- Economic growth in Wales through proposed company expansion



(A) Structures of Qbiotech's novel therapeutics. (B) Molecular simulation of EBC-1013 embedded on the surface of the PAO1 cell outer membrane (LPS-DPPE) bilayer.

AN INNOVATION CASE STUDY

ADVANCING THE DEVELOPMENT OF AN ANTIMICROBIAL SKIN BALM FOR THE PREVENTION OF INCONTINENCE ASSOCIATED DERMATITIS

PROJECT DURATION: 7 months

PARTNERS: Celtic Wellbeing Ltd and Cardiff University

PROJECT AIM: To develop a novel antimicrobial skin balm using natural products

"The Accelerate project has enabled Celtic Wellbeing and Cardiff University to collaborate and create a new and innovative nappy balm that is already generating interest. The project provided the support and platform to access Professor Les Baillie's team in the School of Pharmacy & Pharmaceutical Sciences, which is something that not all businesses have the opportunity to do so. The outcome from the Accelerate project is the next step for Celtic Wellbeing".

Andy Burrows, General Manager, Celtic Wellbeing Ltd.

OVERVIEW

Celtic Wellbeing Ltd is a company based in Conwy, North Wales which has a strategic plan to grow and develop a range of cosmetic and healthcare products based on natural ingredients with scientifically demonstrable results. Until recently the company was unable to develop such products due to their inability to access high quality research capabilities and generate robust scientific preclinical data.

A recent research link with the School of Pharmacy at Cardiff University has opened new RD&I opportunities for Celtic Wellbeing. This Accelerate project builds on the success of a previous collaboration and aims to expand the company's portfolio to include a new antimicrobial skin balm in line with the ethos of their brand specialising in natural and sustainable formulations. Initially, a cosmetic formulation will be developed with antimicrobial actives from natural sustainable bee sources. The project will underpin the future development of a licensed therapeutic for the treatment of incontinence associated skin infections.

This Accelerate collaboration brings together Celtic Wellbeing's commercial industry expertise, and Cardiff University's strong scientific track record in natural products and honey-based research. The project will support sustainability, bring benefits for skin infection/dermatitis sufferers, expand the company's profile, and increase the impact of academic research.

Accelerate is supporting the delivery of this project through Cardiff University Clinical Innovation Accelerator and Prof Baillie's research group at the School of Pharmacy at Cardiff. Celtic Wellbeing are building on an existing collaboration that saw the development of an antiviral lip balm. In addition to creating a novel product Celtic Wellbeing are also keen to stress the link to nature and to support the work the university are doing with local schools and communities across Wales to support bees and biodiversity.



Image courtesy of
Celtic Wellbeing Ltd.



EXPECTED OUTCOMES

- Bringing an innovative natural, antimicrobial, health promoting product to market
- Gain of expertise in pre-clinical RD&I in health-promoting cosmetic products
- New data to support development of further health interventions, and underpin the development of a clinically approved product
- Increased revenue and greater market share in the competitive cosmetic market, strongly leveraged by uniqueness of a strong evidence base generated during this project
- Greater niche customer satisfaction from environmentally principled branding and marketing
- Knowhow and collaborative links to further develop health-oriented products in general and niche markets
- Company growth (diversified sales, employment)
- New opportunities to collaborate with academia
- Case studies
- Peer reviewed publications



POTENTIAL FUTURE OUTCOMES

- Economic impact. Welsh company growth (employment diversified and increased sales)
- Health benefits for sufferers of incontinence associated dermatitis
- Environmental benefits from an environmentally conscious and sustainable product range

"The development of sustainable natural products which support the well-being of the people of Wales is at the heart of our collaboration with the team at Celtic Wellbeing. Accelerate provided the funding need to support the research and development which underpins this work".

Prof Les Baillie, Cardiff University

AN INNOVATION CASE STUDY

PRECISION MEDICINE BASED DIAGNOSIS OF POST-SURGICAL COMPLICATIONS IN PATIENTS UNDERGOING ABDOMINAL SURGERY

PROJECT DURATION: 18 months

PARTNERS: Cardiff University, Siemens Healthcare Diagnostic Products, and Cardiff and Vale University Health Board

PROJECT AIM: To develop new commercial immunoassays for precision medicine-based diagnosis of acute infections, and ultimately sepsis

OVERVIEW

Following a diagnosis of colorectal cancer, 63% of patients will undergo a colorectal resection with most patients having an anastomosis. The risk of infection due to an anastomosis leak can be up to 20%, which can result in sepsis – a life threatening condition which has a high mortality and morbidity profile. There is also some evidence suggesting that a leak could increase the risk of local cancer recurrence.

Despite the significant consequences of an anastomotic leak, there has been little advance in the development of early diagnostics.

The placement of surgical drains near the anastomosis provides a unique window to the local site of inflammation and allows repeated convenient, non-invasive sampling of relevant biological specimen. A highly sensitive and specific bedside test for drain fluid would be a considerable diagnostic improvement for patients undergoing abdominal surgery and could help with the identification and the treatment of those who are at risk of an anastomotic leak.

This project is focusing on localised infections resulting from anastomotic leaks in order to establish immune fingerprints in patients undergoing colorectal surgery with anastomosis.

Accelerate is supporting this project to:

- Develop an accurate diagnostic test based on immune fingerprints for the early detection and characterisation of anastomotic leaks and sequelae
- Identify correlations between localised and systemic immune responses in patients with acute infection
- Utilise artificial intelligence to interrogate biomedical datasets

Professor Jared Torkington,
Consultant Colorectal Surgeon
and Assistant Medical Director
at Cardiff and Vale UHB:

"We have concentrated our research work on projects that have the potential to quickly become game changing for patients and improve the outcomes from cancer surgery. It is such an exciting opportunity to be working within a team that shares the same vision".



Immolute analyser
(photo courtesy of Siemens
Healthineers Llanberis)



EXPECTED OUTCOMES

- Healthcare benefit to patients in Wales through:
Better management of infection risk
Improved care and wellbeing of cancer patients in the long term
- New diagnostic test systems for Siemens
- New employment at Siemens
- Economic impact through earlier improvement in the health and wellbeing of patients
- Machine learning techniques to enhance the development of diagnostic tests
- Data to underpin further academic research collaborations
- Academic publications and case studies



FUTURE IMPACT

- Strategic partnership between Siemens and Cardiff University in diagnostics
- Increased R&D capabilities
- Further collaborations between industry, academic and clinical partners

"The project provides the opportunity to share expertise among the industrial, academic and clinical environments, with the aim of improving patient care. Siemens Healthineers staff involved in the Accelerate project are able to develop their expertise and experience through the direct involvement with the research community, as well gaining real insight into how the products we make impact people's lives" commented Professor Dr Fraser Logue, Vice President of Operation Siemens Healthineers Llanberis.

AN INNOVATION CASE STUDY

EVALUATION OF THE URO17® BLADDER CANCER TEST

PROJECT DURATION: >18 months

PARTNERS: KDx Diagnostics Inc, CellPath Ltd, Cardiff & Vale University Health Board and Cardiff University

PROJECT AIM: To undertake a collaborative, clinical evaluation of URO17®, intended to underpin its commercialisation in Wales

OVERVIEW

Bladder cancer is the second most common cancer of the urinary system. Annually, it accounts for around half a million new malignancies worldwide. Detection of bladder cancer is typically performed by cystoscopic examination; however, this can be invasive, painful and expensive.

Cystoscopy is often augmented by a noninvasive laboratory method such as urine cytology. However, the current non-invasive urine tests tend to display lower sensitivity or poor specificity. Therefore, a need exists for a non-invasive test with both high sensitivity and high specificity for the detection of bladder cancer as measured against the gold standard of cystoscopy.

A US-based company, KDx Diagnostics Inc, have developed a standard immunocytochemical bladder cancer test based on a novel biomarker. Pilot studies have shown this test is non-invasive, is much less expensive than cystoscopy and pilot studies have demonstrated 100% sensitivity and 96% specificity.

The main objective of this Accelerate project will be to evaluate the performance of the URO17® test on a larger cohort of patients (n=500-600), newly presenting with haematuria.

C&V UHB will be a key partner in this clinical evaluation and the study will bring together expertise from the Urology and Cellular Pathology departments and the Rapid Access Haematuria clinic. Cardiff University will sponsor the clinical evaluation and the Accelerate team will provide project management and health economic expertise as well as ensure the study is able to access academic and clinical expertise when required.

CellPath (Newtown, Powys) will develop a home collection front end to the test which will potentially allow patients to collect and ship urine samples from home to the testing facility. A sub-study will aim to evaluate determine the compatibility of a front end collection system with the downstream URO17® test.

The clinical evaluation will also look at the patient's perspectives on the test using a questionnaire and gather information around the cost effectiveness of implementing the test.

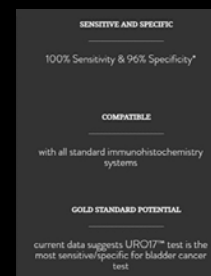
This International collaboration aims to make a significant stride towards improving the care pathway for bladder cancer patients in Wales.

Prof. Kynaston from Cardiff and Vale University Health Board and Cardiff University - "There is an urgent need to develop accurate non-invasive tests, such as biomarkers, in the fight against cancer. URO17® has tremendous potential to distinguish between urinary symptoms due to bladder cancer and more benign causes, speeding up rapid diagnosis and reducing need for unnecessary invasive tests."

1.



2.



1. Image provided courtesy of CellPath

2. URO17® Bladder Test Profile (courtesy of www.kdxdiagnostics.com)



EXPECTED OUTCOMES

- Clinical evaluation data
- Peer reviewed publications
- Case studies
- Establishment of a cost-effective test for the diagnosis of bladder cancer in a UK based patient cohort
- Development of a new home collection system by the Welsh enterprise, CellPath



POTENTIAL FUTURE OUTCOMES

- Improved patient experience
- Changes to the current clinical care pathway for bladder cancer
- Marketing of the test across NHS Wales and beyond
- Increased company revenue
- Opportunity to build a long term relationship between KDx and CellPath

Dr Nam W. Kim, KDx CEO, and CTO - "We are excited to partner with Cardiff University, Cardiff and Vale University Health Board and CellPath through the Accelerate programme to validate and provide URO17® tests in the UK. Through our initial studies, we have shown that the URO17® test exhibited extremely high sensitivity and specificity in detecting bladder cancer from urine samples in both recurrent and new cancers. The study under the Accelerate programme will examine the performance of URO17® in a real-life clinical setting in patients with hematuria, which will facilitate a wide distribution of the test throughout the UK and the rest of Europe. Furthermore, a development and launch of the URO17® home sample collection programme will provide safe and cost-effective means for detecting new bladder cancer which is critical in the age of COVID-19 and beyond."

AN INNOVATION CASE STUDY



DEVELOPMENT OF A RAPID TEST METHOD FOR PLASMA SOLUBLE TOLL- LIKE RECEPTOR 2 DETERMINATIONS IN SEPSIS AND OTHER LIFE-THREATENING CONDITIONS

PROJECT DURATION: 9 months

PARTNERS: JR Biomedical Ltd and Cardiff University

PROJECT AIM: To co-develop and optimize a novel 1-step lateral flow device for measuring soluble Toll-like receptor 2

OVERVIEW

Current biomarkers for diagnosis of sepsis and serious infections have many limitations such as lack of specificity and slow reporting. Prompt and conclusive diagnosis of serious infection for appropriate treatment is vital to prevent poor outcomes and inappropriate or slow treatment.

Soluble Toll-like receptor 2 (sTLR2), a molecule present in plasma and other biological fluids, increases very early and significantly with sepsis and serious inflammations of non-infectious origin. sTLR2 can be used to differentiate between sepsis and serious inflammation and also be used to monitor sepsis patient response to treatment and duration of antimicrobial therapy.

Commercial development of a fast (20 mins compared to ~ 5 hours of an ELISA test), simple, accurate and low-cost one-step lateral flow immunoassay-based quantitative method will enable ICUs and other clinical units to adopt this methodology into routine clinical practice, worldwide. There is interest in adopting the rapid sTLR2 method in ICUs and clinical units (U.K. and abroad) to help diagnose sepsis, womb infections, infections in kidney dialysis patients, sepsis during labour in pregnancy and HIV in mothers' milk. The introduction of the rapid test for research and clinical use will also have positive economic and societal implications for Wales, the UK and worldwide.

Accelerate is supporting the delivery of this project through Cardiff University's School of Medicine, Division of Infection and Immunity. This project built on an established partnership and previously completed feasibility studies. It brought together the combined expertise from the academic team that discovered sTLR2 (Dr Mario Labêta et al.) with industrial partners who provided extensive technical expertise in test development and expertise in commercial exploitation of these technologies.

"Development of new healthcare products by the biotech and medical device industry must be led by the needs of clinicians and opinion leaders. The knowledge shared by the academic team has been essential to the development of the sTLR2 rapid test. I would also like to thank the staff administering the Accelerate Program for their professionalism and help to make the process as simple as possible."

Dr John Rees, Director, JR Biomedical Ltd.



EXPECTED OUTCOMES

- The successful development of a rapid 1-step sTLR2 point of care test
- Expansion of market opportunities for JR Biomedical in the fields of sepsis
- The potential of use of the diagnostic as a prognostic or diagnostic biomarker in other serious infections and a variety of pathologies
- Opportunities for further collaboration between project partners and funding application development
- Case and impact case studies
- Peer reviewed publications



POTENTIAL FUTURE OUTCOMES

- Potential to address a Tier 1 priority condition in NHS Wales, presenting an opportunity to have an impact on significant social and financial burdens to healthcare and affecting an increasing number of patients
- Positive impact on public health through earlier, more accurate and faster diagnosis of sepsis
- Optimisation of antimicrobial treatment, reducing antibiotic use, improving patient management, survival and outcomes
- Potential for company growth and development in Wales through an expanding product portfolio
- Supporting the process towards 'A Healthier Wales' and the Well-being of Future Generations (Wales)



Cyflymu
Accelerate



TRANSFORMING EYECARE
SERVICES IN WALES:

EVALUATING DIGITAL VIRTUAL CLINICS DELIVERED BY HIGH STREET OPTOMETRISTS

PROJECT DURATION: 17 months

PARTNERS: Cardiff University, Cardiff and Vale University Health Board, Optometry Wales and community optometry enterprises

PROJECT AIM: To establish enhanced eye care services delivered by community optometry practices registered with NHS General Ophthalmic Services in Wales

OVERVIEW

There is insufficient capacity in secondary care to assess and manage eye care patients in Wales. At December 2019, nearly 115,000 patients in the R1 category (risk of irreversible sight loss if patient target date is missed) were waiting for a hospital eye appointment in Wales, 38% having exceeded their target date. Moreover, demand on eyecare services is increasing through an ageing population and increased risks linked to other diseases, particularly diabetes.

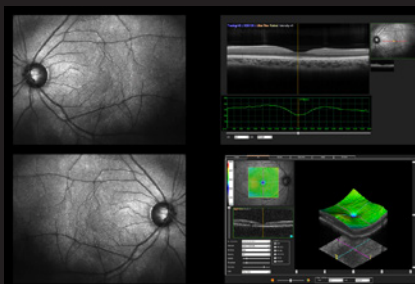
The application of digital technology to tackle unmet clinical needs has seen growing prominence in health and social care, delivering substantial improvements in prudent care. This project aims to alleviate unsustainable pressures on current ophthalmology services through digital innovation. With Welsh Government support, Cardiff and Vale University Health Board has developed a service framework in which registered high street optometrists assume the management of designated high-risk eye patients.

Accelerate is supporting Cardiff academics, Optometrists, and Cardiff & Vale UHB staff to evaluate a revolutionary clinical model to facilitate specialised eye care services in community settings. We are supporting a series of novel pilot services to manage up to 9000 designated patients across 5 domains of care: Glaucoma (new referrals and follow-up); Wet Age Related Macular Degeneration; Diabetic Retinopathy; and Unscheduled Eye Casualty.

Skilled Optometrists in community practices will use state-of-the-art imaging technology, dedicated software and electronic patient records to enable diagnosis by acute care Ophthalmologists viewing digital data uploaded from remote locations. Complex cases will be referred to acute services for appropriate care. Evaluation of pilot data by Cardiff academics will include comparisons with usual care along with patient and practitioner experiential and outcome measures and health economics appraisals. Findings will inform sustainable rollout of shared care ophthalmic services, pan Wales.

"This whole project has highlighted the difference made to patients when care is provided closer to home, within the community and how the skills of primary care optometrists can be best utilised to facilitate a positive experience of healthcare for the patient".

Sali Davis, Chief Executive Optometry Wales.



Ophthalmic imaging data shared with hospital eye consultant using OpenEyes™ dedicated Electronic Patient Record system



EXPECTED OUTCOMES

- Adoption of new technology reducing patient waiting times through community care
- Change in clinical management
- Increased capacity in secondary care to assess and manage eye care patients in the health board
- Skills and competency training for independent optometrists
- Closer links to Secondary Care – technology could lead to provision of additional services by optometry enterprises
- New health economics insights in ophthalmic care
- Engagement with HEI and greater understanding by experts in research in eye care-related health
- Peer reviewed publications and clinical innovation case studies, academic impact for REF

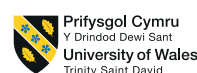


POTENTIAL FUTURE OUTCOMES

- Technology could lead to diversification of other domains of health and social care employing e-patient records
- Future collaboration between commercial, academic, third sector and clinical partners
- Rollout of an innovative model across NHS Wales

"It's about care closer to home and being seen by the right person at the right place at the right time. We are looking to increase capacity in eye clinics and reduce waiting times for patients".

Sharon Beatty, Optometric advisor to Cardiff and Vale University Health Board.



AN INNOVATION CASE STUDY

PERSONALISATION OF REHABILITATION FOR BODY MOTION RELATED INJURIES THROUGH WEARABLE ELECTRONICS

PROJECT DURATION: 12 months

PARTNERS: Ambiquire, Cardiff and Vale University Health Board, and Cardiff University.

PROJECT AIM: To create a new treatment paradigm which will provide clinicians and patients with objective movement analysis data to help guide therapy for individuals with knee pain.

OVERVIEW

Musculoskeletal conditions are the leading contributor to chronic pain and disability, with knee pain amongst the most common patient presentations. Physiotherapy plays an important role in the rehabilitation process after injury or disease; however, the monitoring of patient progress often relies on clinical judgement, and patient feedback. Technology has the potential to provide objective data to accelerate rehabilitation, but further work is needed to translate its use from movement laboratories into patient homes and NHS clinics.

The Sensor Physiotherapy Intervention (SPIN) Research Group at Cardiff University have been researching how wearable biomechanical sensors may play role in providing objective assessment and feedback on patient movement. Such technology could be used to underpin a concordant approach to guiding treatment and measuring change.

Ambiquire, a company based in South Wales, have developed a micro-wearable device (inertial measurement unit) that can acquire and wirelessly stream real time "movement" data.

This project seeks to bring movement sensor technology together with biomechanical data and embedded clinical expertise to develop a simple and affordable product to provide objective movement feedback to patients and physiotherapists. The intention is to deliver this through:

- The development of machine learning algorithms to quantify the biomechanical parameters using single or multi Ambiquire Inertial measurement units (IMUs).
- The development of a web-based interface for biomechanical clinic and home use

"Whether you have had a sporting injury, recovering from surgery or simply getting older, movement induced joint pain can be completely debilitating. To address this growing problem, the Accelerate programme has provided an excellent mechanism to facilitate the collaboration between leading Ambiquire engineers and expert Biomechanics researchers and Active Health clinicians at Cardiff University."

Combining the latest Ambiquire electronic measurement devices, data analytics and AI inference techniques the partnership aims to develop a novel system to enable "patient specific" interventions to be designed and effectively monitored remotely at their home."

Steve Gardner - Managing Director Ambiquire

"Joint pain is a common condition and it is estimated that 23% of individuals aged over 45 in Wales have hip and or knee osteoarthritis. For physiotherapists being able to monitor and provide feedback on how people move and carry out their exercises at home has the potential to transform treatment and maximise the benefit for these individuals"

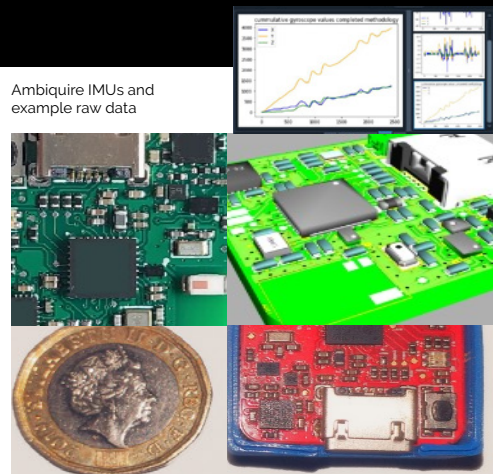
Dr Kate Button - Physiotherapist and R&D lead for Therapies in Cardiff and Vale University Health Board & Director of Research Governance & Active Health Research Theme Lead, School of Healthcare Sciences, Cardiff University

Accelerate is supporting the delivery of this collaborative project through Cardiff University's academic expertise and the provision of project management and facilitation through the Clinical Innovation Accelerator.

Ambiquire, will bring their expertise to the project in terms of the development of IMUs, and will contribute their experience in delivering commercially viable products.

From a clinical perspective, expertise will be provided by a specialist musculoskeletal physiotherapist from Cardiff and Vale University Health Board.

Ambiquire IMUs and example raw data



EXPECTED OUTCOMES

- A new product market for the Ambiquire technology
- An affordable, objective measurement tool to support home-based rehabilitation
- Patient progression informed by objective movement data
- Opportunities for further collaboration and new funding stream between project partners
- Case studies & Peer reviewed publications



FUTURE IMPACT

- Economic impact through expansion of the technology into different fields through a greater understanding of clinical need.
- Company growth driven by collaborative R&D
- Increased efficacy of musculoskeletal rehabilitation in the home setting
- Patient empowerment through increased internal locus of control
- Deliverables aligned with the Well-being of Future Generations (Wales)

AN INNOVATION CASE STUDY

DEVELOPING A POSE ESTIMATION TOOL TO SUPPORT MUSCULOSKELETAL REHABILITATION

PROJECT DURATION: 5 months

PARTNERS: Agile Kinetic and Cardiff University Musculoskeletal Biomechanics Research Facility.

PROJECT AIM: To develop and validate a pose estimation medical device for remote measurement of patient joint angles.

OVERVIEW

Musculoskeletal patient waiting lists in Wales are growing, as is the use of digital technology to support healthcare. This highlights a demand and an opportunity to explore new options for monitoring musculoskeletal patients outside of traditional clinical settings.

Agile Kinetic are a Welsh company that have developed a platform called Mobility Hub. This allows interaction between surgeons, physios and patients undergoing rehabilitation, through an online application. The company are now looking at developing a pose estimation tool for the remote measurement of patients undertaking their exercises via a camera (web/smartphone). Such an application offers patients the opportunity to engage in the rehabilitation process within their home environment.

The Musculoskeletal Biomechanics Research Facility, based in Cardiff University's School of Engineering, has a long-standing history of undertaking patient and healthy volunteer-based biomechanics research. Their research experience can help to develop the work initiated by Agile Kinetic, under the direction of clinical specialists in musculoskeletal rehabilitation.

agilekinetic



Accelerate is supporting the delivery of a collaborative project between Agile Kinetic and Cardiff University to combine their expertise and deliver shared outcomes.

This will include:

- Validating the pose estimation tool
- Capturing 3D movement data
- Integrating the data into Agile Kinetics' data set.



Data collection in the Musculoskeletal Biomechanics Research Facility's Clinical Research Laboratory



EXPECTED OUTCOMES

- A validated tool
- Three-dimensional dataset
- User experience / interface design for final integration and functions
- Artificial intelligence (AI) model fully integrated with MobilityHub
- Mobility tracking functions deployed
- Opportunities for further collaboration between project partners
- Case studies and peer reviewed publications



FUTURE IMPACT

- Positive impact on individual patient care and experience, through empowerment and engagement
- Opportunities to expand the platform to support the rehabilitation of specific conditions
- A platform that contributes to sustainable practices
- Tangible deliverables contributing to the Well-being of Future Generations (Wales) goals including a prosperous, healthier, resilient and Welsh language inclusive Wales

AN INNOVATION CASE STUDY



DEVELOPMENT OF A PHYSIOTHERAPY INTELLIGENT VIRTUAL REALITY SYSTEM

PROJECT DURATION: 8 months

PARTNERS: HexTransforma Healthcare and Cardiff University.

PROJECT AIM: To develop and test the Physiotherapy Intelligent Virtual Reality System (PIVRS) as a Virtual Reality-based physiotherapy platform.

OVERVIEW

Around 3 in 10 people in the UK are living with a musculoskeletal condition. Physiotherapists work closely with this patient group to help them manage pain, address dysfunction and work towards functional outcomes.

New technology is having an increasing role in many aspects of our everyday lives. Therefore, there is potential to explore the role of new technologies in supporting physiotherapists and their patients. This could be an opportunity to advance the use of more objective measures, and to enhance patient engagement.

NHS services have been struggling to keep pace with the growing numbers of people consulting health professionals, and the COVID pandemic has exacerbated things. This increase in demand has reinforced the need for more digital solutions to be used in assessing and monitoring patients; particularly in settings such as the home. This approach can also give patient's more control over their own rehabilitation, with the process of gamifying exercises making them more fun and increasing engagement.

This collaborative project between HexTransforma Healthcare and Cardiff University will focus on developing a novel Physiotherapy Intelligent Virtual Reality System (PIVRS) using affordable wearable and remote technology to allow for real-time monitoring of patients.

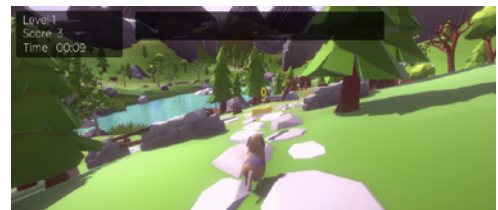
Virtual reality allows the game to be personalised to the individual's rehabilitation targets including improving balance, fitness, range of joint motion and/or strength. Wearable technology can then provide real-time feedback on performance, so patients know how they are progressing and how to improve.

Multiple levels of difficulty within a game means that an individual can progress depending on their performance. The intelligent virtual reality rehabilitation system provides an interactive rehabilitation tool that is tailored to the individual.



Weighting shifting exercise scenario

Accelerate is supporting the delivery of this project through Cardiff University's academic and clinical expertise, alongside the provision of project management and support for a research associate. HexTransforma Healthcare are contributing their industrial expertise in digital healthcare innovation and will bring their experience in developing commercially viable solutions.



Walking based virtual reality scenario



EXPECTED OUTCOMES

- Development of a prototype virtual rehabilitation system
- Sensor integration with the software
- Integration of biomechanics algorithms to calculate lower extremity joint kinematics
- Development of 3D virtual rehabilitation scenarios
- Case studies and peer-reviewed publications
- Seeding of future work



POTENTIAL FUTURE OUTCOMES

- Potential to underpin the future development of the prototype system.
- The development of a prototype is intended to seed future validation work.
- Improved patient empowerment and engagement with rehabilitation.
- Alignment with the priorities underpinning a Healthier Wales, and the Well-being of Future Generations (Wales).
- Future collaborative work between Cardiff University and HexTransforma Healthcare; using industrial, clinical and academic expertise to deliver digital healthcare advancements.
- Potential for company growth and development in Wales through an expanding product portfolio.

AN INNOVATION CASE STUDY

EDUCATING RITTA

(REAL-TIME INFORMATION TECHNOLOGY TOWARDS ACTIVATION)

PROJECT DURATION: 18 months

PARTNERS: Cardiff University, Velindre University NHS Trust, Watson IBM & Meridian IT UK

PROJECT AIM: To develop an augmented intelligence virtual assistant for patients in oncology

OVERVIEW

Supporting patients living with cancer is a key requirement for a cancer centre. Velindre Cancer Centre has been having meaningful conversation with patients, carers and their families about how best to support their information needs and their desire to want to have a measure of control, empowerment and independence as they make their care choices.

Key areas of need are:

- The gaps between existing services and the lack of tools to support having good quality conversations, anytime, anyplace and anywhere
- Access to appropriate high quality information to support their choices and decisions about their emotional, psychological and physical wellbeing.

Through a person-centred, design thinking process, Velindre in conjunction with Pfizer Oncology and IBM Watson have developed the world's first artificial intelligence enabled virtual assistant, trained in oncology to proof of concept (RITTA). This dialogue tool is currently trained to answer a small number of 'intents' to demonstrate capability (RITTA Phase I).

Accelerate is supporting the delivery of phase II; the technical development, scale up, deployment and evaluation of RITTA. This will involve dedicating the time, care and resources required to develop relevant training sets to educate RITTA in answering a wider range of patient concerns and questions. RITTA will be developed for pilot in breast, lung and palliative care based on around 100 – 150 'intents'. The intents will address many of the FAQs patients, carers and families ask about living with cancer. This critical process will be informed by clinicians, patients, academics and industrial partners.



RITTA 'Chatbot'

RITTA Intent Domains



EXPECTED OUTCOMES

- Healthcare benefit to cancer patients and NHS staff in Wales through:
- Redefining how patients interface with the Health service i.e. improved engagement, access to robust sources of information and improved wellbeing
- Providing a platform for the development of more advanced features
- Providing Healthcare providers an in-depth insights into patient behavioural patterns, motivators and other indicators
- Data for further academic research collaborations
- Economic growth
- Knowledge generation and insight in the field



POTENTIAL FUTURE OUTCOMES

- Expansion of RITTA to be trained in other disease areas
- Future collaborations between industry, academic and clinical partners

Feedback from one of the RITTA project collaborators:

"Accelerate has provided us with a platform for collaborations with local companies and Universities and provides support to access specialist clinical expertise essential for the development of RITTA. This should ultimately allow the NHS in Wales to unlock this important innovation and spread wide-scale adoption to transform health and care services in Wales."

Phil Webb, Associate Director of Planning, Performance and Innovation at Velindre NHS University Trust.

AN INNOVATION CASE STUDY

WALES' VIRTUAL HOSPITAL

PROJECT DURATION: 19 months

PARTNERS: Virtus Tech, Cwm Taf Morgannwg University Health Board, Aneurin Bevan University Health Board, Health Education Improvement Wales, Swansea University, Assistive Technologies Innovation Centre (University of Wales Trinity St David), Cardiff and Vale University Health Board, and Cardiff University

PROJECT AIM: To establish a multi-disciplinary, and cross-speciality, undergraduate and postgraduate online virtual environment (Wales' Virtual Hospital)

OVERVIEW

Clinical placements are an essential component of the education provision for students of medicine and other health professions. It enables the vital and very unique experience of applying textbook knowledge to 'real' patients and the demands of an often-evolving clinical situation.

Whilst this is unquestionably valuable experience, opportunities to achieve learning outcomes cannot be consistent across students due to the very nature of their exposure to different patients in defined timeframes and settings, and the unpredictability of patient attendance.

COVID-19 has brought further challenges to learning whilst on clinical placement; bringing communication issues, physical distancing and extended infection control procedures into play.

This collaborative project is focused on delivering a novel approach to maximizing clinical learning opportunities and addressing notable inconsistencies in learning experiences.

Enabled through an online virtual environment (Wales' Virtual Hospital), clinicians will be able to create 3 types of learning experience framed around a patient presentation.

- 360° still environment (with embedded content to create an eLearning package)
- 360° video environment (with game play in both branching and non-branching scenarios)
- Fully immersive 360° /3D environment (with interactive online simulation)

The ability to train and gain immersive experiences, is increasingly important with the restrictions placed on teaching/training during the COVID-19 pandemic. Such an environment reduces the numbers of people in the room, offering increased staff and patient safety. The use of disposable, cardboard VR headsets also facilitates personalised training options with improved safety.

As a training tool this type of environment enables students to experience various clinical situations with a unique full view. These simulations can further be employed as a mode of assessment for high accuracy, low frequency situations, where it is unlikely for students/trainees to experience the situation in real-life.

Accelerate is supporting the delivery of this project which encompasses expertise from those delivering medical education, together with the industrial experience of Virtus Tech, who bring the capability of providing an immersive interactive DIGI Tour platform.

Cardiff University will provide academic expertise to assess the teaching effectiveness of this virtual environment in addition to delivering project management through the Clinical Innovation Accelerator. The Assistive Technologies Innovation Centre (ATIC), University of Wales Trinity Saint David will undertake an evaluation of effectiveness and user experience.



A scene from Wales' Virtual Hospital



EXPECTED OUTCOMES

- Development of a unique and marketable fully immersive, 360-degree 3D virtual learning environment
- A dedicated clinical teaching aid and evaluation tool providing specialist modules and bespoke provision
- A single portal for ensuring continuity across virtual clinical teaching
- An immersive learning experience
- Opportunities for further collaboration between project partners
- Case studies
- Peer reviewed publications



FUTURE IMPACT

- Benefitting the education of healthcare professionals from different specialties and disciplines across medical institutions in Wales
- Positive impact on patient care and experience
- Consolidated medical education jobs in the NHS by providing a single point of entry to all virtual clinical teaching
- A reduced carbon footprint enabled through the virtual environment
- A novel resource for reducing infection risk in the delivery of clinical education
- A high-quality educational package entitled "Wales' Virtual Hospital" to showcase Wales as a Worldwide exemplar of medical education

AN INNOVATION CASE STUDY

PERSONALISED VIRTUAL SURGERY FOR OPTIMISED KNEE ARTHRITIS TREATMENT – AN INNOVATION CASE STUDY

PROJECT DURATION: 16 months

PARTNERS: TOKA, Cardiff and Vale University Health Board and Cardiff University

PROJECT AIM: To enhance high tibial osteotomy surgical planning software through the use of biomechanical and imaging data

OVERVIEW

Osteoarthritis affects nearly 9 million people in the UK; the knee being a commonly affected joint. High Tibial Osteotomy (HTO) is an effective treatment for younger knee osteoarthritis patients as it preserves the native joint by re-aligning the tibia and redistributing the painful high-pressure regions within the knee. However, patient outcomes are still dependent on the accuracy of the procedure, and current solutions are a one-size-fits-all approach.

This project proposes to address this problem, by introducing a bespoke surgical planning tool. The intention is to enable surgeons to precisely achieve the planned correction using a combination of intuitive 3D planning and custom-made, minimally invasive devices for superior patient comfort. Such a result could lead to a significant improvement in clinical treatment options, which will ultimately enhance the patient experience.

A team of researchers, industrial partners and clinicians will collaborate to inform iterations to existing surgical planning software. Patients scheduled for HTO surgery at Cardiff and Vale Orthopaedic Centre, will be recruited as volunteers to take part in a study to collect biomechanical and knee joint imaging data pre- and post-surgery. This data will be used to inform changes to the planning software.

Accelerate is facilitating the delivery of this clinically focused project, through the provision of academic expertise in musculoskeletal biomechanics and imaging, project management, and support for research nurse time to aid patient recruitment. This is enabling the industry partner, TOKA, to implement bespoke changes to their surgical planning software, and bring their own industry-specific expertise to enhance the project outcomes and post project commercial developments.



The Dynamic Biplane Imaging and Biomechanics Laboratory at the Musculoskeletal Biomechanics Research Facility, School of Engineering, Cardiff University (image courtesy of <https://www.cardiff.ac.uk/engineering/research/facilities/musculoskeletal-biomechanics-research-facility/>)



OUTCOMES

- Pioneering evidence driven treatment decision making for knee osteoarthritis surgery
- Integrate research findings into novel HTO surgical planning software for better diagnosis and personalised treatment
- Case studies
- Showcasing of clinical research facilities within Cardiff, and their impact upon industry and NHS Wales
- Seeding of future work
- Peer reviewed publications



FUTURE IMPACT

- Changes to clinical practice within NHS Wales
- Improved patient outcomes through a personalised surgical approach
- Commercial development opportunities within Wales
- Opportunities for further collaboration between project partners



Images courtesy of TOKA Ltd

AN INNOVATION CASE STUDY

CLINICAL EVALUATION OF A WOUND HEALING DEVICE, WOUNDEXPRESS™

PROJECT DURATION: 14+ months

PARTNERS: Huntleigh Healthcare, Cardiff University and the Welsh Wound Innovation Centre

PROJECT AIM: To undertake a clinical evaluation of WoundExpress™, an intermittent pneumatic compression device, in patients with chronic leg ulcers

OVERVIEW

Leg ulcers (a long-lasting sore resulting from a break in the skin) represent a significant source of morbidity with many adverse physical, social and psychological consequences. With appropriate treatment, some ulcers heal successfully with a few weeks, however many persist for months and even years. Such lengthy treatment periods have led to the annual cost of wound treatment in the UK being estimated at £5.6 billion (Guest et.al. BMJ 2020).

Compression therapy in the form of graduated, multi-layered bandaging, is the gold standard therapy for the prevention and management of venous leg ulcers. However, a proportion of wounds still do not progress towards healing and some patients cannot tolerate wearing continual high compression bandaging.

Intermittent Pneumatic Compression (IPC) is an alternative/adjunctive treatment modality which has been shown to be effective in the treatment of leg ulceration. IPC involves the application of controlled mechanical cyclical pressure to the limbs (or part of) by means of compressed air from an electronically operated pump through specialised encircling garments. Pressure and inflation cycles vary, and compression can be applied to the entire limb, or region of the leg.

Certain types of IPC have been shown to promote the healing of wounds, and the reduction of the associated chronic pain. However, IPC devices usually apply relatively high intermittent pressure over a wound site, which may cause concern to patients and clinicians, may interfere with existing treatments, and may not always be tolerated.

Huntleigh have developed an innovative IPC device (WoundExpress™) which applies compression to the thigh of the afflicted leg, away from the actual leg ulcer sites. This device consists of a 3-chamber thigh garment and pneumatic compression pump and delivers a 4-minute compression cycle consisting of a 2-minute venous emptying phase followed by a 2-minute rest phase. It is used for 2 hours per day in a hospital, community or home setting.

Preliminary findings have suggested that WoundExpress™ may be effective in decreasing pain and facilitating healing. However randomised controlled clinical trials (RCTs) are the gold standard for ascertaining the efficacy and safety of a treatment, and for demonstrating the superiority of a new treatment. This is the next important step for WoundExpress™.

To determine the impact of this treatment on chronic venous leg ulcers, a large-scale Randomised Control Trial (RCT) has now begun recruiting patients and will look at whether the new method provides added benefit when used with existing standard treatments. It will operate across 4 countries with up to 10 sites across UK and Europe to assess the clinical evidence in support of the WoundExpress™ device.



Image courtesy of WoundExpress.com

Accelerate and WWIC support is enabling IPCOTT, a large scale, multi-site pivotal Randomised Control Trial to be conducted in patients with chronic leg ulcers with venous aetiology. This will:

- De-risk the step into clinical trials for Huntleigh
- Provide clinical trials/project management expertise
- Support the delivery of a comprehensive evaluation

Such a study would assist health care professionals, clinical commissioning groups etc. to make informed decisions about whether this device could provide better outcomes for patients with chronic lower limb wounds.



EXPECTED OUTCOMES

- Introduction of new disruptive technology into the field of wound healing
- Improved management of chronic leg ulcers for clinicians and patients, through reduced demands on clinical services, and improved healing, pain control, mobility and wellbeing
- Data for further academic-industry research collaborations
- Economic growth
- Knowledge generation and insight into the field of leg ulcer management
- Health economic assessment



FUTURE IMPACT

- Future collaborations between industry, academic and clinical partners
- Opportunity to explore the use of intermittent pneumatic compression in the management of other types of chronic wound

AN INNOVATION CASE STUDY



DEVELOPING PHAGE DISPLAY TECHNOLOGY FOR SHEEP ANTIBODY PRODUCTION

PROJECT DURATION: 6 months

PARTNERS: Ig Innovations Ltd and Cardiff University

PROJECT AIM: To address the need for antibody phage display as a tool for research, diagnosis and therapeutic intervention.

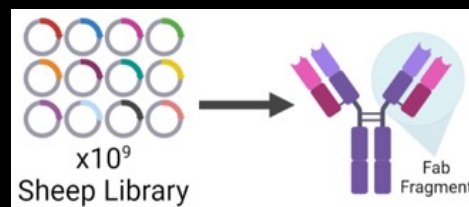
OVERVIEW

Antibody based biological products are a key product in the scientific industry due to the high specificity of target recognition. A requirement has been identified for novel antibody products as tools for research, diagnosis and therapeutic intervention through the development of a technology termed antibody phage display.

A previous project established a sheep antibody library against a known cancer target antigen. This study consolidated the existing Cardiff University and Ig Innovation Ltd collaboration with the aim of characterising and screening this library for antibody fragments (Fabs) of interest against cancer and other diseases. Where possible, the performance of the identified Fabs will be compared against commercial polyclonal antibodies and in house Fabs and further characterised to determine their therapeutic and commercial application.

Accelerate is supporting the delivery of this project through Cardiff University's School of Pharmacy and Pharmaceutical Sciences. Building on an established partnership and a successful initial project, the partners will conduct a collaborative research project to further develop this specialized methodology for producing new antibodies. Academic scientific expertise in collaboration with Ig Innovations research team will screen, produce and evaluate fragmentary antibodies to generate new antibody-based tools. Industrial partners brought extensive technical expertise and resource to the project.

The project is an example of cross-programme referral from CALIN, which is also an ERDF funded programme.



Schematic showing Fab antibody fragment production from a sheep phage display library.



EXPECTED OUTCOMES

- Validation of the developed method for future commercialization and research
- Knowledge exchange between academic and industrial partner leading to an increase in technical knowledge, networks and contacts
- Technology development and identification of fragmentary antibodies (Fab) as well as a new enabling technology for generating new fragments targeting different antigens
- New commercial products, new enabling technologies
- Opportunities for further collaboration between project partners and funding application development
- Case studies
- Peer reviewed publications



POTENTIAL FUTURE OUTCOMES

- Advancement of the field and range of antibody products
- Potential reduction in animal burden required with reduced numbers of animals required for product pipeline, aligning the project with the 3Rs
- Potential for company growth and development in Wales through an expanding product portfolio and production in Wales

"The Accelerate project was critical for us and Ig Innovations to reach the final objective of developing this exciting method for future use."

Prof Arwyn Jones, Cardiff University

"The Accelerate project enabled Ig-innovations to sustain our collaboration with Cardiff University and achieve goals that would have been challenging otherwise."

Dr Bethan Evans, General manager, Ig Innovations Ltd.

AN INNOVATION CASE STUDY



SEREN AND BERTIE DIGITAL EVALUATION

PROJECT DURATION: 18 months

PARTNERS: Rondo Media, Cardiff and Vale University Health Board, University Hospital Dorset and Cardiff University

PROJECT AIM: This project aims to develop and evaluate a world-leading digital platform that will help improve access to and uptake of structured T1D education

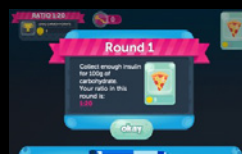
OVERVIEW

BERTIE/SEREN Digital is a patient centred self-management resource for people who are unable or unwilling to attend face-to-face courses or where course availability is poor. BERTIE/SEREN Digital will also be complementary to the established BERTIE and SEREN courses. The new programme will be developed with the needs of international markets in mind and will be adaptable to other languages, cultures, and units.

The SEREN group and Bournemouth Diabetes & Endocrine Centre are collaborating to combine the SEREN® face-to-face programme for children with the BERTIE® online and face-to-face Type 1 Diabetes (T1D) programme for teens and adults to create 'BERTIE/SEREN Digital', a single, structured, comprehensive online education, support and self-management programme for everyone with T1D.

By developing a full suite of education programmes on the same platform the aim is to provide support for everyone with T1D regardless of age, socio-economic status, culture, language and educational status, with user choice allowing those with language and learning difficulties to access programmes written in appropriate formats to include resources to accommodate those of all educational abilities.

Accelerate Through the Cardiff University School of Medicine and Centre for Trials Research, the Accelerate programme will provide a platform to facilitate Bournemouth Diabetes & Endocrine Centre and the SEREN group to collaborate with Welsh digital agency Rondo Media, Cardiff University and Cardiff and Vale University Health Board.



Screenshots of the digitised SEREN & BERTIE platform evaluated in this Accelerate project



EXPECTED OUTCOMES

- Improved access and patient self management through a structured education product for T1D.
- Shared learning and access to the healthcare space, creating new process and ways of working for the enterprise
- Opportunity for further collaboration, research projects and grant application
- Impact case studies through translation of studies to clinical practice
- Peer reviewed publications
- Alignment with Cardiff University civic mission



POTENTIAL FUTURE OUTCOMES

- Potential for significant healthcare benefit with patient empowerment through self management and attainment of HbA1c target.
- Alignment with prudent healthcare principles through education and self management leading to: reduced health costs, hospital admissions, reduced complications with high financial burden
- Near-term impact in Wales, building on current services in delivery by SEREN and BERTIE teams
- Increased market opportunities and thus employment numbers for the enterprise
- Improved accessibility and reduced carbon foot print

"Support from Accelerate enables projects like SEREN & Bertie Digital, with important societal health impact to be delivered which may not be possible otherwise. It has been a pleasure working with all the partners on this worthy subject, helping children to understand and develop strategies for living with diabetes"

Derick Murdoch, Creative Director, Rondo Media

AN INNOVATION CASE STUDY

THE FUTURE OF SUSTAINABLE OPERATING THEATRES

PROJECT DURATION: 10 months and 18 months

PARTNERS: Cardiff University, Cardiff & Vale UHB, University of Wales Trinity Saint David, Cenin Renewables, Medtronic, Nuaire and BIPVco.

PROJECT AIM: To design and build sustainable operating theatres

OVERVIEW

There is a need for buildings to transition towards a zero carbon environment. Hospital buildings and operating theatres use a relatively large amount of energy and produce large quantities of waste. Hospitals produce more than 5 million tons of waste each year. The operating theatre environment contributes ~20-30% of a hospital's carbon footprint. Good environmental conditions for medical staff and patients are also important, and must consider issues including comfort, cleanliness and cross infection.

A project to design and build a sustainable, future theatre is not only pioneering in terms of its intent, but further addresses the real need to move towards a healthier and sustainable Wales.

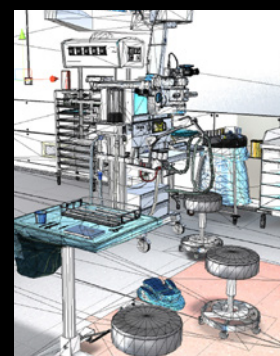
Accelerate is supporting the delivery of this project which brings together collaborators with a wide range of expertise from theatre practitioners, to designers and sustainability build experts. The initial phase has been to establish the scope and project delivery plan. Moving into the next phase has shifted the focus to the designing and construction of the theatre. The design will be focused around the specific needs of a general operating theatre, but incorporate a low energy design, efficient mechanical services for heating, cooling, ventilation and lighting, and building integrated renewable energy generation and energy storage. It will also consider waste handling and minimising waste production, including those of anaesthetic gases.

This has been facilitated by bringing theatre staff together to focus on architectural construction, design features and ergonomics, and, anaesthetics and waste. The subsequent design, construction and evaluation will be overseen by a dedicated project officer, who will facilitate the delivery of tangible outcomes.

Feedback from a Future Theatre project collaborator:

"Accelerate support has enabled us to consider the design and construction of a sustainable hospital operating theatre. We are able to apply our energy positive approach, developed through previous LCRI WEFO funding, to this interesting building type. Not only will we be looking for a zero-carbon performance, but also we will be looking at a wide range of other sustainability aspects, including waste management, and producing a high quality internal environment. We welcome the opportunity to collaborate with a broad team of medical and visual design experts."

Prof. Phil Jones, Welsh School of Architecture, Cardiff University.



A Model of a Future Theatre
Credit: Assistive Technologies Innovation Centre (ATIC), UWTSd.



EXPECTED OUTCOMES

- The design and build of a modular, sustainable theatre for improved patient, staff and environmental wellbeing
- Reduced carbon footprint
- Facilitation of innovation based collaborations and the generation of new knowledge
- Performance measures
- Engagement events
- Training opportunities for NHS staff.
- Provision of a model build to roll out across NHS Wales.
- Academic publications and clinical/innovation/impact case studies.



POTENTIAL FUTURE OUTCOMES

- Future collaborations between industry, academic and clinical partners
- Changes in clinical practices
- Future builds of this innovative, sustainable theatre across the NHS and beyond

Feedback from a Future Theatre project collaborator:

"...following some great talks at the 'Sustainable Anaesthesia Innovation Day' supported by Clinical Innovation Accelerate at the Life Science Hub, it was agreed by Cardiff & Vale UHB Anaesthetic Consultants that we would remove the Desflurane vaporisers from the back bar of the anaesthetic machines. Compared to baseline data, we now save a recurring £8K per month and the department are able to reinvest 50% of savings into equipment for the department. There is also the environmental saving of 80T of CO₂/month, which equates to >350,000km in an average car each month!"

Fiona Brennan, Consultant Anaesthetist, Cardiff & Vale UHB

AN INNOVATION CASE STUDY

CWM TAF MORGANNWG UNIVERSITY HEALTH BOARD OPERATING THEATRES RECYCLING

PROJECT DURATION: 6 months (start date 01/01/2021)

PARTNERS: Veolia Environmental Services, Innotech, Cwm Taf Morgannwg University Health Board and Cardiff University.

PROJECT AIM: To change staff behaviour by demonstrating the impact of improved recycling behaviour.



Industrial and health board partners involved in this project

OVERVIEW

The NHS produces up to 600,000 tonnes of waste each year, and around 85% of this waste is categorized as non-hazardous. Although much of this waste is recyclable, a significant amount is still incinerated or sent to landfills.

Cwm Taf Morgannwg University Health Board (CTMUBH) produces over 2,000 tonnes of waste annually, with operating theatres and pathology laboratories being the areas that produce the greatest quantities. A significant part of this waste is the packaging of consumable products that are routinely used on a single-patient basis.

Whilst healthcare waste must be categorized, segregated and processed according to the appropriate waste management stream, practices around waste management and the communication of relevant practices could be enhanced. For example, diverting specific waste from incineration and landfills into recycling, saves money and reduce carbon.



The amount of single-use plastic items required to intubate one patient in the operating theatre (image courtesy of CTMUBH)

This collaborative project between Cardiff University academics, Veolia Environmental Services, Innotech and CTMUBH seeks to explore pathways for the generation of new products from the waste traditionally sent to landfills, whilst facilitating improved staff behaviours towards recycling in a clinical environment.

Accelerate is supporting the delivery of this project through Cardiff University's experience in rigorous data collection, evaluation and project management. This will work alongside the health board's provision of clinical environments and the staff input required to implement new protocols and training. Industrial partners will contribute valuable expertise in waste management streams and recycling advances, and together this partnership will work towards the advancement of more sustainable practices within NHS Wales.



EXPECTED OUTCOMES

- New recycling bin protocols that meet appropriate clinical standards
- Behaviour change around staff recycling practices
- Enhanced processes for managing waste
- Improved communication around appropriate recycling processes
- Cost savings through increased recycling
- Results from an academic evaluation
- Procurement changes to facilitate the purchase of more recyclable products
- Case studies and peer-reviewed publications
- Seeding of future work



FUTURE IMPACT

- A reduced carbon footprint for the health board
- Opportunities for further collaboration between project partners
- A scalable model to be rolled out across NHS Wales, delivering cost savings, staff engagement, improved waste management and greener procurement practices
- A significant contribution to helping to deliver 'A Healthier Wales' and 'A Sustainable Wales'

For further information contact: Accelerate@cardiff.ac.uk

AN INNOVATION CASE STUDY

REIMAGINING GLANRHYD HOSPITAL CHURCH

PROJECT DURATION: 11 months

START DATE: 1st February 2021

PARTNERS: Cwm Taf Morgannwg University Health Board, Cwm Taf Morgannwg Regional Partnership Board, Zenergy Design Ltd, Mental Health Matters Wales and Cardiff University

PROJECT AIM: Reimagining the building into a multi-use space for the local community, staff and patients with a focus on improving 'wellbeing' and mental health

OVERVIEW

Glanrhyd Hospital is a mental-health hospital in Pen-y-fai near Bridgend and is managed by Cwm Taf Morgannwg University Health Board. The church stands in a prominent position within the hospital grounds and is still used for religious purposes. We propose to reimagine the building into a multi-use space for the local community, as well as staff and patients on site.



"Mental Health Matters Wales is delighted to be partner of such an innovative project which aims to support the Social and Emotional Wellbeing of the community"

Michaela Moore, Director of Mental Health Matters Wales



Accelerate is supporting the delivery of this project which brings together collaborators with a wide range of expertise from architects, sustainability build experts and engineers with charities, experts in mental health and stakeholders at the Cwm Taff Morgannwg Health Board. They will provide project management expertise and will ensure academic input required to convert the project is identified and seconded to the project.



EXPECTED OUTCOMES

- Identification of the stakeholders and their needs
- Co-developed plan and specification for a sympathetic refurbishment including a cost estimate
- Defining the model and staff requirement for the running and operating of the venue
- Identification of potential funding sources
- Establishing an active network of stakeholders that will in future, run the range of activities contributing to Glanrhyd achieving its social, cultural, environmental and well-being ambitions



POTENTIAL FUTURE OUTCOMES

- Securing funding to support a sustainable adaptation of the church into a Community Hub
- Help the Health Board meet the new policies for decarbonisation recently set out for the NHS. A key outcome will be to raise awareness of what is possible with existing NHS buildings that are no longer required for their original purpose
- Increased experience for the company compatible with its core sustainability principles which will strengthen its portfolio
- Possible research opportunities and academic publications eg. through monitoring energy / space usage and optimising performance
- Support for community initiatives especially around wellbeing and mental health support and develop strong ties with local charities

AN INNOVATION CASE STUDY

MICROFLUIDIC SYSTEM TO GROW COLORECTAL ORGANOIDs FOR USE IN STRATIFIED MEDICINE

PROJECT DURATION: 6 months

PARTNERS: Cellesce, Cardiff University and Dublin City University

PROJECT AIM: To develop an effective microfluidic system to allow the growth, monitoring and treatment of patient-derived 3D organoids

OVERVIEW

A paramount need and major challenge in the cancer field is how to rationally prescribe the optimal drug treatment to the individual patient.

Patient-derived organoids (PDOs) have the potential to fulfil this need. They are 3D-structures derived from patient biopsies that fully replicate the original tissue and can therefore act as an avatar in assays to screen for suitable therapies. The bottleneck in implementation of this platform is the time taken to derive and expand PDOs to supply sufficient material for testing in a timely manner. The work is labour intensive, requires specialist facilities, materials and expertise and is therefore very costly. Miniaturisation and automation is the key to making the technology more accessible to a large number of patients to allow PDOs to be used for personalised medicine.

Accelerate is supporting a cross-disciplinary collaborative team of experts to address the challenge of developing a microfluidic system to facilitate the automated growth and propagation of 3D PDOs. The work will be focused through:

- The design and validation of a microfluidic device adapted for the growth of colorectal cancer PDOs.
- Exploring whether organoid health can be monitored using imaging methods whilst organoids are grown on the microfluidic "chip."
- Establishing protocols for retrieval and onward expansion of the colorectal cancer PDOs.

Dr Damien King from Dublin City University commented on this international project collaboration: "Working as part of the Accelerate project with the teams from Cardiff University and Cellesce has been hugely beneficial to the team at FPC@DCU in developing additional expertise in the field of organoid handling on microfluidic platforms. Microfluidic platforms can play a vital role in the deployment of organoid models for personalised medicine applications and also assist in the optimisation of the scale up production of organoid models."

Dr Victoria Marsh-Durban, Cellesce CEO, added "Cellesce highly values R&D collaborations and knowledge exchange with academia. This Accelerate project brings together Cellesce, Cardiff University and Dublin City University with our respective expertise in bioprocess engineering, organoids and microfluidics. We are delighted to work with experts both locally in Wales and internationally."



Prototype microfluidic chip generated using micro-milling techniques. Image: FPC@DCU



ANTICIPATED PROJECT OUTCOMES

- A prototype of an efficient microfluidics system for personalised medicine applications
- Proof of concept for the growth of organoids in a new microfluidics system
- Innovative technology to facilitate the discovery of new and re-purposed cancer therapies
- New workflow processes for Cellesce
- Data generation and new insights into personalised medicine



POTENTIAL OUTCOMES BEYOND THE PROJECT

- System integration with newly emerging label-free, real-time imaging, analysis and growth optimisation workflows that are currently being developed to harness the full potential of the "organoids-on a chip" technology
- Trial the use of organoids from different cancer tissue types in the same microfluidics system, with potential for significant benefits for patients, drug discovery and the economy
- Creation of a spin out company around the use of organoids in personalised medicine
- Future cross-disciplinary collaborations between industry, academic and clinical partners

AN INNOVATION CASE STUDY

geko™ DEVICE – PRODUCT EVALUATION AND WELSH SUPPLY CHAIN LOGISTICS

PROJECT DURATION: 9 months

PARTNERS: Gwalia Healthcare, Sky Medical Technology, Aneurin Bevan University Health Board and Cardiff University

PROJECT AIM: To undertake a clinical product evaluation of the geko™ device in patients with symptoms of COVID-19, and, to enhance the device manufacturer's capabilities, resilience and sustainability within Wales

OVERVIEW

Venous thromboembolic diseases (VTE) are caused by a thrombus (blood clot) occurring in a vein. Patients are assessed for their VTE risk when they enter a hospital. High-risk patients and/or those who will be immobile for long periods of time are managed by prophylactic treatment.

COVID-19 is a highly thrombotic syndrome that leads to both micro and macro-thrombosis and resultant multi-site embolism. Strict thromboprophylaxis has been widely indicated, but traditional anticoagulant therapy has, in some patients resulted in severe bleeding. This has led to an opportunity to explore other options to support the management of VTE in this patient population.

The geko™ is a wearable medical device that provides painless neuromuscular electrostimulation to the lower leg and increases blood circulation in immobile patients. It is manufactured in Wales and indicated for the prevention of venous thromboembolism (VTE), as well as the prevention and treatment of oedema.

The following project is being delivered by way of two parallel strands and focuses upon the geko™ device and its use with COVID-19 patients.

Strand 1. A clinical product evaluation of the geko™ device in COVID-19 patients is being undertaken within Aneurin Bevan University Health Board (AB UHB). This device is being added to standard care and may reduce the risk of clot formation in this patient group without the risk of severe bleeds.

Strand 2. Involves seeding the work around optimising geko™ device manufacturing capability in Wales. This work will explore new processes and strategies to enhance the Welsh manufacturer's capabilities through a sustainable Welsh supply chain and opportunities to enhance the manufacturing line.

Accelerate is supporting the delivery of this project across these strategically aligned strands, with the intention that it will underpin a larger body of future work.

This is being facilitated through the provision of Cardiff University academic expertise in manufacturing automation and supply chain resilience, dedicated project management and the support of nurse time to administer the device and collect data. This will be delivered in collaboration with the clinical and governance expertise of AB UHB, Gwalia Healthcare's manufacturing experience and facilities for manufacturing the geko™ device, and Sky Medical Technology with expertise in R&D, clinical product evaluations and manufacturing practices.

The Project Team

"Meeting the grand challenges that COVID-19 poses to the clinical interventions required in supporting patients and in the delivery of the devices to aid clinicians requires a multidisciplinary, practice-academic endeavour. We are delighted to be working as a team with colleagues from Gwalia Healthcare, Sky Medical, AB UHB, School of Medicine, Cardiff Business School, and the School of Engineering."



The clean room where the geko™ device is manufactured
Image courtesy of Rod Parker, Gwalia Healthcare



EXPECTED OUTCOMES

- Clinical data from the product evaluation
- Introduction of the geko™ device into ITU and acute respiratory unit for increased blood circulation, the prevention of venous thrombosis and, the prevention and treatment of oedema
- Consideration of changes to the clinical pathway for the management of COVID patients in the AB UHB
- Improved supplier assessment and procurement process with a focus on a developing a resilient and sustainable Welsh supplier base
- Iterations to the automated manufacturing process for the geko™
- Case studies and peer-reviewed publications
- Seeding of future work



FUTURE IMPACT

- Changes to the clinical pathway for the management of COVID patients in the AB UHB
- Opportunities to explore the geko™ device use in specific patient cohorts across Wales
- Increased demand for the geko™ device.
- Opportunities for further collaboration between project partners
- A definitively powered randomised controlled clinical trial



The geko™ device (images courtesy of <https://www.gekodevices.com/geko-products/hospital-applications-device/>)

AN INNOVATION CASE STUDY

DEVELOPMENT OF AN ADVANCED DIGITAL AND PHYSICAL ENGINEERING (ADPE) HUB

PROJECT DURATION: 24 months

PARTNERS: Softgel Solutions Ltd, Innotech Engineering, Cardiff University, and Cwm Taf Morgannwg University Health Board

PROJECT AIM: To facilitate the ongoing development of an innovative, digital and physical engineering hub designed to engage and meet changing demands

OVERVIEW

The COVID-19 crisis has highlighted the need to be able react to two issues;

- The repurposing of equipment shelved in stores, deemed out of order due to lack of parts from suppliers, and,
- Opportunities to prototype innovative ideas.

To facilitate this, there has been an opportunity to build on initial, innovative work establishing an Advanced Digital and Physical Engineering (ADPE) Hub at the Prince Charles Hospital. This hub arose from the repurposing of the Maxillofacial-Dental laboratory and its 3D printing capabilities; its creation being to accelerate the impact of game changing, innovative ideas.

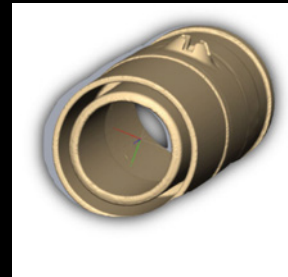
The hub will bring together, and provide a platform for, staff, patients, academics and industry partners to engage in an innovative way of working, by providing an autonomous and rapid mechanism to respond and enable practical solutions to issues.

Without industry involvement, Health Boards do not have access to the equipment, skills or experience to develop this concept. Due to a number of operational, regulatory and practical reasons, external sourcing or off-site engagement has proved too difficult.

Bringing industry capability on board as partners, within a designated working space will enable health boards to rapidly prototype and test ideas, eliminating risk, reducing experimental stages and utilising industry partner know how to scale up production of best solutions.

The COVID-19 emergency has put NHS Wales under real pressure, the success of this project would enable a successful initiative to emerge from it, providing a positive outcome that will increase the resilience of the NHS in the future.

Accelerate is supporting the ongoing development of this innovation hub, by providing academic expertise and by facilitating the expansion of its 3D printing capabilities.



3D printed exhalation ports
An example of repurposing equipment to meet new demands



EXPECTED OUTCOMES

- Development of a central digital and physical engineering capability that can engage with staff across the Health Board
- A new pathway to facilitate innovative solutions
- Health Economic cost analysis
- The expansion of a new spin out company (Innotech Engineering)
- Established links and joined up working with industrial, clinical and academic partners
- Improved patient and staff engagement with the health service, through an accessible pathway to prototype and test innovative ideas
- Improved resilience for the Health Board



FUTURE IMPACT

- Clinical and academic case studies
- Future collaborations between industry, academic, and clinical partners
- Adoption of new technology
- Increases in employment
- Sharing of innovative practices with other health boards pan Wales, and beyond

Exhalation Valves

A shortage of supplies during the current COVID-19 crisis has meant that the Health Board hasn't been able to get hold of certain valves and connectors. An example of this is an exhalation valve (see figure).

The innovation hub worked closely with the Respiratory team to create a 3D design of the valve, and enable the production of in-house printed versions. The Respiratory team has since published this design across their UK national governing body for practice sharing purposes.

AN INNOVATION CASE STUDY

DEVELOPING INFECTION CONTROL PROTOCOLS FOR SAFE DEPLOYMENT OF VIRTUAL REALITY IN HEALTHCARE

PROJECT DURATION: 3 months

PARTNERS: Rescape Innovation Limited, Assistive Technology Innovation Centre (University of Wales Trinity St David) and Cardiff University

PROJECT AIM: To develop infection control procedures for the safe deployment of virtual reality in healthcare settings

OVERVIEW

Virtual reality (VR) enables users to interact with a 3D virtual world, in a safe, real-time environment. It is increasingly being used in the field of healthcare, to enhance the experiences of both patients and staff.

Rescape Innovation Limited are pioneering the use of VR in healthcare to reduce pain, anxiety and improve the patient journey. They have established a Virtual Reality (VR) platform, called DR.VR™, that has been used successfully in the NHS, Care homes and Hospices. This platform has also been used to help reduce anxiety and stress in frontline care staff, as well successfully training empathy and other emotional skills in blue light services.

With the emergence of COVID-19 the requirement for robust infection control measures has become increasingly paramount. This project was focused around the development of the infection control protocols needed for the successful deployment of VR within healthcare settings.

Accelerate supported this project with Rescape through multi-partner input from the Assistive Technology Innovation Centre (ATiC (University of Wales Trinity St David)) and the Cardiff Innovation Accelerator (CIA (Cardiff University)).

ATiC undertook a usability study in order to:

- Establish infection control challenges during deployment of DR.VR™ across a range of uses
- Evaluate the effectiveness of the new infection control protocol material designed and produced by Rescape.

CIA's role included supporting:

- Access to an infection control specialist
- Identification of relevant medical device/ infection control regulations
- Implementation of infection control guidelines suitable for the DR.VR™ technology
- Exploring the efficiency of relevant products in controlling the spread of infection when using the DR.VR™ technology

Feedback from Matt Wordley, CEO of Rescape Innovation

"At Rescape in the last 18 months, we've shown that VR can have an enormous impact on improved healthcare in both clinical and non-clinical settings. This project with the teams at University of Wales Trinity Saint David and Cardiff University will help solve some of the challenges to enable the deployment of virtual reality at scale across both primary and secondary care."



DR.VR™



OUTCOMES

- The development and implementation of new infection control protocols and service provision for the DR.VR™ platform.
- Potential to unlock further development and sales of new products and content for new applications within the NHS, care homes and private clinics.
- Increased market penetration and revenue leading to an employment increase in highly skilled jobs.
- Peer reviewed publications and case studies



FUTURE IMPACT

- Future collaborations between industry, academic, and clinical partners
- Long term benefits to healthcare staff and services through the improved management of stress and anxiety in frontline staff
- Improved well-being across the health and care sector in Wales, whilst aligning with the principles of Prudent Healthcare and A Healthier Wales
- Company growth through an increasing market demand.
- A VR platform that could act as an infection control model beyond Wales

Rescape, ATiC and CIA will use the outputs of this initial phase of work to explore further project opportunities.

AN INNOVATION CASE STUDY

VIRUCIDAL COATINGS IN THE BATTLE AGAINST COVID-19: USING BIOREFINING WASTE TECHNOLOGY TO ENHANCE PPE SAFETY

PROJECT DURATION: 6 months

PARTNERS: Pennog Limited and Cardiff University

PROJECT AIM: To evaluate the efficacy of highly innovative naturally-derived coatings with virucidal activity against SARS-CoV-2 coronavirus to produce safer personal protective equipment and reducing waste through reusable products

OVERVIEW

Personal protective equipment (PPE) is used in a variety of settings to protect the user from risks to their health and safety. Examples of PPE include gloves, eye protection, visors, helmets and masks.

The COVID pandemic has driven an emerging demand for single-use personal protective equipment (PPE) and medical devices. There is also the need for high risk locations and activities to be more resilient and efficient in the handling and use of PPE and surfaces that have the potential for lethal virus exposure.

This project builds on a collaboration supported by Innovate UK between Bangor University's BioComposites Centre and Pennog Ltd. to develop naturally-derived virucidal actives by trying to assess the efficacy of coating formulations in rendering pandemic viruses immobile and destroying them on contact with a coated surface. This innovative coating is intended to render materials that are in contact with the COVID-19 and other viruses safe. This could convert PPE in active use, from a potential virus transmitter into mobile virus-deactivating devices.

Accelerate is supporting this industry-led collaboration to focus on the preparation and evaluation of the efficacy of highly innovative naturally-derived coatings (containing chemically modified chitosan) with virucidal functionality. This is being enabled through Cardiff University's expertise in virology and project management, and the commercial know-how and experience of Pennog.



Preparation of modified chitosan at Pennog for coating PPE materials

"Fibres in crab shells with natural anti-microbial properties could help in the fight against Covid"



Images courtesy of <https://pennotec.com/in-the-news/>



OUTCOMES

- Delivery of quantified virucidal efficacy and cost impact on manufacture for virucide-coated medical devices and PPE surfaces
- Evidence on mechanisms of action and bio-medical applications of chemically modified natural polymers as virucidal agents
- A virucidal coating technology – sustainably sourced and manufactured by Pennog Ltd
- Conversion of single-use PPE to longer-lasting multi-use products



FUTURE IMPACT

- Creation of new high value manufacturing and associated employment in Wales
- Academic case studies
- Industry-led, pan-Wales collaboration combining medical expertise at Cardiff University and synthetic chemistry expertise of Bangor University to develop a platform for further Research and Development projects
- Significant opportunities for increased grant income potential and research staff employment
- New data to support development of further health interventions
- Peer-reviewed publications
- Support for the University's Civic Mission agenda
- Environmental benefits through reductions in waste disposal of single-use PPE



Cardiff University's dedicated Cat-3 biological containment facility for SARS-CoV-2 analysis

AN INNOVATION CASE STUDY

ENHANCING METALLIC ANTI-VIRAL/ANTI-MICROBIAL HIGH TOUCH SURFACES

PROJECT DURATION: 16 months

PARTNERS/STAKEHOLDERS: Armadillo Metal Coatings Ltd, Dusk Water Ltd, The Royal Mint, Cwm Taf Morgannwg University Health Board and Cardiff University

PROJECT AIM: To test, evaluate and validate the use of metallic coatings for surface sterilisation

OVERVIEW

The need to sanitise surfaces has always been important within both clinical and non-clinical settings, whilst surface disinfection compliance might be low. Unfortunately, COVID 19 has increased the urgency of need in order to minimise transmission of the virus. Some studies have indicated that the SARS-CoV-2 virus survives on stainless steel surfaces for as long as 3-7 days. On high-touch areas such as doors, virus transmission becomes an increased risk.

An existing body of evidence indicates that metallic elements such as copper possess anti-microbial properties. For example, microbes such as bacteria and viruses, that come into contact with copper surfaces are killed within hours; this is known as contact killing.

Building on this knowledge, a unique, collaborative project between industry, health care and academia is being undertaken to test, evaluate and validate the potential of combining novel anti-tarnish coatings with metallic surfaces to enhance the killing efficacy of surfaces exposed to microbes including the SARS-CoV-2 virus.

Such a technology has the potential to provide an added benefit for surfaces located in high-use clinical settings, and seeks to increase their practicality through decreasing the effects of tarnishing. This project will also evaluate the commercial standing of these results and complete a market feasibility analysis.

Accelerate is supporting the delivery of this innovative project through Cardiff University's academic expertise in investigating the efficacy of combining novel coatings with metallic surfaces (copper, brass and an anti-tarnish copper) for bactericidal and viricidal properties, alongside project management through the Clinical Innovation Accelerator. This will be complemented by the industrial expertise of The Royal Mint in copper production, and that of Armadillo Metal Coatings in anti tarnish technology. Commercial appropriateness will be managed by Dusk Water, with Cwm Taf Morgannwg University Health Board providing the hospital environments for the installation of push door plates, and the health board engagement needed to implement the results.



Example of a door push plate installed in Cwm Taf Morgannwg University Health Board sites



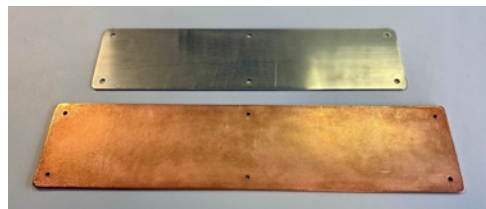
EXPECTED OUTCOMES

- Validation of bio-medical applications of copper coating as bactericidal and virucidal agents in working and domestic environments
- Improved practicality of using metals for day-to-day use, through the use of anti-tarnish coatings
- Market analysis and commercial viability data
- A route for commercial engagement with NHS Wales
- A potential new anti-microbial technology to reduce hospital acquired infections
- Case studies
- Peer reviewed publications and public dissemination reports



FUTURE IMPACT

- Commercialisation of the end-product
- Potential for patent application
- Increases in industry growth and employment
- Opportunities for further collaboration between project partners
- Contributing to a Healthier Wales
- Delivering for the Well-being of Future Generations



Further examples of the door push plates installed in Cwm Taf Morgannwg University Health Board sites

AN INNOVATION CASE STUDY



EVALUATION OF THE RESIDUAL SARS-COV-2 ANTIVIRAL EFFICACY OF A NUMBER OF NOVEL PROLONGED-ACTION HAND SANITISER PRODUCTS

PROJECT DURATION: 1 month

PARTNERS: SGS Quay Pharmaceuticals and Cardiff University

PROJECT AIM: To establish a method for testing prolonged action against viruses and test the performance of a number of novel formulations of hand sanitisers using SARS-CoV-2

OVERVIEW

The use of hand sanitisers have become an increasingly important part of people's daily lives. The impact of COVID has reinforced the need to adopt sanitising methods capable of killing this potentially deadly virus.

Whilst there are a range of hand sanitisers available, and a growing body of evidence behind the parameters needed to be effective against the SARS-CoV-2 virus, demonstrating longevity of effectiveness could be an opportunity to make a bigger impact on public health.

SGS Quay Pharmaceuticals has developed a number of novel hand sanitisers' formulations that meet the requirements for delivering a prolonged anti-viral action. This suggests that these hand sanitisers could deliver up to 8 hours of protection.

To explore the efficacy of SGS Quay Pharmaceuticals' hand sanitisers in delivering prolonged virucidal activity against the SARS-CoV-2 virus, Cardiff University and SGS Quay Pharmaceuticals are embarking on a collaborative project to co-develop and optimise a novel methodology for testing prolonged action hand sanitisers and then to confirm and optimise the performance of the novel formulations.

Accelerate is supporting the delivery of this innovative project through Cardiff University's expertise in virology, the provision of their dedicated category 3 laboratory facilities and their experience in handling the SARS-CoV-2 virus.

SGS Quay Pharmaceuticals will bring their commercial and pharmaceutical expertise to this collaborative project, in addition to supplying their hand sanitisers.

The Clinical Innovation Accelerator will provide project management to support the team to achieve the project deliverables in this short timeframe.

Q
QuayPharma
WORLD-LEADING FORMULATION CDMO



EXPECTED OUTCOMES

- Development of a reliable method for evaluating the viricidal activity of prolonged action hand sanitisers
- Efficacy data for the prolonged performance of these hand sanitisers against the SARS-CoV-2 virus
- Peer reviewed publications



FUTURE IMPACT

- Efficacy against the SARS-CoV-2 virus could expand the market for the SGS Quay Pharmaceuticals
- Improved industrial resilience through a growing product portfolio
- Opportunities for further collaboration between project partners
- Public health impact pan Wales and beyond
- Expanded research portfolio in SARS-CoV-2 for the University



AN INNOVATION CASE STUDY



DEVELOPING NOVEL, LOW SEROPREVALENCE ADENOVIRUSES AS VACCINE VECTORS - AN INNOVATION CASE STUDY

PROJECT DURATION: 11 months

PARTNERS: Inbio and Cardiff University

PROJECT AIM: To develop novel, low seroprevalence adenoviruses as vaccine vectors

OVERVIEW

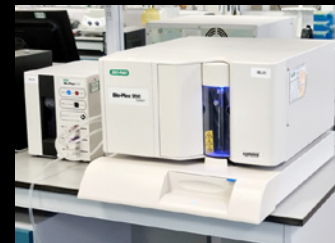
The use of adenoviruses as viral vectors make effective vaccine platforms, as they induce robust adaptive immune responses. Following the rollout of adenovirus-based COVID-19 vaccines and the likely need for repeated vaccinations to manage emerging SARS-CoV-2 variants, the development of immunity against these vectors is likely. This anti-vector immunity can lead to a reduction in vaccine immunogenicity, with likely impacts upon vaccine efficacy. Therefore, there is a need to develop novel adenovirus-based vector platforms using other adenovirus serotypes with low seroprevalence in the human population.

This project between Cardiff University and InBio will evaluate the innate and adaptive immune responses induced by a panel of novel human adenoviral vectors and vector pseudotypes.

The selected viral panel has been chosen for several reasons including:

- Showing potent in vivo adaptive immunogenicity against an encoded transgene.
- Proven pre-clinical induction of mucosal immunity in vivo
- In vitro and in vivo cellular targeting through altered adenovirus receptor tropisms.

Accelerate is supporting the delivery of this project through Cardiff University's School of Medicine. A cross disciplinary approach draws on expertise and resource from the Division of Infection and Immunity, and the Division of Cancer and Genetics in addition to support from the Joint Biological Services Unit at Cardiff University. Industrial partners are providing their expertise in the allergy field and will provide essential specialised equipment and Luminex xMAP® multiplex kits for analysis to further expand their remit in viral immunology.



EXPECTED OUTCOMES

- Expanded research strategy for InBio, from allergy to infectious disease
- Identification of new vectors that have hallmarks of good vaccine candidates
- A targeted approach to the respiratory mucosa. This has the potential to develop vaccines with improved transmission-blocking properties, and higher protection against even mild disease
- Opportunities for further collaboration between project partners
- Case studies
- Peer reviewed publications



POTENTIAL FUTURE OUTCOMES

- A contribution to COVID-response work
- Positive impact on public health through the underpinning of enhanced vaccine development
- Supporting the process towards 'A Healthier Wales'

"Accelerate has provided a unique platform through which to partner with InBio, whose specialised expertise and facilities have enabled us to capture the full potential of Cardiff University's adenoviral vaccine vectors under development. Working with Accelerate has opened doors for me to make new and important connections in key networks, and has enabled me to navigate the process of successfully partnering with industry. As a junior PI, that has been invaluable"

Dr Carly Bliss, School of Medicine

AN INNOVATION CASE STUDY

DEVELOPMENT OF INHALED PROTEIN- BASED PRODUCT AS A PROPHYLAXIS / TREATMENT FOR COVID-19

PROJECT DURATION: 6 months

PARTNERS: Virustatic Limited and Cardiff University

PROJECT AIM: To determine the efficacy of Viruferrin® against SARS-CoV-2 virus

OVERVIEW

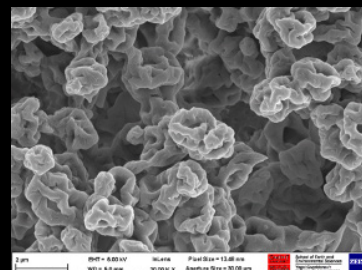
The SARS-CoV-2 virus has posed a threat to the global population, with a pressing need for new drugs that target different stage of the viral life cycle in different parts of the body.

The protein on which the Viruferrin® product is based, lactoferrin, is a natural antimicrobial protein, that is present several body fluids serving as protector against bacteria, fungi and, potentially, viruses. For example, lactoferrin is found at relatively high concentrations in breast milk and plays an important component in the passive immunity between mother and child. As a multifunctional protein it is an important component of the immune defense including reducing activation of inflammatory pathways that were notable with COVID-19 infections.

This project between Cardiff University and Virustatic Limited will evaluate their tested Viruferrin® product as a dry powder nebulizer and/or inhaler to assess its potential as a prophylaxis for COVID-19. This project will allow Virustatic and Cardiff University to validate the efficacy of the intended product on the virus life cycle, and generate data for the further development of this potential medicinal product. Upon completion, and if successful, the data generated will then facilitate an application for funding to explore in vivo models, product development planning, regulatory planning, and clinical trials to progress the validated formulation. This will be either via follow on funding through a larger grant, or via a Clinical Contract Research Organisation which would require investment to fully validate the innovative product.

Accelerate is supporting the delivery of this project through Cardiff University's School of Medicine and School of Pharmacy and Pharmaceutical Science. A cross disciplinary approach draws on expertise and resource from the Division of Infection and Immunity, and the School of Pharmacy and Pharmaceutical Science with the Industrial partners providing Viruferrin® and their technical expertise and advice to inform the experimental process along with materials and consumables.

The project is an example of cross-programme referral from CALIN, which is also an ERDF funded programme.



Scanning electron micrograph of spray-dried Viruferrin® particles generated on this project



EXPECTED OUTCOMES

- Validation of the efficacy of Viruferrin® as a treatment for SARS-CoV-2 infection and other respiratory viruses.
- Validation of a potential alternative treatment for SARS-CoV-2 infection, using a product based on a natural antimicrobial protein found in breast milk, tears and other body fluids.
- A targeted approach for prophylaxis in the lungs where COVID-19 infection effects are pronounced
- Expanded research strategy for Virustatic Limited
- Opportunities for further collaboration between project partners and funding application development
- Case studies
- Peer reviewed publications



POTENTIAL FUTURE OUTCOMES

- A contribution to COVID 19-response work
- Positive impact on public health through the development of protein-based prophylaxis for an array of unmet clinical needs
- A validated product having impact on patients in terms of reduced illness and mortality through the use of a natural product
- Potential for company growth and development in Wales through an expanding product portfolio
- Supporting the process towards 'A Healthier Wales' and the Well-being of Future Generations Act (Wales)

Professor Arwyn T Jones, Project lead for the School of Pharmacy and Pharmaceutical Sciences, said: that

"Accelerate provided a perfect opportunity for us to utilise multidisciplinary expertise and technologies at Cardiff University to address the needs of this project and identify the potential of Viruferrin® as a prophylaxis for COVID 19".

AN INNOVATION CASE STUDY

DEVELOPMENT OF A HYPERBARIC OXYGEN THERAPY SERVICE TO TREAT PEOPLE WITH LONG COVID IN A COMMUNITY PHARMACY SETTING

PROJECT DURATION: 5 months

PARTNERS: Gravells Pharmacy, Scarlets and Cardiff University

PROJECT AIM: To create a new pharmacy therapy delivery service

Jamie Thorne, Pharmacist/Director Gravells Pharmacy - "My time working with Accelerate has been fantastic. The communication is outstanding and the level of support has been just outstanding. I would definitely enjoy working with them again in the future. Everything was so professional and well organised".

OVERVIEW

Long COVID is a condition that affects around 10-20% of people who have tested positive for a COVID-19 infection. The condition commonly causes a range of symptoms, including prolonged tiredness, 'brain fog' and shortness of breath, which can last weeks, months and even years after the initial infection. The cause of the condition is unknown and, as yet there are no effective treatment options.

However, hyperbaric oxygen therapy (HBOT) has been reported to be beneficial in improving many of the main symptoms associated with the condition. HBOT provides periods of high percentage oxygen at a pressure higher than sea level via a chamber and is delivered by a trained operator. It can be provided safely, in a range of community settings.

This project aims to co-design the development of a community-based HBOT service and evaluate the process with a small group of people with long COVID to explore their experiences and perceived short-term impact of HBOT. The development of a protocol will help to inform future, larger scale research. The project will also help to further guide the development of HBOT service provision within a community pharmacy setting.

Accelerate is supporting the delivery of this project through Cardiff University's School of Healthcare Sciences. The project provides a unique opportunity to collaborate with an engaged and innovative community-based partner, via a fast-paced innovation scheme, which will develop new skills, expertise, wider collaborative opportunities and further promote understanding Accelerate type programmes of work. The HBOT chamber will be hosted by Scarlets at their Parc-y-Scarlets stadium, providing a crucial facilities to support this study. It is also anticipated that this project will help the research team at Cardiff to subsequently scale up a larger, externally funded (e.g. RFPB scheme or NIHR HTA programme) clinical trial, with the support of the Centre for Trials Research, Cardiff University, to explore the feasibility and efficacy of HBOT in managing long-COVID. The industry partner will develop a new process of service and therapy delivery to the community that will benefit the enterprise and community of Carmarthenshire.



EXPECTED OUTCOMES

- The project will potentially lead to the development of new services for Gravells Pharmacy, with the associated benefits, such as business diversification, company growth and providing novel therapies closer to home
- The findings of this project will inform the development of HBOT regimes in a community setting for those affected by long-COVID, particularly in the West Wales region, and will help to establish the appropriateness and potential viability of community based HBOT services for this and also potentially, other related conditions.
- The project will enable Cardiff University to work closely with a SME in West Wales, helping them to further develop their business model and inform potential role expansion of the community pharmacist.
- The industry partner, Gravells Pharmacy, will also establish meaningful collaborative links with a local HEI, which can provide them with access to relevant expertise to further support the company development.
- Working closely with Scarlets to provide facilities and connections for future projects and research
- Case studies
- Peer reviewed publications



FUTURE IMPACT

- Potential for company growth and development in Wales through the delivery of a new, community-based therapy service
- Important pandemic research information for the treatment of long-COVID
- Alignment with the priorities underpinning a Healthier Wales, and the Well-being of Future generations (Wales)
- Positive impact on public health and community engagement
- Collaborative funding applications to support the undertaking of full-scale clinical trials.

AN INNOVATION CASE STUDY

CYNON VALLEY

PROJECT DURATION: 12 months

PARTNERS: Cynon Valley Organic Adventures Ltd, Interlink Rhondda Cynon Taf, Cwm Taf Morgannwg University Health Board, South Cynon Primary Care Cluster / Swansea University School of Medicine and Cardiff University

PROJECT AIM: To build, evaluate and promote engagement with a resource for green social prescribing

OVERVIEW

Our health is affected by many influences. Social and economic factors are known to influence health status more than clinical interventions. Awareness that long-term health conditions adversely impact social engagement, employment and mental health, is driving the exploration of new socially-oriented models for improving health outcomes.

Social prescribing involves non-clinical, community-based interventions for a variety of health conditions, as well as improving health behaviours and well-being, such as physical activity programmes, healthy eating advice, gardening, arts and volunteering.

Green social prescribing offers opportunities to improve health and well-being through access to green spaces and nature-based activities. Despite moves to embed social/green prescribing within the NHS, there is a paucity of robust evidence of its effectiveness, which would underpin its role in reducing poor health and inequalities.

Set in Rhondda Cynon Taff, one of the most socioeconomically deprived communities in the UK, this project builds on existing links between local GPs, wellbeing coordinators and Cynon Valley Organic Adventures, creating new opportunities to engage with a nature. In addition to building a new nature trail, the project explores its potential for improving well-being and explore engagement with those in positions to influence social prescribing practices.

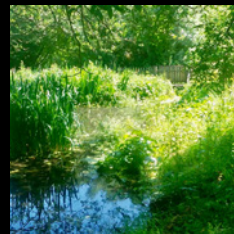
Accelerate is supporting the delivery of this collaborative project through the input of academic experts across 3 Cardiff University Schools, with engagement and project management expertise from by the Clinical Innovation Accelerator. The collaboration will enable:

- A review of published literature on Green Social Prescribing and assessment of the perceptions of community healthcare professionals about the value of such approaches.
- A community developed nature trail in Abercynon which will provide opportunities for GP referrals and community members to engage in nature-based activities
- An assessment of the impact of green prescribing on personal and societal wellbeing using an on-line self-assessment tool developed as part of this project.



"Cynon Valley Organic Adventures are delighted to be working alongside Cardiff University on this upcoming project. The project will not only give local people opportunities to improve well-being but will also help us to develop an amazing community space that will act as a source of learning and accessible green space for years to come."

Janis Werrett, Director CVOA



A diverse 2 acre environment, ideal for green prescribing referrals
(images courtesy of Cynon Valley Organic Adventures Ltd.)



EXPECTED OUTCOMES

- An interactive, co-produced and co-created nature trail in the Cynon Valley, serving the local community to promote improved wellbeing and long-term health outcomes
- An app-based wellbeing tool to measure subjective wellbeing of individuals engaging with the trail
- A model green prescribing approach which could be replicated at other sites across Wales
- Opportunities for further collaboration
- Case studies
- Peer reviewed publications



FUTURE IMPACT

- Increased awareness of the potential benefits of green prescribing for the local population amongst primary care healthcare professionals in South Cynon
- Evidencing engagement with nature through the medium of a nature trial has a positive impact on community wellbeing
- A model to inspire and support the implementation of green social prescribing across Wales

"Our partnership with CVOA and the people of Cynon Valley is about creating a trail which provides visitors access to nature and the benefits of being in green spaces. Green prescribing is very topical, but there is a need for more robust scientific evidence to help society gain a better understanding of the benefits it can bring to people's lives. Cardiff University will determine how connecting with nature promotes health and well-being. We will support the community by providing expertise from groups such as the Pharmabees project to help create vital pollinator friendly spaces, which we will link with educational resources."

Prof Les Baillie, Cardiff University

AN INNOVATION CASE STUDY

INVESTIGATION OF THE PROPHYLACTIC PROPERTIES OF A CONSORTIUM OF PROBIOTICS IN EXPERIMENTAL MODELS OF ALZHEIMER'S DISEASE

PROJECT DURATION: 18 months

PARTNERS: Cultech Ltd and Cardiff University

PROJECT AIM: To Investigate the properties of probiotic formulations in experimental models of Alzheimer's Disease

OVERVIEW

Cultech Ltd are a Welsh company specialising in the manufacture of innovative nutritional supplements, particularly probiotics. Their work has led to the generation of some preliminary findings suggesting that a probiotic nutritional supplement may reduce weight gain, inflammation and cognitive decline linked to a western style high-fat diet and impact upon Alzheimer's Disease (AD).

These findings support the growing body of evidence demonstrating the involvement of the gut-brain-axis in the development of AD, and suggest the possibility of a probiotic-based approach to preventing AD development. The company requires the support of academic expertise to validate and translate these early findings into meaningful outcomes along the evidence driven pipeline towards potential human studies.

Accelerate is supporting the validation and extension of work into a novel refined AD mouse model, by bringing Cardiff University academics and researchers together with the team at Cultech Ltd. The findings from this study would enable an in-depth assessment of the impact of probiotics on AD progression and two distinct probiotic products, one a new product for Cultech Ltd, will be compared to provide insight into the impact of different consortia. An important outcome would be the identification of potential plasma/faecal biomarkers for use in future human clinical trials.

Cultech Ltd



EXPECTED OUTCOMES

- A step towards a new product with novel attributes
- Generation of an evidence base to support the new product
- Economic growth for Cultech Ltd through product line development
- Knowledge expansion and insight in the field of neuro degeneration and probiotics for both Cultech Ltd and Cardiff University
- Generation of a pipeline towards patient based trials
- Peer reviewed publications and presentations
- Innovation case study.



POTENTIAL FUTURE OUTCOMES

- REF Impact case study
- The potential to have a significant impact on a global healthcare problem
- Data to seed further work in this area including funding bids and studies
- Patient based trials and the potential for patient health benefits
- Future collaborations and sharing of links between industry, academic and clinical partners

Feedback from a Director at Cultech:

"From Cultech's perspective the Accelerate Funding is very important helping us to develop a position in the neurocognitive market place. It is important to have a validated model to enable us to translate our lab-based findings into a meaningful output.

Ultimately the objective will be to run human trials but the information we will gain working with >1 model of the disease will be invaluable and would present a very strong basis to enable us (as a group) to apply for funding for human studies to facilitate the development of a new product line. The facilities available at Cardiff are excellent and as an indigenous Welsh Company we are delighted to be able to work alongside the experts in the field."

AN INNOVATION CASE STUDY

DEVELOPMENT AND VALIDATION OF A HEALTH PROMOTING TEA

PROJECT DURATION: 15 months

PARTNERS: Adwell Foods (Welsh Brew Tea) and
Cardiff University School of Pharmacy

PROJECT AIM: To develop a honey-based health tea
enriched in natural polyphenols and salicylates

OVERVIEW

Common age-related diseases such as cancer, cardiovascular disease and type 2 diabetes are more prevalent in western countries compared to Southeast Asia.

Higher relative risks for these major causes of morbidity and mortality have been attributed to dietary differences between the East and the West.

Evidence suggests that naturally occurring bioactive phytonutrients (beneficial plant-derived molecules) including polyphenols and salicylates have wide-ranging health benefits, reducing risks for diseases more commonly associated with Western diets.

Hypothetically, increasing consumption of polyphenols and salicylates will contribute to reduced incidences of major categories of human disease, particularly cardiovascular disease, cancer, neurodegenerative disease and recurrent bacterial infections. Numerous dietary components such as berries, cacao, honey and tea are particularly rich in risk-reducing polyphenols (PP) and salicylates (SC). However, more research is needed to improve evidence of their health benefits and the development of evidence-based natural foodstuffs containing augmented levels of risk-reducing compounds.

Accelerate supports this project as an extension of Cardiff University's on going research and innovation relationship with Adwell Foods. The project undertakes an intensive programme of research and development, building on Adwell's new health promoting honey tea.

A new enhanced blend of tea will be developed with physiologically optimised polyphenol and salicylate contents, enabling consumers to augment their intake of prophylactic compounds underpinned by evidence from a pre-clinical validation trial incorporating assays to monitor changes in PP and SC levels in healthy volunteer subjects. Evidence from the trial will inform the design, development and eventual implementation of full-scale clinical intervention trials of PP/SC optimised teas in patients with high risks of target pathologies.

Ultimately this novel tea product will be a unique addition to the retail market, demonstrating strong potential for novel evidence-based prophylactic food products in niche sectors of health and social care.



Honey is a rich source of natural polyphenols and salicylates



EXPECTED OUTCOMES

- A novel, validated health tea with evidence-based benefits
- A new niche health product launched to market
- A strategic re-branding, marketing and promotional drive founded on principles of environmentalism, science-based products and an ethos supporting honeybees
- Contribution to the evidence base behind dietary polyphenol and salicylate levels and disease prophylaxis
- Peer reviewed publications and clinical innovation case studies



FUTURE IMPACT

- The development of further blends of tea, underpinned by rigorously developed scientific evidence
- Collaborative funding applications to support the undertaking of full scale clinical trials, including at risk populations

Adwell Foods Limited is a family owned company established in 1993, located on the Gower Peninsula in South Wales. Their core product, Welsh Brew Tea, is an iconic Welsh brand, uniquely blended with African and Indian teas to complement Welsh water.

For nearly 30 years Adwell have continuously diversified and expanded their product lines. Recently, they teamed up with Cardiff University's award winning **Pharmabees Project** and Cardiff and Vale University Health Board to develop a novel health-promoting green tea augmented with Welsh honey, wildflowers and blackberries, due for launch in autumn 2020. Their ambitious and innovative development pipeline includes optimally formulated honey teas with clinically proven health benefits.



AN INNOVATION CASE STUDY

EMOTIONMIND DYNAMIC: EVALUATION OF A GUIDED SELF-HELP PROGRAMME FOR IMPROVING EMOTIONAL WELLBEING, SELF-ESTEEM AND EMPOWERMENT

PROJECT DURATION: 12 months

PARTNERS: Hayley T Wheeler, Speaker Insight, Bangor University, Hywel Dda University Health Board, Cardiff University.

PROJECT AIM: To explore the social and commercial value of Hayley Wheeler's novel approach to improving the mental health and wellbeing of adults and children through a mix-modality intervention, EmotionMind Dynamic.

OVERVIEW

Wellbeing is influenced by a complex interplay of emotional, physical and environmental. COVID-19 pandemic's impact on mental health has thrown this into sharp relief. For many years treatments for mental health have mainly been clinical, involving pharmacological and psychological treatments. Talking therapies, however, have long waiting times which potentially have adverse impacts on mental health outcomes. Diversifying the availability of interventions would help to address unmet needs by increasing capacity and broadening choice.

While needing robust safeguarding measures to protect vulnerable people, non-clinical approaches delivered outside of statutory services would increase choice, improve access and encourage innovation. For example, guided self-help coaching can help to enhance life skills, build resilience, confidence and self knowledge, leading to improved mental health and wellbeing. Emotion-Mind Dynamic (EMD), developed by Hayley T. Wheeler Ltd, is a novel mixed-modality programme comprising life coaching, mentoring, counselling skills, teaching and mindfulness.

Aims:

The project aims to develop evidence for the therapeutic potential of EMD. The Wales School for Social Prescribing Research has enabled Hayley to work with Bangor University's Social Value Hub to evaluate the efficacy of EMD, strengthening its appeal as a social prescribing referral option for Primary Care. Business development specialists, Speaker Insight, will work to enhance Hayley's leadership skills and progress her business model, fostering greater market penetration, business growth and sustainability.

"We are delighted to partner in this collaborative project. The team from the Social Value Hub, part of CHEME - Dr Mary Lynch, Prof Rhiannon Tudor Edwards, Dr Ned Hartfiel and Eira Winrow - are excited to join forces with Hayley Wheeler and the Accelerate team to undertake the Social Return on Investment (SROI) evaluation of the EMD programme. This cooperative approach between academics and Hayley should provide valuable insights on this innovative non-clinical approach to addressing mental health and wellbeing."

Dr Mary Lynch, Bangor University

"We are truly excited to be part of this project. At Speaker Insight, we champion thought leaders and changemakers who want to help others and make a positive impact on the planet. Hayley's approach and methodology is innovative, inspiring and potentially life changing, at a national and even global level. Her vision matches that promise."

Helena Holrick, Director Speaker Insight Ltd

Accelerate is supporting the delivery of this project through the Clinical Innovation Hub's expertise in project management, building multi-disciplinary work packages led by expert collaborators. This project embeds research expertise at Bangor University's Social Value Hub in conducting Social Return On Investment evaluations, ethical, and commercial development expertise of Speaker Insight, and Hywel Dda UHB Research Innovation and Improvement Hub to facilitate referrals.

Hayley Wheeler's collaboration with these partners aims to develop her EMD programme with an improved business model and further enhance her recognition for delivering effective, non-clinical well-being support.



"I love being happier in myself and a more positive mindset. I enjoyed how much it changed my life and mind set, disliked opening up at the start."

EmotionMind Dynamic client



EXPECTED OUTCOMES

- Successful entry to the online space for non-clinical guided self-help wellbeing support
- Increased company recognition and reputational gain through evidence-based wellbeing interventions
- Contribution to online wellbeing services for clients impacted by the COVID-19 pandemic and learnings about the consequences of COVID-19 on emotional wellbeing
- Enhanced knowledge of the online wellbeing space, enabling greater strategic approach to targeting the client market
- Case studies and peer-reviewed publications



FUTURE IMPACT

- Business expansion through online delivery of EmotionMind Dynamic, and an expanded service provision
- Opportunities for new evidenced-driven collaborations between project partners
- Environmental gains through provision of online support and life coaching, mitigating carbon footprint
- Contribution to a Healthier Wales through enhanced well-being, leading to social and economic gains

Hayley Wheeler's thoughts on working with CIA Accelerate

"I feel privileged to be working with and supported by Accelerate. It has empowered me to set my goals and take the right actions to achieve them. It's opening doors to make new connections in the right networks. I'm now working with business consultants defining my EmotionMind Connection Therapy business model for licensing and also with Bangor University, researching the efficacy of EmotionMind Dynamic in action."

AN INNOVATION CASE STUDY

MAKING WELL: HEALTH & HEALING THROUGH GREEN CRAFTS

PROJECT DURATION: 6 months

PARTNERS: The Fathom Trust, Brecon Mind, Powys Teaching Health Board, Bangor University and Cardiff University

PROJECT AIM: To test the idea that an embodied-relational approach to health and healing, using green crafts, can help people re-evaluate habits of self-perception and find paths to recovery, resilience, and regeneration

OVERVIEW

Healthcare needs should be met in the most appropriate environment. For some people, a non-clinical setting is the preferred and more suitable option. It is also one that can demonstrate better sustainability, flexibility, and potentially a better return on investment.

Green care is a provision that sits within the field of social prescribing and is aimed at supporting people with a defined health need. It employs structured activities such as horticulture, animal care, physical activity and crafting as a way of interacting with nature. This engagement with nature has been linked to physical, emotional, social and cognitive outcomes. As such, it has support from the Royal College of Psychiatrists, and is increasingly being enthused by GPs.

The Fathom Trust is a Welsh social enterprise providing green care through traditional craft making, nature conservation, and facilitating reflective practices. Its volunteers offer activities which engage with the natural world through a holistic approach, 'Fathoming', to enhance well-being through the experience of grounding oneself in nature.

The Making Well programme aims to improve health outcomes for people with long-term conditions. It is delivered by The Fathom Trust in a rural setting in the Brecon Beacons. Through an 8-week course, Making Well integrates the unique skills of local crafts people with the mental health expertise of Dr William Beharrell. It aims to:

- Use craft and nature-based activities to improve wellbeing.
- Improve service delivery in primary healthcare.

"The Making Well programme is an opportunity to nurture connection and meaning in our lives and in our community, a space for self-care, reflection, learning and friendship." Jess, Horticulturalist

Accelerate is supporting this programme from an academic and project management perspective. Local GPs and Mind Cymru will facilitate referrals to the study, supporting the evidence base. Social Prescribing experts at Bangor University will undertake a Social Return on Investment (SROI) evaluation with a Theory of Change model. Social Scientists at Cardiff University will undertake an ethnological study to develop a Practices of Change model. This collaborative project will also involve the Fathom Trust working closely with other locally based teams, including the Green Minds project and mental health teams.



Green crafts - Images courtesy of The Fathom Trust



EXPECTED OUTCOMES

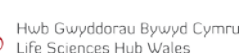
- A social return on investment (SROI) evaluation of the programme, with internal and public-facing reports. Initial data indicates an SROI ratio of nearly £5 social value generated from £1 invested
- A Practices of Change model
- Establishment of multi-disciplinary referral routes, supported by preliminary evidence of 40-50% improvements in individual wellbeing achieved through engagement in Fathoming activities
- Increased volunteering opportunities within the community
- A promotional film for 'Making Well: Health & Wellbeing Through Green Crafts'
- Opportunities for further collaboration between partners
- Peer reviewed publications



FUTURE IMPACT

- Potential to optimise the programme's social value
- A developed understanding of the fathoming process is a translational output to be shared with other green social prescribing programmes
- A deeper appreciation of green social prescribing practices and the relationship with social interaction and well-being

"When you're in hospital, you're in a very small room. It's plain and it's clinical.. You're very aware you're being analysed all the time and it can be overwhelming. When you're at Fathom, you're outside in the fresh air and you can see the greenery and mountains and it's a more pleasant environment to talk about your mental health."
Making Well Participant



AN INNOVATION CASE STUDY

OPENING DOORS TO THE OUTDOORS

PROJECT DURATION: 8 months

PARTNERS: The Outdoor Partnership | Partneriaeth Awyr Agored, Bangor University, North Wales Recovery Communities, KIM Inspire, Cardiff University

PROJECT AIM: to explore the subjective experience and the Social Return On Investment (SROI) in active pursuits for participants referred by social prescribers, GP practices, and local community mental health teams

"We've been extremely fortunate to have the support of Accelerate working alongside expert academics. It's allowed us to maximise impact and improve our offer, both internally and externally. We're now perfectly positioned to share good practice across Wales and further afield."
Tracey Evans, CEO

OVERVIEW

The Outdoor Partnership (TOP) is a leading social enterprise located North Wales. Their vision is to enhance the health and wellbeing of people living with mental health difficulties, through facilitating guided participation outdoor activities. Among these are walking cycling, and outdoor pursuits such as climbing, canoeing and sailing. They envisage a generational change in which engagement with outdoor activities is an accepted feature in the lives of people in their community. They aim to build capacity to support participation and skills development and enhance partner delivery models to develop a robust delivery framework for Wales and beyond. They focus on grassroots participation, strengthened by partnership with National Governing Bodies. TOP prioritises an effective developmental continuum for participants while supporting the vital strategic work of NGBs.

In this project, TOP are running a programme of organised group activities, 'Opening Doors to the Outdoors', evaluated by Bangor University's Social Value Hub in terms of subjective experience and Social Return On Investment (SROI) for participants referred by GPs, social prescribers, and community mental health teams. The project addresses TOP's key strategic objectives:

- To deliver generational change to encourage lifelong participation in outdoor activity and support recovery from the COVID pandemic
- To build capacity to support local participation, performance, skills development (first time experiences – through to long term sustainability and repeat activities) and employment of all ages
- To enhance partner delivery model to develop the current framework across the rest of Wales and throughout the UK, and
- To develop quality products offering enjoyable outdoor experiences

Accelerate supports this project through Cardiff University's School of Geography. Researchers from Bangor University are working with Outdoor Partnership and local support groups to examine the benefits and social value of instructor-led activity groups in North Wales.



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EXPECTED OUTCOMES

- Evaluation of 'Opening Doors to the Outdoors' will enable The Outdoor Partnership to upscale their Healthy & Active Walking programme, upscale its activities and share good practice throughout Wales and in new regions of the UK
- New opportunities will arise for a range of packages to evolve via a toolkit approach as part of TOP's funding and income strategy to support long-term investment
- The evaluation will allow the Charity to demonstrate its social value and health service savings when bidding for funds to upscale and sustain future projects
- The SROI will advance our understanding of social prescribing beyond the confines of public health intervention by describing human action and social processes at their centre
- The findings will enable Bangor Uni to do further work in public health and preventative economics, with an academic paper comparing and contrasting SROI and Social Cost Benefit Analysis methods (expected Jan 2023)
- The study will build on evidence for novel approaches to describing social prescribing interventions, centred on the activities of participants and experienced project leaders



POTENTIAL FUTURE OUTCOMES

- Enhanced ability to manage and optimise social value and increase opportunities for future participation
- Broadened appeal to groups with unmet health needs
- Benefits to local economy, environment and services, informed by the nature and extent of social value found
- Greater alignment with priorities underpinning a Healthier Wales, and Well-being of Future Generations Act (Wales)
- Sustainable business growth with an expanded portfolio

"At the start of my life, I was homeless, sleeping rough on the streets. I contacted the Outdoor Partnership and joined their Pathways to Employment programme, gained qualifications and became an instructor. I'm now working alongside the Outdoor Partnership, which is amazing!" - Ryan, Climbing Instructor

"When the first 12 week block finished some people said, 'you wouldn't take away our medication, how can you take this away?' - Anthea, Instructor

AN INNOVATION CASE STUDY



HIGH STREET FITNESS: THE CREATION OF COMMUNITY-LED HEALTH RESILIENCE CENTRES IN AREAS OF HIGH SOCIOECONOMIC DEPRIVATION

PROJECT DURATION: 8 months

PARTNERS: High Street Fitness, MIND and Cardiff University

PROJECT AIM: To create a community-led and focused Health Resilience Centre.

OVERVIEW

Even before the impact of COVID-19, it was recognised that delivering improved health outcomes would involve adapting and adopting new ideas and sustainable ways of working that would result in a positive impact for people, patients, staff and volunteers.

The project will co-create a Health Resilience Centre within a deprived community that will remove financial barriers to access, change perceptions of high-quality fitness, mental health awareness.

In order to make the centre accessible to as many people as possible we will work closely with community leaders, GPs, Social Prescribing Groups, Health Boards, Local Authorities and Health Science Academics and the charity MIND.

We have employed a research-based approach to inform on impact, change and direction to the strategic approach and micro strategies.

The effective implementation of such centres in deprived areas has the potential to improve health outcomes; provide opportunities for people and reduce drug related harms; improve socioeconomic indicators; and generate growth in employment opportunities for people in Wales around the production of healthcare innovation.

Accelerate is supporting the delivery of this project through Cardiff University's School of Healthcare Sciences. Following on from the success of the award-winning Wellbeing Hub in Pontypool Cardiff academics are partnering with industry to undertake a number of evaluation methods to evidence and obtain key information of the benefits created by the HRC intervention. The outcome of which will be a rapid realist evaluation to determine how, why, for whom and under which conditions the High Street Fitness and Wellbeing Hub in Pontypool works.

The official partnership with Mind Cwm Taf Morgannwg is an important one. Mind splits its operation by borough, ensuring that each faction of Mind has a real local feel to it. High Street Fitness and Wellbeing want to work the same way; a local community facility, run by the local community. Our partnership with Mind throughout the Accelerate project means we can offer a 360 approach to health and wellbeing that will evidence:

- Generational change for the lifelong participation in health, activity, and support
- Building capacity to support local participation performance, skills development and confidence in all ages
- Enhancing the partner delivery model to develop the current



EXPECTED OUTCOMES

- Sustainable reductions in medical approaches to health, potential reduction in prescription medicines and improvement in mental and physical health outcomes
- Research evidence describing how, why, for whom and under which conditions HRCs work
- A model defined by co-created community engagement, demonstrating partnership building that de-risks the process of HRC commissioning, and one that increases sustainability and outcomes aligned with community needs
- Diversification of the business activities and employment supported by evidence
- Opportunities for further collaboration between project partners and funding application development
- Case studies
- Peer reviewed publications



POTENTIAL FUTURE OUTCOMES

- Increased awareness of the benefits of HRC for the local community, amongst health and social care professionals, and local social interest groups
- Evidence to show HRCs have a positive benefit for individual health, social cohesion and community recovery post-pandemic
- Alignment with the priorities underpinning a Healthier Wales, and the Well-being of Future generations (Wales)
- Positive impact on public health and well-being
- Potential for company growth and development in Wales through an expanding product portfolio

Daniel Crandon, CEO High Street Fitness - "Working on this project with Accelerate has really allowed us to establish what we think we got right and what we need to improve as we take this project forward and into other boroughs throughout Wales. The project with Accelerate allows us to improve our practices and eliminate errors we have already made ensuring our expansions are as seamless as possible."

AN INNOVATION CASE STUDY

MAKING SPACE FOR NATURE: A CO-PRODUCTION WITH THE COMMUNITY SURROUNDING PENTRE AWEL

PROJECT DURATION: 6 months

PARTNERS: Urban Habitats Consulting Ltd, Ysgol Pen Rhos, Carmarthenshire County Council and Cardiff University

PROJECT AIM: To co-create a community-led and focused space for nature in the community.

"Urban Habitats firmly believes that evidence and research co-produced with communities is a powerful tool in health creation. Research and evidence informed approaches are not sufficiently prioritised in the built environment sector and children's voices are often missing. And yet for us this is central to our practice/se. Accelerate has helped Urban Habitats to extend, diversify, and build our work in partnership with leading thinkers and educationalists."

Mark Drane, CEO Urban Habitats

OVERVIEW

The aim of our project is to work with the community surrounding Pentre Awel to co-produce plans for making space for nature in the existing community and in the future at Pentre Awel. Pentre Awel is a new development along the Llanelli coast that will include housing, business, education, research, and leisure facilities. Our project will engage children, parents and teachers at Ysgol Pen Rhos in open-ended conversations about their communities and physical environments, provide creative making tasks to elicit design thinking around how communities connect with nature and with each other, and yield an action plan for making space for nature in communities. Our project creates an opportunity for both children and adults to use their "outside voices" and a mechanism for their voices to be heard.

Furthermore from a perspective of health creation, access to nature including green and blue (water related) space is one of six priority areas identified in Creating Healthier Places And Spaces For Our Present And Future Generations by Public Health Wales (2018). These priority areas require parallel action and so cannot be seen in isolation, they include:

- walking and cycling infrastructure
- green and blue infrastructure
- food growing and retail environment
- community, health and social care services from local facilities
- low levels of air pollution
- building design

Accelerate is supporting the delivery of this project through Cardiff University's School of Psychology and School of Geography and Planning. Researchers from Cardiff University have been working in partnership with Ysgol Pen Rhos, Urban Habitats, and Learning through Landscapes, to co-produce plans for natural spaces in the existing community and the future development, Pentre Awel.



EXPECTED OUTCOMES

- An understanding of the benefits of natural environments; barriers and challenges to engaging with natural environments
- Delivery plan for how the community surrounding Pentre Awel can make space for nature in the future
- Actionable guidance for stakeholders
- Opportunities for further collaboration between project partners, student and funding application development
- Case studies and impact case studies
- Peer reviewed publications



POTENTIAL FUTURE OUTCOMES

- Increased awareness of the benefits of the natural environment to children, adults and the community
- A positive impact for individual health, social cohesion and wellbeing outcomes, encouraging environmental concern and action
- A successful strategy for community involvement will provide a tool box of ideas for adoption in other communities
- Alignment with the priorities underpinning a Healthier Wales, and the Well-being of Future generations (Wales)
- Potential for company growth and development in Wales through an expanding product portfolio

"The opportunity for children at Ysgol Pen Rhos to work with experts in their respective academic fields provides a richness to our curriculum that is unique. At the heart of this fantastic collaboration are children's voices and thinking about where they live, their community and what they want to see change. These authentic learning experiences are treasured by us as a school community and we look forward to change that they will bring."

Dr. Joe Cudd, Executive Head Teacher, Ysgol Pen Rhos

AN INNOVATION CASE STUDY

FITKIT POSTURAL CORRECTION EXERCISES FOR ADOLESCENT CHILDREN.

PROJECT DURATION: : 4 months

PARTNERS: : Fitkitpro International Ltd, Cardiff University

PROJECT AIM: For all children leaving for secondary school, happy, healthy, fit, and strong within themselves.

"In Wales, approximately 1.6 million adults are classified as overweight and 655,000 as obese. In addition, more than one in four of children in Wales are overweight or obese when they start primary school. It is estimated obesity costs the NHS £6.1 billion per year across the UK."

Public Health Wales, June 2022

OVERVIEW

Back pain has been reported to be as common in adolescents as it is in adults. It is estimated that 30-70% of adolescents report episodes of back pain between the ages of 10-17 years." East Sussex Healthcare Trust (NHS).

Children are sitting for long periods of time at school, and with the growth of social media and computer games, they are sitting more at home as well. However, the real issue is about how we sit, not the fact that we are sitting. Countries that still sit in a squat position do not have the lower back pain problems that we have, primarily because sitting doesn't require much use of your body's muscles.

The prime focus of the pilot scheme would be to provide the opportunity for every pupil, irrespective of currently how active/fit/or involved in sport that child is, to engage in a range of safe and enjoyable exercises within a gradually progressive controlled programme, with the aim of combating the debilitating effects of modern societies reliance on "Sitting/crouching over", by activating and strengthening the muscle groups not utilised when sitting".

The FK Pro System utilises the individual's own body weight as the resistance, at as small a percentage as safe and appropriate. This therefore allows even the most de-conditioned person to safely use the FKPro System. Every muscle group is used through a full range of movement, reminding the body how it should move and correcting dysfunctional movement patterns and posture. In doing so we strengthening of the support and stabilising muscles as well as the prime movers, these are the ones that are overlooked in any machine-based exercise.

Accelerate has supported FKPro by providing collaborative engagement opportunities, by bringing together Fitkitpro International Ltd with a number of schools in Wales in less affluent regions. FKPro will evaluate the children's interaction with the product and the effectiveness and uptake in use.

"I've had to deal with many NGBs and all the way up to the UK government, I can honestly say that Sue Bevan and Suhair Jawad and Accelerate have been amazing to work with. They have gone above and beyond anyone that I have dealt with before. Their help has been fast, efficient, extremely friendly, I cannot praise them enough."

Peter Faulkner, Director / Founder Fitkitpro International Ltd



- The FKPro suspended bodyweight training system is a tried, tested and effective training modality at every level. Safe to use by children, it is also used by Welsh, British, European, World, Paralympic and Olympic champions, as well as a vast range of professional and international teams.
- FK Pro is an award-winning British company working in collaboration with World Rugby on their global education program, working in association with the GB Equestrian World Class Program, and is the official supplier to the English Institute of Sport, who look after the Team GB Olympic athletes.



EXPECTED OUTCOMES

- To provide the opportunity for every pupil, irrespective of currently how active/fit/or involved in sport that child is, to engage in a range of safe and enjoyable exercises within a gradually progressive controlled program.
- To combat the debilitating effects of modern societies reliance on "sitting / crouching over" by activating and strengthening the muscle groups not utilized when sitting.
- FitKit Pro is already available in England but will be new to the Welsh market.



POTENTIAL FUTURE OUTCOMES

- A positive impact on the pupils' physical health. It will improve their postures, and their movement as a whole. More of them will feel able to play a sport, without feeling out of place.
- An economic impact. Half of teachers have at least one day off work due to lower back pain. This training program will help improve stability and reduce lower back pain, decreasing time off work due to lower back pain.
- A positive impact on cost saving and pressure reduction on NHS Wales.
- Equipment manufacture, training facility, and office will all be in Wales, creating new jobs in the community.

Summary of Achievements





COVID

Over the course of the COVID pandemic, the Clinical Innovation Accelerator (CIA) has had the opportunity to facilitate a range of innovative projects that have contributed to the COVID-response across Wales. A number of these projects were conducted in Cardiff University's BSL category 3 laboratory, with CIA supporting the time of research associates to deliver this work.

Some of the 14 CIA supported COVID-response projects are available to view as case studies (see contents page), the others are summarised below.

Testing the efficacy of BCB manufactured hand sanitiser against the SARS-CoV-2 Virus



Partners: BCB International and Cardiff University

Since the COVID pandemic emerged, the use of hand sanitisers have become increasingly important. Whilst a range of hand sanitisers are available on the market, there is a paucity of evidence to support their effectiveness against the SARS-CoV-2 virus. BCB International have a hand sanitiser (80% alcohol denat) on the market, but at present its effectiveness against the SARS-CoV-2 virus has not been substantiated. This collaborative project tested the efficacy of the hand sanitiser manufactured by BCB International. Using Cardiff University's dedicated BSL-3 laboratory, the team looked at the effectiveness of this hand sanitiser under different conditions (such as the quantity of virus and contact time), a comparison against other hand sanitisers on the market, and validating the alcohol quantity. The results found that the hand sanitiser consistently achieved at least 99.9999% reduction in virus infectivity against SARS-CoV-2 following a 10-second contact time of the product and virus.

Outcomes:

- A data package around the efficacy of the BCB hand sanitiser against the SARS-CoV-2 virus and the percentage alcohol it contains.
- Evidence to support the potential for BCB's hand sanitiser in preventing the transmission of SARS-CoV-2 virus.

Testing the efficacy of a novel polymer-based formulation for surface cleaning against microorganisms, including SARS-CoV-2

Partners: Connect Electronics and subsidiary, Connect Protection, and Cardiff University

Since the COVID-19 pandemic, the need to be able to sanitise and sterilise clinical and non-clinical surfaces has become of paramount importance. This project is primed to refine the development of an all-in-one product, designed to clean, sanitise, and deposit a protective layer on surfaces, focusing on killing, and providing a residual barrier against micro-organisms, including SARS-CoV-2. This novel, non-alcohol-based formulation will be developed to deliver prolonged action through the use of polymer technology. With Connect Electronics working with a formulations lab to optimise the product formulation and commercialise the product through its company registered in Wales, Connect Protection, this collaboration with Cardiff University seeks to test the efficacy of the formulation. This will be undertaken in Cardiff University's BSL category 3 laboratory against relevant virus, fungal and bacterial agents, including viable SARS-CoV-2. Its efficacy over a prolonged duration (several days) will also be quantified.

Expected Outcomes:

- A novel methodology for testing a prolonged action surface cleaner.
- A publicly disseminated data package on the efficacy of these formulations against selected microorganisms including the SARS-CoV-2 virus.
- An evidence base supporting new product lines.



Testing the efficacy of a grapefruit extract based anti-bacterial/anti-viral cleaning formulation

Partners: Care-Wipes and Cardiff University

Cleaning products employed in healthcare settings must demonstrate effectiveness in destroying bacteria and viruses. However, many of the products used contain levels of bleach or alcohol and this use of chemicals comes at a cost to human and environmental health. There is also danger in mixing alcohol and bleach-based products as they form chloroform.

Care-Wipes are developing a cleaning formula aimed at the healthcare environment that offers a safer option to bleach or alcohol-based products. This project aims to optimise the formulation and test the efficacy as an antibacterial and anti-viral cleaning solution, whilst ascertaining the most appropriate forms for this product to be used within healthcare.

Expected Outcomes:

- An optimised formulation.
- Efficacy data on the formulation as an anti-bacterial and anti-viral cleaning product.
- A cleaning product with enhanced health and environmental profile.
- A cleaning product available in the formats that best support healthcare needs.

Testing and evaluating alcohol-free sanitiser and surface hygiene in practical applications

Partners: Waterless Ltd and Cardiff University

The COVID pandemic has led to an increase in the use of hand sanitisers by the public. Many of the hand sanitisers that have demonstrated efficacy against viruses contain high levels of alcohol. These high levels of alcohol are not only flammable but can result in dry, sore skin, and in some groups of people (the young, elderly and those with sensitive skin) dermatitis. Waterless have developed a non-alcohol based hand sanitiser called Nilaqua. Nilaqua is kind to skin, has a low safety risk, is effective in killing viruses and bacteria, and has demonstrated a post application protection (in vitro) of up to 6 hours. This can encourage use and reduce cross contamination. This project will bring the formulation experience of Waterless's sanitising solutions together with the academic expertise and facilities of Cardiff University to explore the 'real world' application of Nilaqua. It will determine the effectiveness of Nilaqua against viruses on skin and surfaces in an ex-vivo model.

Expected Outcomes:

- Development of testing methodology that mimics 'real world' application.
- Evaluation data of the efficacy of Nilaqua as a long action hand sanitiser and its effectiveness against viruses.
- An evidence base to support the promotion of effective, non-alcohol containing hand sanitisers.

Developing novel, low seroprevalence adenoviruses as vaccine vectors

Partners: InBio and Cardiff University



Adenoviruses as viral vectors make effective vaccine platforms, as they induce robust and durable antigen-specific immune responses. Following the rollout of adenovirus-based COVID-19 vaccines and the likely need for repeated vaccinations to manage emerging SARS-CoV-2 variants, the development of immunity against these vectors is possible. This anti-vector immunity could lead to a reduction in vaccine efficacy, and therefore novel adenoviral vector platforms need to be developed using other adenovirus serotypes with low seroprevalence in the human population. This project will evaluate the innate and adaptive immune responses induced by a panel of novel human adenoviral vectors and vector pseudotypes, when administered in a preclinical model. The adenovirus panel has been selected based on preliminary data that show potent in vivo adaptive immunogenicity against an encoded transgene, proven pre-clinical induction of mucosal immunity in vivo; and finally in vitro and in vivo cellular targeting through altered adenovirus receptor tropisms.

Expected Outcomes:

- Expanded research strategy for InBio, from allergy to infectious disease.
- Identification of new adenoviral vectors that have hallmarks of good vaccine candidates.
- A targeted approach to the respiratory mucosa, with potential to develop vaccines with improved transmission-blocking properties and higher protection against even mild COVID-19 disease.



Viruferrin® testing and manufacturing a dry powder nebuliser / inhaler to support the management of COVID-19

Partners: Virustatic Ltd and Cardiff University

There is currently no cure for the SARS-CoV-2 virus, and therefore a need to explore anti-SARS-CoV-2 agents. Viruferrin® contains a naturally produced immunomodulatory protein. Its role in the immune system lies in its ability to bind to pathogens and inhibit their function. Lower than usual levels of this protein have been found in the respiratory tracts of those presenting more severe symptoms of SARS-CoV-2. Viruferrin® contains a protein that has been used in the management of respiratory diseases. This project will produce and test Viruferrin® as a dry powder nebuliser or inhaler against SARS-CoV-2 virus.

Expected Outcomes:

- Production and characterisation of spray dried Viruferrin®.
- Information on anti-SARS-CoV-2 activity of Viruferrin®, the Viruferrin® formulation, and the Viruferrin® formulation from impactor chambers mimicking the human lung.
- Potential contribution to a portfolio of protein-based products aimed at addressing unmet clinical needs.

Optimising the antimicrobial formulations required for a misting device

Partners: F&K Holdings and Cardiff University

Hypochlorous acid (HOCl) is produced naturally by white blood cells to fight infection. It can also be formed when chlorine is dissolved in water, and when dissolved in water, HOCl has shown itself to be an effective and non-toxic disinfectant. With recent advances it is now possible to stabilise HOCl and prolong its shelf-life from 1-2 hours to up to 24 months. F&K Holdings have an innovative sterilisation product based on a novel, stable form of hypochlorous acid (HOCl), that inactivates viruses, bacteria, endospores, and fungi, and is non-hazardous. This has the potential to be an effective, environmental disinfectant, which could be dispersed through a misting device and used as a hand sanitiser. This project with Cardiff University looks to optimise the formulation and determine the efficacy of the different formulations on live SARS CoV 2 virus and a complete suite of other viruses, bacteria, fungi and spores.

Expected Outcomes:

- Optimisation of a novel formulation of HOCl based sanitiser.
- A data package underpinning the efficacy of these formulations against selected microorganisms including the SARS-CoV-2 virus.
- New product line 'Made in Wales'.

Concluding Statement

The programme of work delivered by CIA has enabled targeted support for Welsh enterprises and health boards to make significant advancements towards healthcare provision and economic development.



Effective R,D & I Collaborations

ERDF contribution £6M
Partner contribution £7M
Cardiff contribution £3M



Pan Wales project

engagement from Health
Boards and Welsh enterprises



Supported **165**
business-academic-clinical
collaborations

The success of this work has been made possible through the building of effective collaborations; underpinned by the clinical innovation skill set of CIA, and the clinical and commercial expertise of their project partners. Through the sharing of risks and rewards, the opportunity to develop, refine and advance innovative practices has brought tangible benefits to health and care practices, service provision, education, and social well-being. The strength of this work lies in the number of sustainable processes and best practice models that are contributing to a pan Wales legacy of delivering a Better Wales. The impact of this work will continue to be realised beyond the lifespan of Accelerate, with opportunities to translate and commercialise these innovations beyond Wales.