

Smart, Bioactive and Nanostructured Materials for Health

Summary

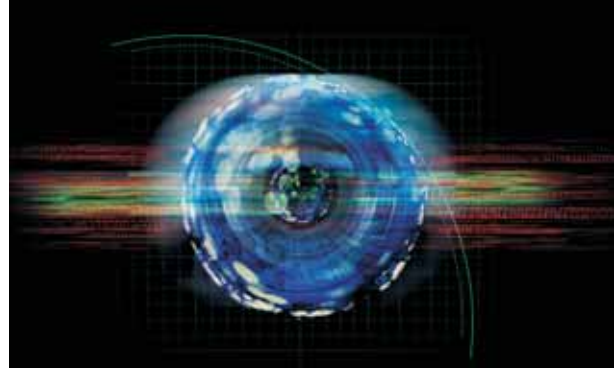
The Technology Programme has allocated an indicative amount of £7 million funding to a competition in Smart, Bioactive, and Nanostructured Materials for Health.

The healthcare market is a complex, demand-led sector where technology developments in materials, devices and equipment can translate into new products and services more quickly than can be achieved for pharmaceuticals. The healthcare market worldwide is worth over \$200bn and is enjoying growing demand with the ageing population and a more technology-aware consumer and patient base. The UK has a significant share of the international market in advanced health technologies and devices, and this leading position is due to a number of factors including the presence of a strong industry, an experienced and skilled workforce, an increasingly innovation-aware healthcare delivery service, and our innovative scientists and engineers.

Step changes in the solutions that can be offered to the patient will increasingly depend on closer interaction between the physical device and the biological human environment. This requires greater compatibility, bioactivity and increasing multi-functionality to provide improved monitoring, diagnosis and therapy in the future.

Examples of the applications of these technologies in healthcare are:

- Nanostructured materials, smart or responsive biomaterials, and advanced devices for applications in tissue repair for implantable and extracorporeal use,
- Multi-functionality at surfaces: modifications to achieve the appropriate bio response e.g. biocompatibility/bioactivity, adhesion, anti-microbial, hydrophilicity/hydrophobicity – for stents, diagnostic sensors, hard tissues, wound dressings, catheters.

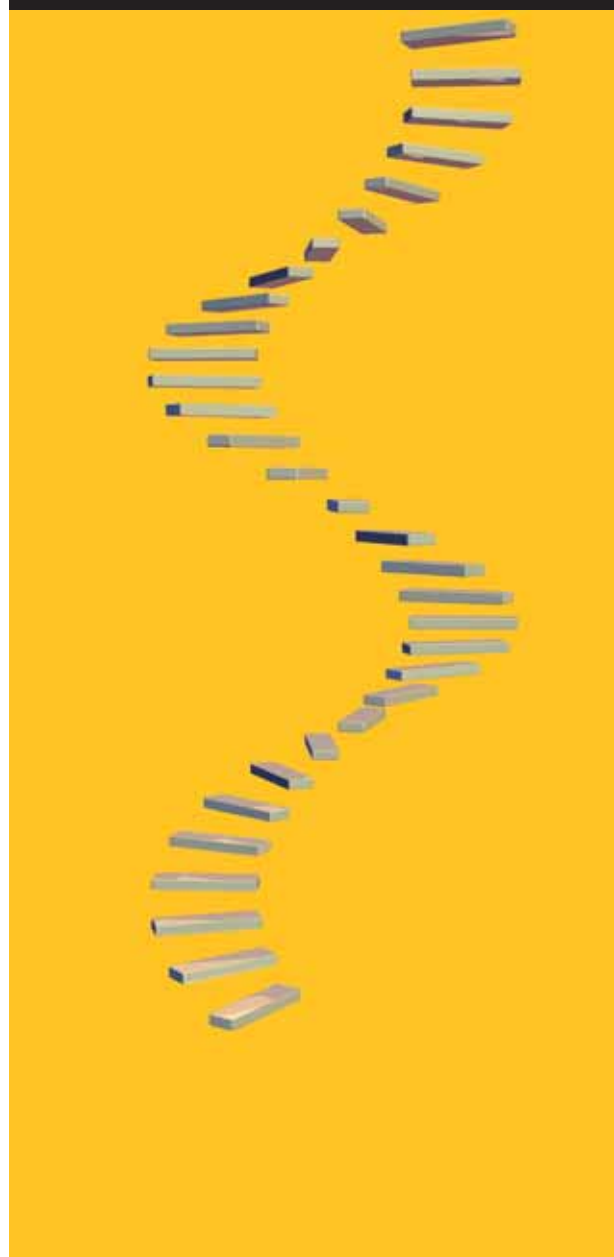


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**SUCCEEDING
THROUGH INNOVATION**

Smart, Bioactive and
Nanostructured
Materials for Health

COLLABORATIVE RESEARCH
AND DEVELOPMENT



- Smart implants for short and long term implantation for diagnosis, monitoring and therapy, including microsystems and fully implantable telemetry systems capable of self-reporting.

This is underpinning technology with uses in many areas of medicine such as orthopaedics, cardiovascular medicine and reconstructive surgery. It is also highly multidisciplinary, bringing advances in materials science, nanotechnology, chemistry, surface engineering, tissue engineering, pharmacology, microelectronics and mathematical modelling together with surgical and clinical sciences to transform existing products and generate new products that drive innovation into clinical practice.

Applications are sought for collaborative R&D projects which will develop novel and improved materials, surfaces and interfaces for healthcare applications. These may be:

- industry-oriented basic research; or
- applied R&D projects; or
- experimental development (technology validation) projects

and involve science-to-business (S2B) or business-to-business (B2B) interactions. Projects should be business-led and project consortia should include at least one partner with defined end-user needs. The Technology Programme has allocated an indicative amount of £7 million to this competition. Additional funding from Research Councils may also be available for projects where there is a significant high quality academic component and in particular for those projects that demonstrate added value to their existing portfolios; by building on or being complementary to existing academic research programmes.

Background

Nanostructure may confer beneficial properties on biomaterials used in tissue repair or in the fabrication of medical devices with advanced functionality. An implant's cell/surface interaction is fundamental to its long term success. This interaction is dictated by a combination of structural properties at the micro- and nano-scale as well as physicochemical parameters (charge, functional groups etc). The engineering of specific orientations or depth related features into an implant could enable biomimetic function.

Convergence of drug and material based therapies is already underway, and the procedures that can be impacted by such developments include organ replacement and minimally invasive surgery, with the possibility of new surgical practices and new clinical specialities.

Manipulation of cells and proteins at physical surfaces will be a feature of future devices; we are already seeing the use of drug eluting stents but this will expand to cover other devices and with improved ability to release drugs over long timescales. Even without added drugs, manipulation of the functional performance of surfaces may allow materials to respond to a changing in-vivo environment, such manipulation including anti-microbial, anti-thrombogenic, analgesic and cell differentiating capabilities. For example, much of the work on cell micro-topography has never been applied in the field of bio-scaffolds and therefore there is a missing body of knowledge on micro- and nano-topography effects of surfaces within the macroporous biological scaffolds currently being employed for tissue engineering.

Innovation in the mechanical properties of implantable biomaterials could include the ability to change shape within the body, eg smart materials carrying a shape-memory which could undergo morphological change following an electronic or physiological trigger.



Innovations in materials with properties that enable infection to be eliminated or reduced are highly desirable. Encapsulation materials for efficient power sources for medical devices, such as developments that allow energy harvesting opportunities thereby reducing dependency on batteries, is another area where innovation would be useful.

It is important that new systems and materials are developed in realistic test environments that provide good biodynamic models to ensure the transition to human healthcare will be a realistic possibility therefore development of materials and devices in isolation from a biological system or clinical interface is not encouraged in this competition.

Multi-disciplinary projects need to address the industrial viability of any new technologies or materials, and early clinical evaluation is encouraged. Teams should ensure that clinical end-users and, where appropriate, patients are consulted during the project.

Scope for Applications

We welcome proposals which involve the application of smart, bioactive or nanostructured materials for all areas of healthcare (including diagnostic, drug/vaccine delivery, veterinary, surgical and dental applications) but projects that demonstrate significant innovation in the following areas will be particularly welcome:

- New cardiovascular bioactives,
- New neuronal devices with drug and stimulation functions,
- New urological devices,
- Cartilage and joint repair,
- Mediation of the inflammatory response.
- Improved cochlear implants for hearing restoration,
- Encapsulations for sensors, actuators and devices that enable energy harvesting.

Assessors will be looking for clearly identified industrial application and/or commercial potential for the UK from the output technology from the proposed projects. Project consortia should therefore include at least one 'end-user' partner and demonstrate a credible route to industrial adoption and/or commercialisation. Proposals should address the industrial viability of any new manufacturing processes which would be required for industrial exploitation of the output particularly with regard to incorporation in volume manufacturing of devices.

Funding Allocation and Project Details

The Technology Strategy Board advises on the selection of priority technology areas and the allocation of funding for the Technology Programme. The Technology Strategy Board is currently being established as an executive non-departmental public body and will in future be responsible for the development and delivery of the Government's programme of technology support, including the Technology Programme.

An indicative £7m of Technology Programme support has been allocated to Collaborative Research and Development projects that address one or more of the areas indicated above and involve science-to-business and business-to-business interactions.

Typical projects would have 2-3 year duration, require support around £500k-£2m, although no project will be rejected on the grounds of size alone, and generally aim to implement significant business change in a 5-7 year time frame rather than shorter-term payback. Larger projects will be considered but the case must be exceptional. In particular we would encourage projects that can demonstrate benefits to a number of business sectors, and ideally should include at least one partner with defined end-user needs.



Additional funding from EPSRC and BBSRC may be available for projects where there is a significant high quality academic component and in particular for those projects that demonstrate added value to their existing portfolios; by building on or being complementary to existing research programmes.

Projects can range from small, highly focused basic research aimed at establishing technical feasibility, though to applied research, and to experimental development projects. It is anticipated that most of the funding will be allocated to proposals in the applied R&D

(attracting 50% public funding) or experimental development (25% public funding) categories. Projects involving industry oriented basic research (75% public funding) will also be considered but a robust case must be made to support the requested level of funding. Definitions of the above categories of research can be found in the Guidance for Applicants – see <http://www.dti.gov.uk/innovation/technologystategy/index.html>

The Technology Strategy Board will require all projects to provide a non-commercially confidential summary, at the start and the conclusion of the project, for dissemination.

Contacts

If you have any queries about the technical scope of the competition or the application process, please contact the Technology Programme helpline on **01355 272155** or email **info@technologyprogramme.org.uk**

Key Dates

Competition opens: 24 April 2007

Competition event in London - 25 April 2007. For more information about this and other events use the web address below.

Deadline for registering your intention to submit an application: 11 June 2007

Deadline for all Academic Finances through the Je-S systems: 14 June 2007

Deadline for all Outline applications: 18 June 2007

Full stage opens: 16 July 2007

Deadline for receiving full stage applications: 11 September 2007

Decision and feedback to applicants: October 2007

For details on how to register and apply go to:

<http://www.dti.gov.uk/innovation/technologystategy/index.html>