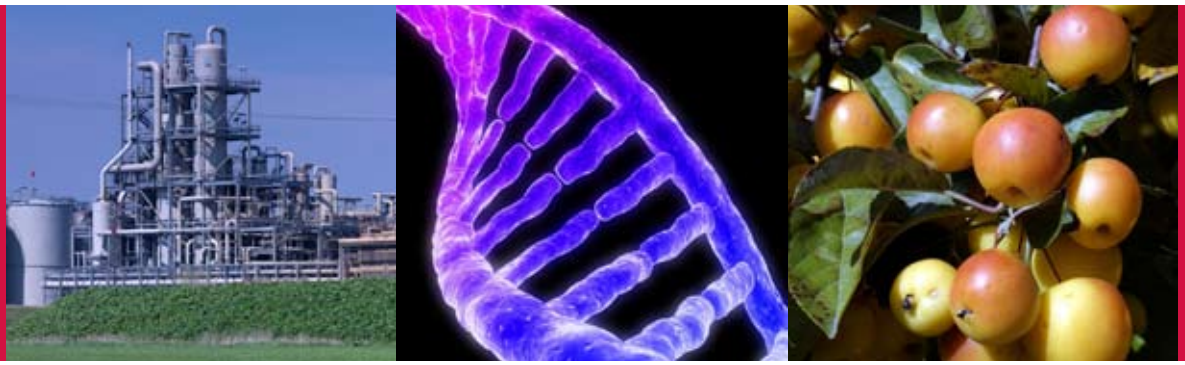
Technology Strategy Board
Driving Innovation



Biosciences

Technology Strategy 2009-2012

EXECUTIVE SUMMARY

Executive summary

The biosciences underpin our understanding of life. They include biology, physiology and neuroscience, biochemistry and microbiology, as well as food, agricultural and environmental science. Exploitation of the biosciences is most keenly demonstrated in biotechnology, an industry that has delivered new applications ranging from novel medicines to sustainable routes to energy and materials, improving our quality of life while reducing our environmental footprint.

Yet the new opportunities remain enormous: for instance, we still have much to do in building the capability to develop mathematical models that will predict reactions in the human body.

The global challenges of climate, societal and demographic change are generating an ever-increasing need for more sustainable energy and industrial feedstocks that do not conflict with the food chain in their production. The challenges associated with ageing populations and the accelerating economies of developing countries present multiple opportunities for developers of lower cost medicines.

The UK, building on its strong base in the biosciences (in particular its world-leading science base in genomics, fermentation, biocatalysis, plant science, marine organisms and mycology), is well-positioned to exploit the business opportunities that will arise as we address these challenges.

The following are examples of this strong base:

- the UK is ranked third globally for citation impact in the biological sciences
- the overall UK science budget will increase to almost £4 billion each year by 2010-11, which will include almost £2 billion for medical research over three years to fund both basic and translational research
- a quarter of the entire research expenditure by the UK's manufacturing sector is funded or carried out by the pharmaceutical sector – equivalent to £10 million each day
- the biosciences sustain the economic wealth generation of 10 of the top 50 UK generators of value added operating in several sectors (pharmaceuticals and biotechnology, tobacco, beverages, food and drug retailers, food producers)
- in our analysis we found that industry sectors that benefit significantly from the biosciences (pharmaceuticals, biotechnology, chemicals and food) contribute 8% of the UK's Gross Value Added.

Priority areas

This Technology Strategy Board *Biosciences Technology Strategy* has been informed by extensive consultation with the industry and other organisations, and also draws on the output of the Department for Business, Innovation and Skills (BIS) Innovation and Growth Team's study on industrial biotechnology. We have then applied the Technology Strategy Board's four criteria for investment:

- the UK has the capability
- there is a large market opportunity
- the idea is ready for exploitation
- the Technology Strategy Board can make a difference.

Analysing this input has led us to build a UK strategy for biosciences around the following three priority areas:

- genomics
- industrial biotechnology
- agriculture and food (agrifood).

The UK has significant capabilities in these three interlinked areas and has opportunities for further commercial exploitation into large, growing global markets through innovation. Indeed a systems biology approach that brings together our increasing understanding of genomics and metabolic pathways will position us to develop breakthrough technologies that will have a significant impact on progress in medical biology, industrial biotechnology and agrifoods. The major applications for these three priority areas that emerged from our analysis include:

- new biological therapeutics and delivery systems, new vaccines, monoclonal antibodies and functional products (eg nutraceuticals), and gene and cell-based therapies (eg regenerative medicine, genotyping and gene therapy, and personalised medicine)
- efficient chemical and biological processes, including catalysis and biocatalysis, and chemical to bioprocesses
- sustainable energy and materials, eg waste treatment and recycling, biofuels, renewables and other biomaterials, and chemicals
- maximising the use of scarce land, water and resources to meet food and non-food needs, through advanced farming systems, efficient crop and livestock breeds and genetically-modified (GM) organisms.

Implementation

To implement this strategy, we will invest in UK businesses that can exploit biosciences-based technologies within our four criteria for investment. To bring these technologies to market we will be working with other organisations to ensure suitable tools are in place to do this.

Several of the research councils have supported research in the biosciences, in particular the Biotechnology and Biological Sciences Research Council (BBSRC), the Engineering and Physical Sciences Research Council (EPSRC) and the Medical Research Council (MRC), and we will work together to ensure that UK business can benefit. The BBSRC is the principal investor in biosciences research, spending £418 million in 2008-09, and has a number of ways in which it encourages scientists to work with business. The BBSRC intends to provide at least £34 million for complementary and collaborative activities with the Technology Strategy Board over 2008-12.

In addition, we will work with regional bodies and the knowledge transfer networks to ensure an aligned approach, and will use knowledge transfer activities to share best practice and increase collaborative working.

The Technology Strategy Board will invest to support and encourage:

- greater use of genomics-based technologies and knowledge sharing by UK companies, in particular those working in non-competitive, distinct sectors
- technologies that enable advanced generation biofuels
- next-generation biorefinery technologies
- UK chemicals and chemistry-using businesses to exploit the opportunities for bio-based processes
- UK companies working in crop, food and livestock protection

The Technology Strategy Board will ensure:

- that the biosciences play a part in current and future innovation platforms
- an increase in the number of knowledge transfer partnerships in the biosciences
- that businesses have opportunities to exploit BBSRC-funded research, with particular attention to their research industry clubs.

New discoveries and the applications of biosciences have had major impacts on politics and society in general (GM crops and stem cell research are two high-profile examples) and will continue to do so. It will therefore be important to consider the outcomes of investments in this wider context. In this respect, it will also be important to follow developments at BIS emerging from its 'Consultation on Science and Society', particularly in respect of 'increasing public confidence in science, research and their application'.

The Seventh Framework Programme is the European Union's main instrument for funding research in Europe, and recent themes have included food, agriculture and fisheries, and biotechnology, as well as biorefineries, nanosciences, nanotechnologies, materials and new production technologies. We will work to ensure that significant opportunities for research investment and knowledge transfer are available to organisations in the UK through participating in and influencing European Framework activities.

This is a summary of the Technology Strategy Board's Biosciences Technology Strategy. For the full document, see www.innovateuk.org.

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