

The Royal
LiverpoolBioCampus
University Hospitals

September 2010



Liverpool's Leading Life Sciences...

*Better
Together*



Liverpool's Leading Life Sciences...

Liverpool has an excellent portfolio in health and bioscience related disciplines in both the commercial and non commercial sectors. It has probably the largest national grouping of complementary health and bioscience related disciplines in medicine, veterinary science and tropical medicine, the largest concentration of pharmaceutical industry in Europe and also hosts the UK's National Biomanufacturing Centre.

Within the city there are a significant number of biomedical companies as well as the National Human Tissue Bank and the National Zoonosis Centre. The University of Liverpool (UoL) is a designated Cancer Research UK research centre and is the Medical Research Council's centre for drug safety science. The Liverpool School of Tropical Medicine (LSTM) has a worldwide reputation and its current research portfolio is in excess of £145million.

The opportunity to develop a focus for Life Sciences activity is presented by the redevelopment of the Royal Liverpool University Hospital. Demolition of the existing hospital creates a large brownfield site in the heart of the Knowledge Quarter of the City, available for further development. This is an opportunity that enables the full potential of the diverse range of Life Sciences assets to be realised.

The vision is of a commercially focused BioCampus, with a concentration and co-location of research, industry and health provision collaborating in health related research and clinical trials enabling Liverpool to become a centre of global excellence in biomedical sciences. Not only will the outputs result in improved approaches to patient care and outcomes it will continue and maintain the city's economic renaissance.

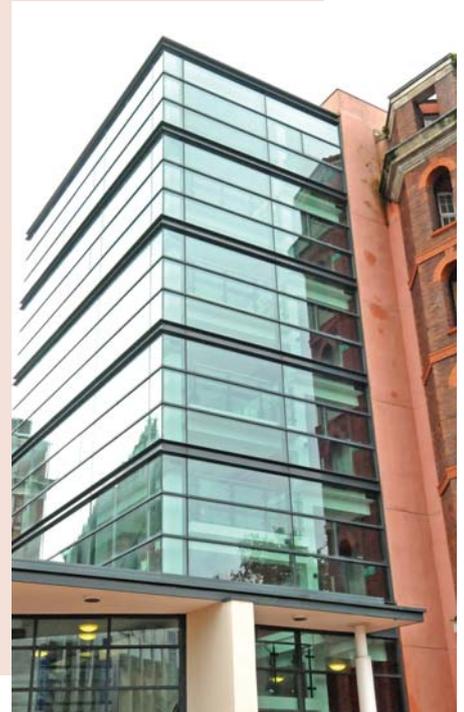
LIVERPOOL AND THE ROYAL

The Trust – Research Capability

The Royal Liverpool & Broadgreen University Hospitals NHS Trust (RLBUHT), turnover £400m in 2009-10, is the leading NHS organisation for research and education in Cheshire and Merseyside. As well as general adult acute hospital services for most of Liverpool, it provides a wide range of specialist diagnostic and treatment services, many of which are regional or supra regional. Research is undertaken in close collaboration with the UoL, LSTM and many research projects are funded by and undertaken in conjunction with pharmaceutical and other commercial research organisations

Key areas of clinical and research expertise include cancer, infection, haematology, pharmacology, ophthalmology, gastroenterology/digestive system, oral health and diagnostics. The Trust hosts a National Institute for Health Research (NIHR) Biomedical Research Centre (BRC) for Microbial Disease in conjunction with the

UoL and LSTM and a NIHR Biomedical Research Unit (BRU) for Pancreatic Diseases with UoL. The Trust is unique in having both a BRC and a BRU. RLBUHT and UoL also host the Liverpool Experimental Cancer Medicine Centre. The Trust has recently opened dedicated facilities for clinical trials within the Royal and commissioned a PET-CT scanner to support cancer diagnosis and research.



A strategy for investment

The Trust is planning a new hospital to replace the existing Royal Liverpool University Hospital on part of its current site. The business case is fully supported by the NHS locally and approval was confirmed by the new coalition Government in June 2010. Three PFI bidders have been shortlisted, and start on site is expected 2012, with the new hospital opening in 2016.

The new Royal is being designed to deliver best in class performance; an excellent patient environment with 100% single bedrooms, improved clinical productivity, sustainable design and construction, and, a landmark public building at the gateway to the city.

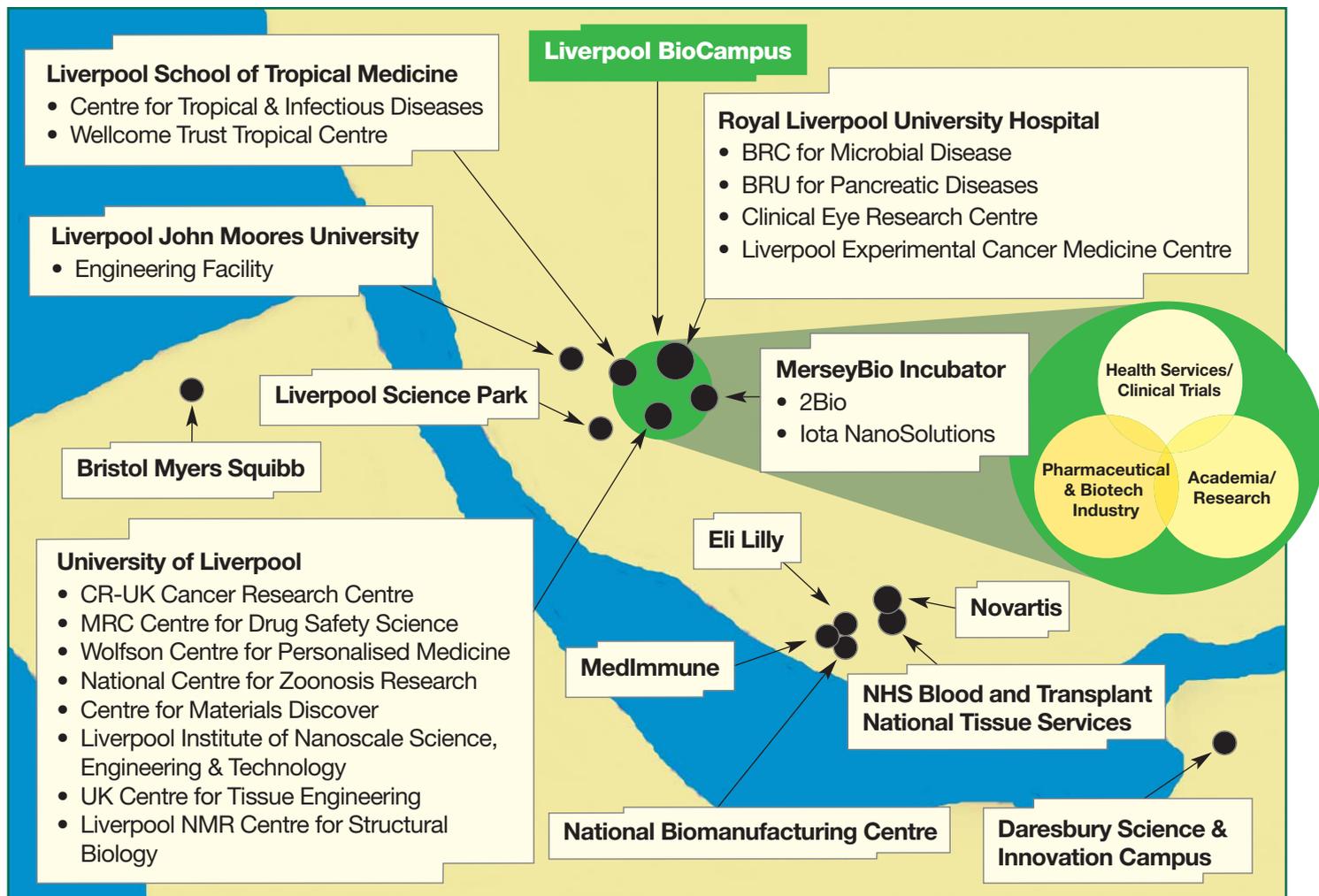
The Trust's outline planning permission for the new Royal includes up to 100,000m² of further health related development on the site, taking the form of new city blocks around a landscaped public green space. This enables development of the BioCampus.

The BioCampus is a key element of the regeneration strategy for the Liverpool City Region and a priority for the Knowledge Economy Plan for the City. The BioCampus opportunity is enhanced by the site's location, close to the universities, LSTM, Liverpool Science Park and the existing MerseyBio incubator. This area, with its concentration of knowledge and cultural

assets in a historic part of the city centre, is unique to Liverpool among provincial cities. As well as the new hospital, UoL and LSTM are planning new life science research laboratories.

The next step for the BioCampus is the BioInnovation Centre (BIC). This will be completed before the new Royal has been built and is independent of the hospital redevelopment. MerseyBio has been operation at capacity for some years and the BIC will complement this by providing laboratory space, business support and commercialisation, and networking facilities for both new and growing life science businesses emerging from the research base.

Liverpool's Biomedical



“ The BioCampus enables the Trust, University and industry to work together in accelerating the drug pipeline, maintaining the predominance of Liverpool's pharmaceutical sector in the global marketplace and improving patient outcomes. ”

*Sir Howard Newby,
Vice-Chancellor of the University of Liverpool*



Assets



Professor Cheng-Hock Toh



Professor Munir Pirmohamed

The three profiles which follow illustrate the strength and breadth of capability and collaboration, with promising implications for improved patient treatments and outcomes. Three areas are featured, all relating to infectious diseases, including HIV. The common theme is new approaches that maximise the benefits of existing drug therapies.

Biomedical Research Centre – Microbial Disease

The Trust was awarded an NIHR BRC by the Department of Health in 2007, one of only twelve in the country, in conjunction with UoL and LSTM. This came with £13.5m in research funding and £6.4m for specialist laboratories and a six-bed clinical research facility for phase I and phase II clinical trials.

BRC status recognises Liverpool's unique combination of expertise; LSTM's worldwide reputation, UoL as a national leader in pharmacology, a strong research record in infection; and the National Zoonosis Centre. The Royal is their clinical partner and hosts the regional infectious diseases and HIV/sexual health services.

Cheng-Hock Toh, Professor of Haematology, is Director of the BRC. He explains that the centre reflects the emphasis now placed on translational research – taking advances in basic medical research out of the laboratory and through commercial partnerships into the clinical setting.

Current projects include a new test for the early diagnosis of sepsis, an innovative plantain extract (see case study on Provoxis) treatment for Crohn's disease, and a new TB drug therapy developed at LSTM.

Improving the effectiveness of HIV therapy is also a strong theme for the BRC, including a project to tailor treatment to individual patients.

Personalised Medicines

The UK's first and only NHS Chair is held by Munir Pirmohamed, Professor of Pharmacogenetics and an honorary consultant at the Royal.

Pharmacogenetics can be defined as “the study of the genetic basis for differences between individuals in their response to drugs.”

It is part of the move from blockbuster to niche buster drugs; identifying patients most likely to benefit from a drug, or finding other indications for existing products, so as to make them more cost effective, is a commercial imperative for drug companies.

The aim of Liverpool's research programme – the largest of its kind in the UK – is to define the mechanisms of variability in drug response and translate these findings into clinical care. It works in conjunction with the BRC.

The Department of Pharmacology has strong links to the Medicines and Healthcare products Regulatory Agency (MHRA), with Professor Pirmohamed and Professor Kevin Park being Commissioners on Human Medicines. Their expertise has secured its designation as the MRC centre for drug safety science, along with a £3.7m grant, the only one in its field in the country.

In 2009, the department also opened the Wolfson Centre for Personalised Medicine, funded by the University and a £2m donation from the Wolfson Foundation, in the refurbished former Liverpool Royal Infirmary.

Nanotechnologies for Drug Delivery

The UoL's Department of Chemistry is a leader in the development of techniques for using nanoparticles in drug delivery. These offer a new approach where a drug presents problems of low solubility or permeability within the body. If it is delivered in small enough particles, it may still be able to circulate around the body to the target cells.

The focus for Professor Steve Rannard's research group within the department at present is HIV, working with the Department of Pharmacology and Professor Saye Khoo of Pharmacology and the Royal's infectious diseases team.

Drugs delivered as a nanoparticle may also have other, less desirable effects on the body, therefore drug safety is a further link with Pharmacology and Professor Pirmohamed's team.

In 2009, the group received one of a small number of Research Councils-UK Grand Challenge Awards. This provides three years of funding to demonstrate the applicability of the research, with the potential for a further three years to develop it with commercial partners into clinical trials.

The work is built on a novel technique for creating nanoparticles of a substance, developed with colleagues in IOTA NanoSolutions. IOTA is a small technology company based in the MerseyBio incubator, with over 20 patents in the field.

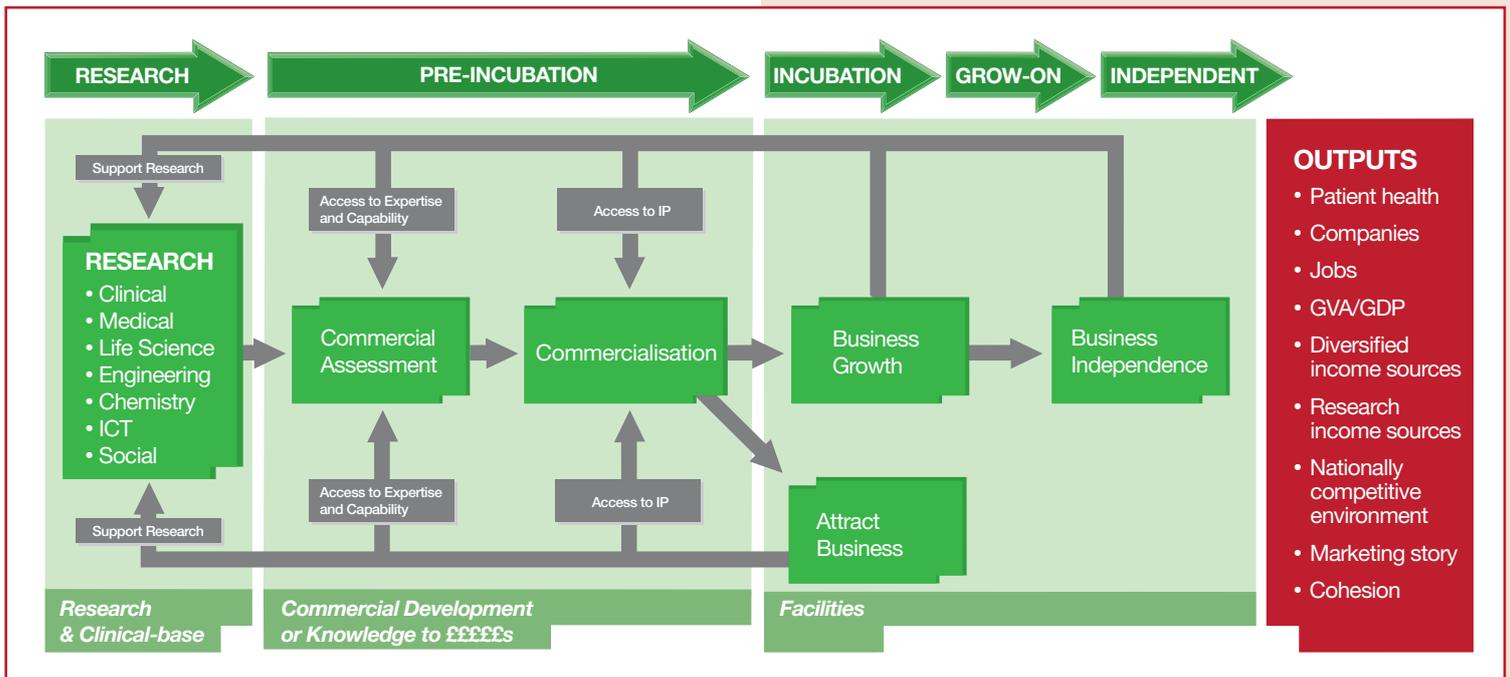


“ The creation of a new BioInnovation Centre will enable Liverpool to realise its potential to accelerate the translation of knowledge and technology into business, filling a much needed gap in our local infrastructure. ”

*Professor Robert Sutton,
Director of Research and Development*



The BioInnovation Centre



PROVEXIS plc – A LIVERPOOL SUCCESS STORY

Provoxis plc entered Liverpool's MerseyBio Incubator in 2003 with seed investment, and after only two years became a publicly traded company on the London Stock Exchange, with a current market capitalisation of £40 million. This is a life science business that discovers, develops and licenses scientifically proven functional food, medical food and dietary supplement technologies.

Provoxis established laboratory-based operations in MerseyBio in order to develop its first product, Fruitflow®. This is a proprietary extract of tomato with anti-thrombotic properties, helping to prevent heart attack and stroke by inhibiting blood platelet aggregation. It has been developed through clinical trials, which have substantiated health claims, through manufacturing processes and commercial product marketing. The company is now in advanced licensing discussions with global companies for incorporating Fruitflow® into yoghurts, beverages and other products. Fruitflow® is the first (and only) technology to have a health claim adopted by the European Food Safety Authority.

The company has other innovative technologies. As part of the support that Provoxis has received in MerseyBio, the

company was introduced to innovators in the Liverpool health sciences community, including Professor Jon Rhodes, consultant gastroenterologist at the Royal. Provoxis worked with Professor Rhodes on the commercial potential of a plantain extract to be used as a medical food for the dietary management of Crohn's disease. This is now undergoing a clinical trial to establish its effectiveness in keeping the disease in remission. The company is also looking its potential applications in preventing and treating infections with the 'super bug' C. difficile.

Provoxis plc is a Liverpool success story – an innovative Life Sciences company that has been incubated in Liverpool, growing in scope and value, and in partnership with the research and health care communities in the city.

Through MerseyBio, Liverpool has an excellent track record of identifying new commercial opportunities from the research base, supporting their development and housing early-stage life science businesses. Existing facilities have been operating at capacity for some years and the planned BioInnovation Centre (BIC) will provide space to support latent demand from new early-stage businesses emerging from the research base, businesses wishing to co-locate operations in close proximity to key expert clinical and research groups in Liverpool, and growing businesses.

The BIC is the first step in expanding the scale of the existing model for development of commercial opportunities from the research and clinical base, and is the next step in developing Liverpool's BioCampus. It will comprise:

- Laboratory facilities for new and growing SMEs
- Business Support & Commercialisation Centre
- Meeting and networking facilities.

“ The new hospital is the catalyst for Liverpool to become a centre of excellence for the commercialisation of biomedical related intellectual property, building on its existing biomedical science cluster of health provision, research and industry. ”

*Tony Bell OBE, Chief Executive
The Royal Liverpool & Broadgreen University Hospitals
NHS Trust*



BioInnovation Centre continued...

The facilities and expertise available within the Business Support & Commercialisation Centre will be crucial in achieving the conversion of intellectual property derived from the clinical and research base into business opportunities not only for the SMEs in the BIC but also for the wider life sciences community. As with all such environments, stimulating flow and exchange of ideas is critical and the meeting space will enable both formal and informal networking across health, academia and industry.

An expert group has been established to develop the BIC concept and a location on the RLUH BioCampus site has been identified. A preliminary design assessment has been undertaken and is now progressing to a more detailed design phase based on best practice from around the world. Under the current timetable, the building is due to be commissioned during 2013.

Investing in the Liverpool BioCampus

2003	MerseyBio Incubator
2004	Clinical Eye Research Centre
2006	Liverpool Science Park
2008	Centre Tropical & Infectious Diseases
2009	NIHR BRC Microbial Disease
2009	Wolfson Centre Personalised Medicine
2010	NIHR BRU Pancreatic Diseases
2013	BioInnovation Centre
2016	New Hospital
2016	Investment Sites Available

World EXPO Shanghai

Delegation October 2010

- The largest ever World Expo, with more than 200 nations and international organisations showcasing their interpretations of the official Expo theme: Better City, Better Life.
- Liverpool is the only UK city outside London to have a dedicated presence at the Expo.
- Liverpool's Life Sciences strengths and the BioCampus promoted in October – Industry month – by a delegation from the Royal Liverpool University Hospital and the University of Liverpool:
 - Sessions by the professors for leading academics and researchers, pharmaceutical and diagnostic industries.
 - Meetings at local science parks with pharma and biotech companies and other potential investors.
 - Visits to Fudan University to promote further educational and teaching exchanges.
 - Evening presentation to raise awareness of the BioCampus, and to seek partners interested in becoming involved in its long term development.

Members of the Delegation

Tony Bell OBE,
Chief Executive, RLBHUHT

Professor Chris Foster,
Professor of Cellular Pathology and Molecular Genetics, UoL

Professor Simon Harding
Professor of Clinical Ophthalmology, UoL

Professor Patrick Chu,
Consultant Haematologist, RLBHUHT

Geoff Wainwright,
Director, 2Bio Ltd

Helen Jackson,
Director of Strategy & Redevelopment, RLBHUHT

Wendy Hull,
Interim Director of Finance, RLBHUHT

For further information contact:
jenny.jowett@rlbuht.nhs.uk

www.liverpoolbiocampus.com