

Detecting dangerous diseases

The SpectroSens sensor system developed through this project represents a breakthrough in biochemical detection which has the potential to make nations safe from bio threats and enable governments to tackle and prevent outbreaks of human and animal disease.

The need

With globalisation we've seen an increased threat from previously obscure diseases such as Ebola and bird flu, as more people travel the globe on a regular basis. The World Bank (2008) has suggested that the global cost of a moderately severe flu pandemic could be \$2trillion and kill 71 million people. In this context, early detection and prevention must be a priority.

Globalisation has also brought the notion of bioterrorism to the fore with instances of anthrax by post and ricin on the Japanese underground system bringing home a very real problem.

The results

In this Technology Strategy Board co-funded R&D project, Stratophase, a spin-out company from the University of Southampton, led a consortium to develop optical microchip sensors capable of detecting toxins, viruses and bacteria. The sensor is highly robust and can be miniaturised. As a result it can be made portable and so offer diagnosis – on the spot – vitally important in containing any outbreak. Previously, such work would need a laboratory.

The global point-of-care testing market for human health was worth \$10bn in 2006, which is 36% of the in-vitro diagnostics market.

At the sensor's core is an optical microchip which measures changes in a liquid on its surface. These changes show how antigens bind to antibodies attached to the chip. The sensor produces multiple readings which make it more reliable in its detection. It detects all classes of biological targets, including proteins, viruses and bacteria, regardless of size, on the same microchip.

It is a small, versatile and accurate device which can be used for laboratory analysis, process control or bio-detection. For example, by helping to enable continuous processing in pharmaceutical production rather than batch processing, the sensor could contribute to 30% improvement in efficiencies.

Competitive advantages

SpectroSens offers several commercial advantages:

- It detects minute changes in refractive index, allowing relative composition to be tracked for process control
- A fibre-optic network of multiple sensing points over many kilometres can all be linked to a single readout unit
- It's immune to electro-magnetic interference
- It's intrinsically safe for flammable environments
- It measures biological targets directly, without the need for tagging or labelling
- It's highly sensitive which makes it suitable for critical environments
- It provides simultaneous multiple discrete readings which gives more reliable measurement and detection
- It's cheap to manufacture
- It's suitable for hand-held operation.



HOW TECHNOLOGY STRATEGY BOARD MADE A DIFFERENCE:

'The network and consortium building were almost as useful as the funding.'

Next steps

Several applications for the sensor have been discovered already, including food and beverage manufacturing, pharmaceutical processing, life science research and development, industrial manufacturing and process measurement, homeland security biohazard detection and point-of-care diagnostics.

A new Technology Strategy Board co-funded R&D project is currently looking into developing a detection system for foot and mouth disease to enable inspectors, and ultimately vets or farmers, to quickly identify the infection on the spot, reducing both false alarms and containment time. The global animal health market was worth \$17.4bn in 2005, with the relatively immature veterinary diagnostics and equipment sector estimated to be worth around \$2bn. The consortium estimates the potential global market for sales of field portable detection equipment for foot and mouth and similar animal infections is £25-50m

per year, and that it will be able to capture a significant percentage of this within three years of the project being completed.

Stratophase is also a partner in a fully-funded £4m contract with the Ministry of Defence which is aiming to develop a portable biodetection device for use by army personnel in the field.



Project #15487

Project partners

Stratophase, University of Southampton, Smart Fibres and Davin Optronics

Technology Strategy Board investment

£282,500

Total project investment

£565,000

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Technology Strategy Board

Driving Innovation

Collaborative research and development projects are one of the tools that the Technology Strategy Board uses to drive innovation in the UK. The Technology Strategy Board is a business-led executive non-departmental public

body, established by the Government. Its role is to promote and support research into, and development and exploitation of, technology and innovation for the benefit of UK business, in order to increase economic growth and improve the quality of life. It is sponsored by the Department for Business, Innovation and Skills (BIS).

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