UNIVERSITY OF BIRMINGHAM

think
Business with Birmingham
issue four

A route to better health

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think health

A route to **better health**

The University of Birmingham has transformed how clinical research is carried out in the community through the development of the first mobile clinical research facility in the UK – the pioneering Health Research Bus (HRB).

The work of the HRB embraces a wide range of activities including clinical studies, scanning programmes and health promotion activities and has already been used at sites such as GP surgeries, sporting facilities, city markets as well as being open to the public at a variety of events including the National Science Festival.

Professor Paul Stewart, Dean of Medicine said: 'The facility offers a unique opportunity for researchers by bringing research straight into the community and allows access to cutting-edge clinical facilities. It helps us to reach large parts of the population which have previously been difficult to engage, notably young children, the elderly, and ethnic minority groups as they find the experience of taking part in research intimidating or may have difficulty travelling.'

'Doctors can be out in the community conducting simple, but essential clinical trials through investigations, observations or just interviews. The Health Research Bus will also help to raise public awareness of the major health issues facing the UK including obesity and healthy ageing; both of which are major research strengths for the University.'

Professor Paul Stewart
Dean of Medicine, University of Birmingham

The bus was funded by Birmingham Science City via Advantage West Midlands and the development has been a partnership, with the facility being run through the Wellcome Clinical Research Facility (CRF) at University Hospitals Birmingham NHS Foundation Trust and Birmingham Children's NHS Trust.

The Health Research Bus can also be used in partnership with businesses and organisations who are seeking to engage with the community in delivering or promoting clinical research or healthcare in the West Midlands.

Birmingham Science City

Learn more
www.birminghamsciencecity.co.uk/research-alliance
contact: c.potter@bham.ac.uk

* This project is part of a larger investment by Advantage West Midlands in the research infrastructure of the West Midlands region, which unites the Universities of Birmingham and Warwick in a strategic research partnership – SCRA – formed under the Birmingham Science City initiative.

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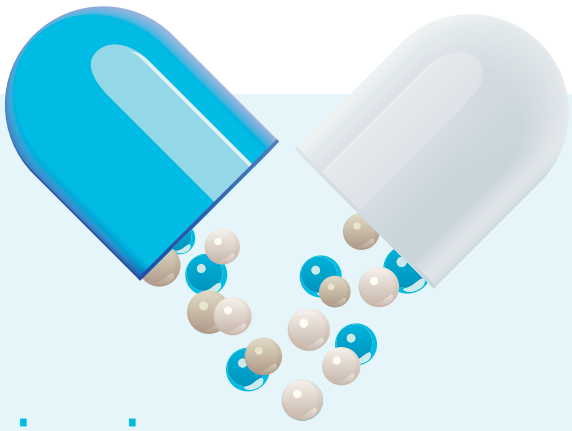

Re-designing the 'designer' drug

Scientists at the University of Birmingham have discovered a modified form of the drug MDMA – commonly known as Ecstasy – which has 100 times more cancer-busting properties than the popular recreational drug itself and which they hope may be able to be produced in a safe form to treat patients suffering from leukaemia, lymphoma and myeloma.

The new work builds on the scientists' discovery six years ago that more than half of the cancers of white blood cells they looked at responded in the test tube to the growth-suppressing properties of psychotropic drugs including amphetamine derivatives such as Ecstasy and anti-depressants such as fluoxetine (Prozac).

At the time, the team stressed that translating their laboratory findings into a useable clinical compound would present significant problems, not least because the dose of MDMA required to treat a cancerous tumour would have proved fatal to the patient. They aimed to break down the actions of the drug to isolate its cancer-killing properties from its general toxicity.

Working with researchers from the University of Western Australia who produced the new compounds for them, the Birmingham scientists found specially modified forms of Ecstasy boosted in their ability to attack and destroy cancerous cells by a factor of 100. Importantly for the future, they believe they understand the mechanism behind this.

'This is an exciting next step towards using a modified form of MDMA to help people suffering from blood cancer. While we would not wish to give people false hope, the results of this research hold the potential for improvement in treatments in years to come.'

Lead author Professor John Gordon, University of Birmingham's School of Immunology and Infection

Professor John Gordon is also co-founder, CSO and Director of University of Birmingham spin-out company, Celentyx Ltd. Celentyx is a human immune system focused R&D and service company that develops treatments for serious common diseases by utilising it's unique Immuno-Profiling™ platform to investigate the human immune system at the highest levels of resolution.

University of Birmingham spin-out companies

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think energy

The rare earth challenge

Rare earth elements, including neodymium, samarium and dysprosium, are used in high energy permanent magnets. Neodymium iron boron (NdFeB) magnets are used in many green technologies including generators for wind turbines and motors in electric vehicles. They are also a fundamental component in high technology products, such as computer hard drives.

Global industrial demand and the increasing development of green technologies has caused a shortfall of rare earth elements available on the world market and resulted in prices for neodymium and dysprosium soaring from around $20/kg and $150/kg to $420/kg and $3500/kg respectively over the last 18 months.

A team of researchers at the University of Birmingham has risen to the challenge of finding a more sustainable solution by recycling the existing stock of scrap rare earth magnets contained within electronic equipment.

Over the last seven years, Dr Allan Walton, Dr John Speight, Professor Rex Harris and the late Dr Andy Williams from the School of Metallurgy and Materials have developed techniques to separate and reprocess scrap magnets. Hydrogen gas is used to break down permanent magnets contained within scrap hard disk drives into a soft magnetic powder (a process known as Hydrogen Decreptiation – HD). As the resultant powder is no longer permanently magnetic it does not stick to other ferrous components and can, therefore, be easily separated from the electronic equipment in which it is housed. The powder can then be directly re-formed into new magnets with properties close to those found in commercial magnets made from primary sources.

Dr Walton said 'The demand for rare earth elements is set to double in the coming years and production is struggling to keep pace. With over 600 million hard disk drives being manufactured every year, which contain rare earth magnets, there is clearly a huge recycling opportunity that we were keen to explore.'

Most of the energy and cost associated with producing rare earth magnets is from the mining of the ores, refining out the pure metals and casting the alloy. Therefore, by using this new method the financial and energy savings will be significant.

This is just one of the technologies available for licensing through Alta Innovations, the University of Birmingham's technology transfer company.

Technology and IP

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'The demand for rare earth elements is set to double in the coming years and production is struggling to keep pace. With over 600 million hard disk drives being manufactured every year, which contain rare earth magnets, there is clearly a huge recycling opportunity that we were keen to explore.'

Dr Allan Walton
School of Metallurgy and Materials
University of Birmingham

think advanced manufacturing

Driving innovation with Aston Martin

Scientists and the business development team at the University of Birmingham have developed a mutually rewarding relationship with luxury sports car manufacturer, Aston Martin. The two organisations are working together on a number of projects that utilise several different areas of the University's expertise.

An initial project through the Advanced Materials programme, part of the Science City Research Alliance* initiative, looked at investigating the company's paint processes and successfully identified areas for improvement. This project led to further work with the Interactive Multimedia Systems Group in the University's School of Electronic, Electrical and Computer Engineering which is focussing initially on human factors and future instrument panel design.

Aston Martin are also a valued sponsor of the University's entry in the Formula Student UK competition where a race car is produced by engineering students. To support this work Aston Martin donated one of their cars to the School of Mechanical Engineering for the students to use in their research. Head of the University's Manufacturing Technology and Systems research group, Mark Jolly, said 'We really appreciate the generosity of Aston Martin in donating one of their state-of the-art cars to our School, their cars are exemplars in the use of a wide range of Advanced Materials and this has greatly enhanced the practical learning experience for our students'.

'We are very keen on promoting engineering as a future career choice and the opportunity to partner with the University of Birmingham on a number of different projects will hopefully inspire undergraduates through exposure to practical application of their degree discipline.'

Ian Minards, Product Development Director for Aston Martin

*The Advanced Materials Project is part of a larger investment by Advantage West Midlands and ERDF in the research infrastructure of the West Midlands region, which unites the University of Birmingham and the University of Warwick in a strategic research partnership – the Science City Research Alliance (SCRA) – originally formed under the Birmingham Science City initiative.

Birmingham Science City

Learn more
www.birminghamsciencecity.co.uk/research-alliance
Contact: r.simpson.1@bham.ac.uk

'Setting' a new standard

A new energy efficient and environmentally friendly technique for manufacturing advanced fibre reinforced composites is being developed by scientists at the University of Birmingham.

Conventional production techniques such as pultrusion and filament winding involve impregnating the reinforcing fibres in a resin bath. This method, which has not changed in over forty years, has many disadvantages including the need for manually mixing the resin with a hardener, the limited pot-life (transformation from a liquid to a cross-linked solid), the large volume of solvent required to clean the equipment at the end of each production cycle and emissions to the atmosphere.

The Sensors and Composites Group at the University's School of Metallurgy and Materials has led the research to develop a new method where precision pumps are used to deliver the resin and hardener, on demand, via a static mixer to a custom-designed resin impregnation unit.

Shafiq Irfan, lead-researcher on the project said 'In addition to the reduction of emissions to the atmosphere, the new production process is capable of delivering the exact volume fraction of the resin required. The option of integrating a range of low-cost optical fibre sensors for process monitoring is also available. From an end-user point of view, the added benefit of having no 'bath' to clean at the end of the day is a major bonus'.

This is another example of a technology available through Alta Innovations Ltd, the University of Birmingham's technology transfer company.

Technology and IP

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think environment

Keeping Birmingham cool

A Knowledge Transfer Partnership (KTP) between the University of Birmingham and Birmingham City Council is helping to provide the necessary evidence to ensure the effective delivery of the Council's long term vision that the City 'will be the UK's first sustainable global city with a low-carbon energy infrastructure and well prepared for the impact of climate change'. The KTP will seek to quantify for the first time the combined impact of the 'Urban heat island' and climate change up to 2100 in Birmingham.

Urban heat island is the term used to describe the phenomenon of higher night time temperature levels being recorded in metropolitan areas than those that are recorded in rural areas. This is mainly due to the fact that the building materials used in urban areas retain heat gained during the day and release it slowly at night. Observations of the heat island in Birmingham show that on some nights temperatures in the city can be 8°C higher, much stronger than the usual 1 or 2°C. This can put considerable heat stress on the built infrastructure and on individuals living in a city that has already experienced extreme weather events such as thunderstorms and tornadoes.

Cllr Paul Tilsley, Deputy Leader of Birmingham City Council, said, 'The 2003 heatwave saw temperatures top 38.5°C nationally, which caused over 2,000 excess deaths in the UK. Research suggests these could be average summer temperatures by 2040 as our climate continues to warm and extreme weather becomes more frequent and intense – so we need to understand how future weather events will affect people's health and the city's infrastructure, which is exactly what this project will enable us to do.'

Surprisingly the latest national climate change scenarios that are available do not take into account the urban heat island effect. Working with Professor John Thornes, Dr Xiaoming Cai and Dr Lee Chapman in the School of Geography, Earth and Environmental Sciences at the University of Birmingham the KTP will seek to fill this gap. Existing climate modelling skills and expertise residing at the University will be transferred to the City Council via an easy to use climate change adaptation planning tool called the BUCCANEER (Birmingham Urban Climate Change Adaptation with Neighbourhood Estimates of Environmental Risk).

'The project will certainly put Birmingham at the forefront of research into understanding the impact of climate change at a neighbourhood level in cities. It will provide vital information for a range of Council services in the City as well as being key to the effective adaptive responses of Birmingham City Council partners, in particular the NHS.'

Sandy Taylor at Birmingham City Council

This Partnership received financial support from the KTP programme*, Birmingham Environmental Partnership and Birmingham Health and Wellbeing Partnership. * KTP aims to help businesses to improve their competitiveness and productivity through the better use of knowledge, technology and skills that reside within the UK knowledge base. KTP is funded by the Technology Strategy Board along with the other government funding organisations.

Knowledge Transfer Partnerships

Learn more
www.birmingham.ac.uk
contact: ktp@contacts.bham.ac.uk

think business

University of Birmingham celebrate win at the 2011 Impact Awards

Dr John Pearson, Business Development Manager at Alta Innovations Ltd, the University of Birmingham's technology transfer company, has been awarded 'Knowledge Transfer Achiever of the Year' at this year's PraxisUnico Impact Awards.

John Pearson pictured here collecting his award from Maggie Philbin, who regularly provides comment on technology for the BBC.

John joined the University of Birmingham in 2009 from a career in industry and has substantially raised the external profile of the University with business. As a result of John's vision and drive, in November 2010 The University of Birmingham and medical diagnostics specialists, Abingdon Health Ltd, announced the launch of Bioscience Ventures Limited ('Bioscience Ventures'), a new joint venture aimed at developing and marketing new diagnostics products for the healthcare and other industries.

The new business is already a beacon of good practice in technology commercialisation and could reach revenues of £20m within 5 years. Without John's enterprising outlook and problem solving abilities this new development would not have taken place and the University would not be in a position to deliver the economic and societal impact which is now possible through Bioscience Ventures Ltd.

'Joining forces with an experienced management team has greatly accelerated the progress of our medical diagnostics technology to market. Although these developments are always a team effort we are very pleased that John's personal contribution has been recognised in this way.'

Dr James Wilkie, CEO of Alta Innovations and Director of Research and Commercial Services. University of Birmingham

Recipe for healthy living

Food manufacturers face the challenge of making low fat food alternatives to some of the consumers' favourite products (such as desserts, cooking sauces and salad dressings) not only taste as good but also that give the same texture and sensation in the mouth when eaten.

Dr Philip Cox, at the University of Birmingham, has led the research behind the development of a novel process using initially 'hydrophobins' and now other more common food grade proteins to stabilise air droplets of approximately the same size as fat droplets, which are normally extremely difficult to form in the correct size range. The new air filled protein coated droplets can be added at any stage of the manufacturing process.

'As the size of the droplets in the new low fat emulsion are much closer in size to the 'real thing', a more reliable and consistent final product is achieved that gives a much better mouth experience. In addition the new emulsion provides a more economical alternative to traditional based technologies.'

Dr Philip Cox
School of Chemical Engineering
University of Birmingham

Another technology available from Alta Innovations, the University of Birmingham's technology transfer company.

Technology and IP

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IQ booster

You can boost your organisation's knowledge and resources by tapping into world-class expertise at the University of Birmingham. We're constantly making exciting breakthroughs – in medicine and engineering, energy and social science – and then making them available to the people who will benefit most.

Here is just a snapshot of some of the technologies currently available from Alta Innovations, the University of Birmingham's technology transfer company.

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Title	What is it?
Ruthenium coated nanoparticles for imaging	Noble metal coating of nanoparticles with luminescent complexes for use as life science research tools
Production of particulate nanoclusters	Method for scaling up manufacture of nano clusters to allow potential industrial use in applications such as catalysis
Enterically delivered alginates as an anti-colorectal cancer agent	New research results that indicate by reducing concentrations of iron in the colon the progression of polyps to tumors may be inhibited
Water-based cathode formulation for solid oxide fuel cells	A new water based ink formulation for use in the manufacture of SOFCs which may give increased performance and reduce environmental impact
Volatile biomarkers of inflammatory bowel disease	Volatile organic compounds from faecal samples that may allow differentiation between irritable bowel syndrome and inflammatory bowel diseases such as Crohn's
Recombinant protein production	Biotherapeutic proteins produced in E. coli. that can now be directly secreted to the cell culture medium allowing more efficient production
Recovery of rare earth magnets	A new process for recycling rare earth magnets, made from increasingly expensive rare earth metals, from scrap electronics
EUCLID - Laser Interferometer with Convex Mirror	A compact laser interferometric measuring device capable of sensing linear displacement at the pico metre level
Super-absorbent Gels in Investment Casting	A new rapid shell build method using super-absorbent polymers which reduces shell build time

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