

## Wellcome Trust response to the Lambert Review, April 2003

1. The Wellcome Trust (“the Trust”) is grateful for the opportunity to take part in this review of business-university collaboration. Our response is focused on aspects of collaboration that involve technology transfer activity, specifically the translation of biomedical research outcomes into healthcare products or other benefits. As a registered charity, the Trust has key concerns around barriers to technology transfer that may differ in focus from those of universities (which are charities exempt from registration with, and regulation by, the Charity Commission) and businesses. Some examples of the difficulties that the Trust has experienced in the translation area because of the Charity Commission’s current interpretation of ‘public benefit’ are outlined below. We have also highlighted a number of other areas where we believe that there may be opportunities to improve the technology transfer process at the business and university level, including issues around funding, management and skills.
2. In order to place our response in context, it is important to explain the nature of the Trust as an organisation and the implications that this has for our involvement in the translation sphere.
3. The Wellcome Trust is an independent research-funding charity, established under the will of Sir Henry Wellcome in 1936. It is funded from a private endowment, which is managed with long-term stability and growth in mind.
4. The Trust is one of the largest non-Governmental funders of biomedical research in the world. In the year to 30 September 2002, the Trust’s expenditure on research grants was more than £400 million, the majority of which was in the UK. The Trust’s broad mission of fostering “research with the aim of improving human and animal health” allows a diverse portfolio of activities to be undertaken, of which translation is a key component.
5. Facilitating business-university collaborations has been one aspect of the Trust’s translation activity, which has included funding initiatives such as the University Challenge Fund; the establishment of a wholly-owned business subsidiary, Catalyst BioMedica Limited; and in March 2003, the creation of a Technology Transfer Division within the Trust. These and other projects are outlined in greater detail later on in the document.
6. Before addressing the review’s specific questions, the Trust would like to make a number of general points in relation to the focus of this review and its wider implications. Whilst it is important to acknowledge the positive contribution that universities can make to the UK’s economy through technology transfer activity, it is vital to recognise that a balance needs to be maintained between these activities and the traditional core activities of modern universities -- research and teaching. Without strong government support for these two core activities, ‘knowledge transfer’ cannot take place.
7. In terms of healthcare outcomes, the full benefits of collaboration between businesses and universities can often only be seen in the long term. Judgements on the value of such collaborations based on short-term indicators should be made with caution. Moreover, the true value of such collaborations should be measured in terms of real public benefit, such as advances in healthcare, and not economic return alone (which, as explained below, is not the public benefit that charities are required to pursue).

**Q1. Best practice and examples of excellence in business-university collaboration in the UK and abroad.**

8. There are many different forms of business-university collaboration which can contribute to economic and wider public benefit. In terms of technology transfer, the Trust supports the most appropriate route of exploitation for projects on a case-by-case basis, depending on which will achieve the greatest public benefit. For healthcare developments, this might take the form of licensing, royalty type arrangements or spin-outs. In other cases, making the outcomes freely available without restriction may lead to the greatest public benefit, as in the case of the Human Genome Project. An important part of Catalyst BioMedica Limited's activities has been the administration of a Development Fund of £20 million over five years, which was intended to help 'bridge the gap' between basic research and commercial product development. Between 1999 and March 2003, this Development Fund has supported over 40 early-stage projects designed to achieve the commercial translation of promising new technologies with healthcare application. Some of these projects have been implemented through funding within universities and some through academic spin-outs. A summary of all of the projects supported can be found at Annex A.
9. In March 2003, a new Technology Transfer Division was launched within the Trust.<sup>1</sup> The Division supersedes the role played by Catalyst BioMedica Limited in providing translation funding and technology transfer support for and on behalf of the Trust. The Division's aim is to maximise the impact of research innovations on healthcare by facilitating the development of early stage projects to a point at which they can be further developed by the market. It also seeks ways to promote technology transfer in the research communities that the Trust supports.
10. The Technology Transfer Division will provide new forms of funding that are designed to build on the strengths of the universities and academic researchers through two types of grant support:
  - University Translation Awards
  - Strategic Translation Awards

The primary purpose of these new award schemes is to support biomedical research projects at an early stage with a view to maximising the number of innovations which are developed to the point where they can be funded by commercial investors. With funding from commercial investors, companies can then in turn further develop these new healthcare applications into commercial products. Strategic Translation Awards are specifically targeted at areas that are of strategic importance to the Wellcome Trust, such as various fixed-term initiatives and strategic ventures that are supported through the Trust's general funding mechanisms. In the case of these awards, the Trust's Technology Transfer Division will directly assist university technology transfer offices in project management and in seeking corporate partners.

11. The Trust has also been involved in several consortia projects with industrial participants which aim to provide community resources that are useful for both academic and industrial research. These projects illustrate the benefit of collaboration for the purpose of

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<sup>1</sup> Further information can be found at: <http://www.wellcome.ac.uk/en/1/biottd.html>

producing data which is pre-competitive and from which all organizations will benefit but where no one organization would have resources sufficient to generate the work individually. A recent example of this is the Structural Genomics Consortium (“SGC”), which was launched on 3rd April 2003 as a £40 million consortium between the Wellcome Trust, GlaxoSmithKline plc and four Canadian funding agencies (Genome Canada, the Canadian Institutes for Health Research, the Ontario Innovation Trust and the Ontario Research and Development Challenge Fund). The aim of the SGC is to increase substantially the number of protein structures of relevance to human health and ensure that they are available in the public domain. The SGC will be established as a charitable company and will provide grants to the University of Oxford and the University of Toronto to undertake the research.<sup>2</sup>

## **Q2. Strengthening relationships and potential barriers to success**

12. Technology transfer depends on productive partnerships that capture the strengths of academia, business developers, industry and investors. The Trust’s approach is to work in partnership with others, playing a complementary role to scientists, university technology transfer offices, life-science companies and the investment community. In addition to funding schemes, the Trust’s Technology Transfer Division will provide advice and support, for example by mentoring start-ups, providing access to industry and venture capital finance contacts and guiding researchers and universities through the patent and business process.

### **Funding and regulatory issues**

13. Access to funds is a major barrier to success in the area of healthcare translation. Particularly relevant in the healthcare area is the lack of sufficient early-stage financial support – both at proof of principle and at market testing stage -- to produce self-sustaining companies or products that can be licensed. Development funds, such as the Trust’s new translation award schemes, aim to assist in addressing this funding gap, but more sources of funding at an appropriate level are needed. SMART awards are too low value to make a significant difference. In the Trust’s experience, academic start-ups in the life sciences typically need upwards of £500,000 to £1 million in order to develop to a point at which venture capitalists will be willing to invest.
14. In addition to problems with overall levels and availability of funding, further barriers are posed by the limitations placed on the type of translation activity which research funding charities such as the Trust can support because of their status as registered charities. These limitations have arisen because of the definition of what constitutes ‘public benefit’ and therefore how charitable funds can be applied to elements of commercial activity.
15. One example of how this has affected projects is the University Challenge Fund (“UCF”), which was announced in 1998 to encourage the transfer of academic research outcomes into start-up companies for their development into products to benefit humankind, to which the Department of Trade and Industry (DTI) contributed an initial £25 million, the Trust £18 million and the Gatsby Charitable Foundation £2 million. At the time, the Trust was not permitted by the Charity Commission to use charitable funds for financing access

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<sup>2</sup> Further information can be found at: <http://www.wellcome.ac.uk/en/1/awtprerel0403n287.html>

to managerial skills, preparing business plans and covering the costs of establishing and supporting spin-out companies' 'non-research' costs. Universities in receipt of UCF awards have found the limitations on the use of the Trust's funds too restrictive. As a result of this restriction, this and other schemes will be less effective in maximising the public benefit of translation.

16. Commercial investment can be difficult to attract when a project is at an early stage and the investment would be viewed as high risk. Although the scientific premise may have commercial promise, in order to attract commercial investment, a company must demonstrate that it can manage a host of other factors to make its business succeed. Therefore, a start-up company will have to, for example, prepare a business plan to show how much funding it will need, how long development will take and so on. The better prepared the business plan, the greater the likelihood of attracting commercial investment. To help start-up companies to attract such commercial investors, the Trust and/or other non-commercial support are often currently the only source of funds. Therefore, by enabling the Trust to provide funding to support the production of a business plan, as well as moving the research forward to an appropriate stage, the possibility of attracting commercial or other investors substantially increases. The Trust is of the view that using its charitable funds to support such 'non-research' costs may actually be necessary to comply with its duty to make sure its charitable funds are spent wisely. To allocate funds to a start-up company without supporting its administration and management might of itself be an imprudent course of action if that might lead to failure of the company and translation not being taken forward.
17. Recent Charity Commission Guidelines on Social Investments and the Commission's acceptance of the modern re-statement of the Trust's objects under its new Constitution (which includes translation) suggest that its views on whether charitable funds could be used to fund such 'non-research' costs may have moved on since the UCF initiative. However, it would be helpful if this were made more explicit by the Charity Commission or by the Government in the expected new charity legislation.
18. Current interpretations by the Charity Commission of "public benefit" in the context of what a charity may fund have also hindered the extent to which research space supported through charitable funds can be used for commercial activities. This has had a major impact on projects funded through the Joint Infrastructure Fund (JIF) and the Science Research Investment Fund (SRIF), which together represent a £1.75 billion partnership between Government and the Wellcome Trust to develop the infrastructure of the UK university network.<sup>3</sup> For example, under the terms and conditions of JIF awards, the portion of a building funded by the Trust cannot be used for commercial activity or commercially based research.
19. Universities in the UK, as charities exempt from registration with, and regulation by, the Charity Commission, have greater freedom to act in the area of translation and indeed are required by the UK higher education funding councils to add knowledge transfer as a third aim to their two traditional aims of teaching and research. The Trust would like the charity law to be expanded to permit research funding charities, which fund in large part through UK universities, to match what the universities are permitted (and now required) to do. The Trust believes that in order for biomedical-research-funding charities to be able

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<sup>3</sup> Further information can be found at: <http://www.wellcome.ac.uk/en/1/biosfgjif.html>

to facilitate (particularly the early stages of) translation, the Government should permit them to have a greater role in funding translation activities, in all their aspects, under a much broader interpretation of what benefits the public (and would therefore be charitable). This could be achieved either by the Charity Commission taking action to expand its definition of public benefit, or, if it does not have the power to do so, by adding this to legislation currently being developed by Government to implement the review by the Cabinet Office Strategy Unit of the charitable and wider not-for-profit sector.

20. Current interpretation of VAT regulations regarding the “business” use of charitably-funded buildings also has a negative impact on science and its industrial application. Current interpretation allows zero-rating for VAT on the construction costs of a building if less than 10% of the building is to be used for “business” purposes. “Business” has a very broad meaning under VAT legislation, which can make it difficult for universities to comply. HM Customs & Excise (“C&E”) appear to be advising some universities that the construction costs of buildings being funded by JIF and SRIF should attract VAT if the research to be undertaken in those buildings will be carried out by postgraduate students (unless such research fits within the 10% de minimis exception). This is on the basis that C&E deem the universities to be making a supply of education to the postgraduates and education is a business activity for VAT purposes. These rules also make it more difficult for universities to collaborate with industry because research collaborations and contract research may also be treated as “business” activities under the VAT rules. Some universities are forced by these rules to put industrial collaborations in old buildings to avoid this problem.
21. Any VAT paid on construction costs in this context (i.e. where the university cannot recover the VAT) would reduce the amount available for subsequent running costs and the costs of the research that these buildings are expected to house. The Trust does not expect to pay any VAT on the construction costs on such buildings because all of them are intended for charitable academic research.
22. The Trust believes that all charitably-funded research – the results of which must be disseminated for the public good and which has the primary purpose of furthering human knowledge – should be treated as “non-business research”. This would enable universities to obtain zero-rating for VAT on buildings used for such research. We therefore believe that C&E interpretation of VAT regulations regarding the use of charitably-funded buildings is working against the Government’s aim of facilitating increased technology transfer. If the definition of public benefit were expanded to cover the Trust’s translation activities, as described in paragraph 18 above, it would be helpful if those activities were also to be treated as “non-business” for VAT purposes.
23. When Trust funds are applied to undertake research and development activities similar to those carried out by biotechnology and pharmaceutical companies, the Trust is unable to benefit from the research and development tax credit incentives introduced by the Finance Act 2000 for small businesses, and the Finance Act 2002 for large companies. The Trust believes that charitable funding bodies ought to be eligible for analogous incentives and that the rules should be made less restrictive. This would allow financing bodies (such as banks) to use these allowances, with the benefits of this to be received by the charity in the form of lower funding costs. It seems inequitable to favour the commercial sector over the charitable sector where the same activities are being undertaken, particularly

given that there is an additional requirement on charities to undertake such activities for the public benefit, which supports the Government's role in this respect.

24. Reforms introduced in the Chancellor's April 2003 Budget have made some progress by improving the operation of existing R&D tax credits to ensure that more businesses can claim a wider range of relief. Before these revised measures were introduced, if the Trust funded research and development, the Trust's contribution would be deducted from a small company's claim for research and development relief but not from a large company's claim for relief, effectively penalising the small entrepreneur.

### **University issues**

25. There are a number of issues at the university level where there could be opportunities to enhance technology transfer and business-university collaboration.
26. Clearer university policies on commercialising academic research and inventor reward schemes would help academics who would like to exploit their research through commercial routes. Increasing awareness among universities and academics about commercial and technology transfer issues would also help researchers to realise when a commercial option would be the best route for exploitation for research innovations. It would also help to create realistic expectations of the academic commercialisation process. For example, there can sometimes be unrealistic pressure to create start-up companies. Current statistics suggest that a very high number of the companies being created will be unsustainable in the long-term, when in fact technology licences and other forms of collaboration might be more appropriate.
27. University policies and procedures for managing the conflicts of interest that exist between academic freedom and commercial interests are also needed to minimise a potential barrier to effective collaboration. Public confidence in the outcomes of cutting edge, and often controversial, research depends on the ability to prove that universities retain their academic integrity. This can be a difficult and subtle balance to maintain.
28. As universities are encouraged to become more business-focussed, awareness of the intellectual property system is increasing and improving. However, more work needs to be done to increase understanding both at the academic researcher level, for example to help scientists recognise when they have potentially patentable research, and at the university level, for example in terms of resources.
29. Many universities lack both the financial and internal resources to protect their intellectual property adequately. Wider government funding is needed if universities are to be really effective at obtaining appropriate IP protection and exploitation.
30. Some universities, especially those based in large conurbations, are facing severe infrastructure pressures which could inhibit future growth and success in translation activities. Problems in obtaining planning permission, recruitment, housing and traffic congestion are often cited as key challenges to this field of activity.

### Q3. Graduates and skills

31. Another area where there may be potential for improvement is in the recognition of technology transfer work as an area which requires specialist skills and knowledge. Whilst there are some examples of excellent technology transfer offices in UK universities, there is a need for more consistency across the board. This might be achieved through better training of high calibre individuals wishing to pursue a career in this field. Training might take the form of 'on the job' apprenticeship in the translation sphere, as well as more formal learning environments. Funding for this should be a priority for the Government.
32. The Trust sees a connection between this and wider career issues in science. The maintenance of sufficient research volume to meet the demands of business and industry without detriment to the science base will depend on the creation of attractive career structures for scientists and engineers within universities. Without this, it will not be possible to maintain a vibrant research community or a healthy flow of scientists to businesses and, of equal importance, the many other areas of public life where there is an increasing need for scientifically literate people.
33. We believe people are at the heart of developing a robust research base and we have concerns that many aspects of scientific careers are not currently attractive, mainly due to low pay and poor career structure. Reports published by the Trust on aspects of PhD research training indicate that many young scientists give up a career in research early in their careers.<sup>4</sup>
34. In the Trust's review of PhD supervisors, almost half felt that it is now more difficult to recruit high calibre PhD students than it was five years ago. The main reasons given were that a scientific career is unattractive financially and that long-term career prospects for students are poor. The loss of talented individuals from the academic research base has potentially serious knock-on effects for business and industry. Measures taken by the Government in its 2002 spending review may be a first step towards addressing some of these issues.

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<sup>4</sup> These reports can be found at:  
<http://www.wellcome.ac.uk/en/1/biosfgcdpinfstucar.html>

## ANNEX A

### Types of project supported by Catalyst BioMedica Limited

1. Vaccine adjuvant technology
2. Orphan GPCR functional genomics
3. Therapeutic Intervention to alter intracellular steroid levels
4. Discovery programme for a novel hyperproliferative diseases target
5. Autologous wound healing
6. Novel protein-protein interaction detection technology
7. New obesity target and pathway
8. Next generation photosensitizers for cancer therapy
9. Protein translocation screens for drug discovery
10. High-throughput screening for a mutant drug target
11. Novel uses of ligands for cancer therapy
12. Vascular endothelial growth factor (VEGF) promotes cervical ripening in vivo
13. Novel use of heat shock protein in the prevention of arthritis in the CIA model
14. Therapeutic potential of ligand/receptor chimeric protein
15. Early diagnosis of Alzheimer's disease
16. Growth factors that allow the propagation and differentiation of stem cells
17. Modified collagens to enhance wound healing
18. Novel anti-inflammatory agents
19. New signal analysis tools for defibrillators and pulse oximeters
20. A new treatment for Alzheimer's disease
21. 'Prime-Boost' vaccine against hepatitis B
22. Compression garments for the treatment of venous disease
23. Involvement of connexin 43 in wound healing
24. Identification of compounds that target the hypoxia signalling pathway
25. Computational drug design based on surface charge distribution
26. Characterization of novel molecules with immunosuppressive properties
27. The design, synthesis and testing of novel polymer therapeutics
28. The 'rescue-gene' approach to functional genomics in zebrafish
29. Development of the MAPH technique for genetic diagnosis

#### **Disclaimer**

The following descriptions are for illustrative purposes only and should not be relied upon as definitive or used for investment decisions or other purposes. The descriptions of the projects are opinions and might contain forward-looking statements that, just like the research they describe, are subject to risk and uncertainty.

#### **Vaccine adjuvant technology**

The purpose of this award to Professor Doug Fearon, University of Cambridge, was to obtain proof-of-principle for a potential new vaccine adjuvant patented by the university. The research built on previous findings that enhanced antibody responses to protein antigens can be generated as a result of a simple chemical modification, the introduction of an aldehyde group into the protein.

### **Orphan GPCR functional genomics**

Development Fund support has been provided to Drs Mark Carlton and Sam Aparicio, then at the Wellcome/CRUK Institute, University of Cambridge, to develop a rapid 'bioinformatics-to-gene knock-out and phenotype' procedure for the acquisition of functional information on selected orphan G-protein coupled receptors (GPCRs). Based on their drug target patent portfolio series A, venture finance and more recently a £12 million series B round was obtained for the company Paradigm Therapeutics Ltd.

### **Therapeutic intervention to alter intracellular steroid levels**

Intracellular access of glucocorticoids to their nuclear receptor is gated by pre-receptor metabolizing enzymes. Professors Jonathan Seckl and Brian Walker, University of Edinburgh, have a Development Fund award to validate such enzymes as potential drug targets in the treatment of metabolic, cardiovascular and neurodegenerative diseases.

### **Discovery programme for a novel hyperproliferative diseases target**

A number of diseases are associated with cellular hyperproliferation including psoriasis, cancer and photoageing. A Development Fund grant have been awarded to a team led by Drs Simon Ward and Mike Cork, University of Sheffield, to develop new treatments that block a novel cell surface receptor and inhibit a normal physiological pathway governing the balance between cell proliferation and differentiation.

### **Autologous wound healing**

The University of Sheffield spin-out company CellTran Ltd received a Development Fund award to develop and obtain clinical proof-of-principle for Transcell S, a technology for improving the speed of healing chronic skin ulcers using patients' own cells delivered on a chemically defined bandage.

### **Novel protein-protein interaction detection technology**

Dr Rory Duncan, University of Edinburgh, has received a Development Fund Award to reduce to practice his concepts for a technique that should allow intracellular protein-protein interactions to be mapped in a live cell, high-throughput format more effectively than current research tools allow.

### **New obesity target and pathway**

A novel gene having a role in each of energy regulation, metabolism and behaviour was identified by Professor Azim Surani, Wellcome/CRUK Institute, and in collaboration with Professor Barry Keverne of University of Cambridge, forms the basis of a Development Fund project directed at unravelling the mechanism of action and pathways in which the gene product is involved. Animals lacking the gene have late-onset obesity, eat less and have a lower core body temperature.

### **Next generation photosensitizers for cancer therapy**

Aberrant cells that cause disease can be destroyed by compounds which, when exposed to certain wavelengths of light, generate reactive oxygen species that stimulate cell killing and cell death. The efficacy and safety of such photodynamic therapies can be enhanced by targeting the compound to the aberrant cell and avoiding healthy cells. Drs Ross Boyle and John Greenman, University of Hull, have a Development Fund award to develop a form of photodynamic therapy that should provide selective targeting.

### **Protein translocation screens for drug discovery**

ProXara Biotechnology Ltd, a spin-out from University of Bristol, received a Development Fund award to validate that modulation of intracellular protein translocation is a viable strategy for small molecule therapeutics. Such molecules are difficult or impossible to identify by conventional screening methods. Professor Jeremy Tavare (CSO) and Dr Paul England (CEO) have developed high content screens and proprietary analysis algorithms for compound screening, at high throughput, with proteins that translocate as part of their function.

### **High-throughput screening for a mutant drug target**

Development Fund support has been provided to the Cancer Genome Project (led by Professor Mike Stratton, Dr Andy Futreal and Dr Richard Wooster) at the Wellcome Trust Sanger Institute for the development of an assay, high-throughput screening and selectivity analysis for therapeutic compounds that inhibit a mutant protein involved in the development of several human cancers.

### **Novel uses of ligands for cancer therapy**

Development Fund support has been provided to Dr Barbara Spruce, University of Dundee, and Dr Suzanne Eccles, Institute of Cancer Research, Sutton, to demonstrate pre-clinical in vivo efficacy of the anti-cancer properties of a range of sigma ligands. A second award was made to investigate the discovery that sigma ligands have the potential for a two-pronged attack on tumour cells - that of promoting apoptosis, or cell death, and anti-angiogenesis, delaying the growth of new blood vessels required to allow increase in tumour size and promote the formation of metastases or secondary tumours.

### **Vascular endothelial growth factor (VEGF) promotes cervical ripening in vivo**

A Development Fund award was made to Professor Asif Ahmed at the University of Birmingham to successfully demonstrate that VEGF is the key mediator that promotes cervical ripening where neonatal delivery needs to be induced without causing fetal distress.

### **Novel use of heat shock protein in the prevention of arthritis in the CIA model**

Professor Gabriel Panayi of King's College, London at Guy's Hospital has demonstrated proof-of-principle that the endoplasmic reticulum molecular chaperone BiP can prevent and treat the usual inflammatory effects associated with arthritis in the collagen-induced arthritis (CIA) mouse model. A spin-out company, Immune Regulation Limited, has been formed to further develop the technology to the next stage in which a phase I human clinical trial is planned.

### **Therapeutic potential of ligand/receptor chimeric protein**

Drs Simon Jones and Nicholas Topley of the University of Cardiff and University of Wales, College of Medicine are investigating the therapeutic potential of a chimeric protein to act as an anti-inflammatory agent in cases of bacterial peritonitis in a pre-clinical in vivo model. The applicants have already shown that the chimeric protein under investigation up-regulates several chemokines associated with processes leading to the resolution of acute inflammation.

### **Early diagnosis of Alzheimer's disease**

The early and accurate diagnosis of Alzheimer's disease would have a major impact on the care and treatment of elderly people. At present, a definitive diagnosis is only available at autopsy. Diagnostic Potentials, based in Glasgow, was founded by Dr Kerry Kilborn and colleagues, who will complete a phase I clinical trial to test their proprietary technology. This consists of software that involves the use of electroencephalogram data and analysis of event-

related potentials following a cognitive task to develop an early-stage diagnostic for Alzheimer's and a platform technology for other CNS conditions.

### **Growth factors that allow the propagation and differentiation of stem cells**

Dr Stephen Minger is the founder member of CereStem, a spin-out company from King's College London. CereStem's proprietary technology consists of a range of novel growth factors that allow propagation and differentiation of a wide range of stem cells. It is anticipated that one of the applications of this technology will be in future transplantation therapy for diseases such as type 1 diabetes and Parkinson's disease.

### **Modified collagens to enhance wound healing**

Professors Karl Kadler and Neil Bulleid at the University of Manchester have received two Development Fund awards to produce and further evaluate a series of novel recombinant human collagens with enhanced physical and biological properties. It is hoped that these molecules will lead to new skin substitute products for the treatment of chronic and acute wounds.

### **Novel anti-inflammatory agents**

Professor Steven Dower and colleagues at the University of Sheffield are using their Development Fund award to develop a new genome-based high-throughput screening method that will allow the identification of a complete range of modulators of the inflammatory response. The project is expected to lead to the generation of novel anti-inflammatory agents.

### **New signal analysis tools for defibrillators and pulse oximeters**

CardioDigital Limited, a spin-out company from Napier University, Edinburgh was established by Professor Paul Addison and Drs Jamie Watson and Brendan McGuckin to harness the increased signal analysis capacity of an established engineering-based method. A Development Fund award to the company will allow the generation of software that extends the functionality of defibrillators and pulse oximeters to give real-time patient status information.

### **A new treatment for Alzheimer's disease**

Senexis Limited, a new company founded by Dr Kelvin Stott and Dr Andrew Doig at UMIST, is focused on the development of pharmaceuticals for the diagnosis and treatment of ageing-related diseases. The company has received a Development Fund award to generate a novel class of inhibitors that can effectively block and reverse the key step of protein-peptide aggregation in the brain that results in Alzheimer's disease as well as many other neurodegenerative and some other ageing-related diseases.

### **'Prime-Boost' vaccine against hepatitis B**

Dr Samuel McConkey, University of Oxford, has received a Development Fund award to support phase 1 and 2A clinical trials to be carried out to assess the effectiveness of a DNA Prime-Boost vaccine in the treatment and prevention of hepatitis B. This study is being conducted through field trials in the Medical Research Council Laboratories in The Gambia.

### **Compression garments for the treatment of venous disease**

Dr Dias and Dr Cooke from the William Lee Innovation Centre of the Department of Textiles at UMIST have received Development Fund support alongside Professor McCollum from the Department of Surgery at University of Manchester, for a cross-disciplinary study into the engineering of novel custom-made seamless compression stockings capable of delivering a

defined pressure profile. These compression garments are being studied as a potential replacement for the four-layer bandaging system currently used for the treatment of venous ulcers.

### **Involvement of connexin 43 in wound healing**

Dr David Becker, University College London, and Professor Colin Green, University of Auckland, New Zealand, have been awarded joint funding for an investigation into the effects of antisense connexin 43 constructs on the rate and quality of wound healing, caused both by skin lesion and burn.

### **Identification of compounds that target the hypoxia signalling pathway**

Professors Peter Ratcliffe and Adrian Harris from the University of Oxford have received Development Fund support for their study into the hypoxia signalling pathway. The first two phases of the project were carried out under contract with BioFocus Ltd where a robust screening assay was established and hit compounds were identified. Further characterization of these compounds was then carried out by staff at University of Oxford. This project is co-funded by Cancer Research UK.

### **Computational drug design based on surface charge distribution**

Cresset BioMolecular Discovery Ltd received Development Fund support for the expansion of an existing computational approach, based on the charge distribution pattern of a known ligand, into the new way of virtually screening compounds against a target protein. The new technology has been built on the work of Dr Andy Vinter and effectively enables a 'protein's eye view' of potential ligands. Validation of the technology through the positive identification of different structures with the same biological function has been a key milestone in this project.

### **Characterization of novel molecules with immunosuppressive properties**

Pharmatrin Ltd, a Campus Company from Trinity College Dublin, has received Development Fund support for its investigations into previously identified new chemical entities that have immunosuppressive properties. The first tranche of funding was used to repeat and validate earlier findings, and two lead compounds series are now under development with the aim of selecting a candidate for clinical study by the end of the award. This project is co-funded with a consortium of Dublin-based funding organizations.

### **The design, synthesis and testing of novel polymer therapeutics**

Polytherics Ltd, a spin-out from The School of Pharmacy, University of London and Imperial College London, is supported by both a Development Fund award and the Bloomsbury Bioseed Fund. The company is based around a set of patented technologies which use combinatorial chemistry techniques in the field of polymer-linked therapeutics. The objective of the seed phase is to develop three drug candidates in cancer and infectious diseases.

### **The 'rescue-gene' approach to functional genomics in zebrafish**

DanioLabs Ltd, a spin-out from the University of Cambridge and the University of California, San Francisco, is bridging the gap between biology and therapeutics in ophthalmic and neurological disease. Zebrafish has been developed as a major research tool in vertebrate biology. DanioLabs functional genomics studies, using the rescue-gene approach in zebrafish coupled with directed chemistry, is identifying drug targets and lead compounds which treat human disease. DanioLabs is co-funded by the Development Fund, Cambridge University Challenge Fund, a DTI SMART award and funding from the Cambridge Angel Network.

**Development of the MAPH technique for genetic diagnosis**

Dr John Armour at the University of Nottingham has been awarded a Development Fund grant to validate a new technique for use in the diagnosis of genetic disorders involving sequence deletions or insertions. The technique, termed Multiplex Amplifiable Probe Hybridisation (MAPH), currently has application in the diagnosis of certain cancers, mental retardation and Duchenne muscular dystrophy. The award aims to allow the development of a fully robust method that can be used commercially.