



## Novel 3D imaging to improve type 1 diabetes treatment

In collaboration with academics, industrial partners and accredited laboratories, LGC has developed a novel imaging technique to improve the success rate of pancreatic islet transplants for people with type 1 diabetes.



## The Requirement

In people with type 1 diabetes, the beta cells in the pancreas are destroyed and no longer produce insulin. More than 250,000 of these individuals in the UK are dependent on multiple daily insulin injections or insulin pumps to restore stable glucose levels. Up to a third experience dangerous low glucose levels (severe hypoglycaemia) resulting in collapse without warning. These patients may benefit from pancreatic islet transplantation, a surgical procedure in which healthy cells from a donor pancreas are transplanted into a recipient. However, cells in the pancreatic islet are fragile, so it is important to ensure they are in good condition prior to transplantation.

## The Solution

LGC's new 3D imaging approach enables rapid quantitative assessment of the health of the cells identified for transplantation. Using specialised fluorescent markers and laser scanning confocal microscopy, LGC scientists produce high-resolution optical sections through each pancreatic islet which allows living, dying and dead cells to be identified. Software algorithms developed at LGC then process and reconstruct the information to create 3D profiles of the pancreatic islets. These profiles can be used to determine whether donor cells will yield a successful transplant.

Presently, light microscopy, a qualitative procedure, is used to assess the quality of the cells. However LGC's new quality assurance procedure produces quantitative information, required for full regulatory compliance, on viability and potency of the cells.

## Impact

LGC has been using this new method to create retrospective profiles of transplanted pancreatic islets, and is now extending the application to clinical samples. Once fully validated the imaging system will permit pre-transplant assessment of islet quality enabling appropriate selection of donor cells which have the highest chance of a successful transplantation. This in turn will improve the clinical outcome for patients with type 1 diabetes.

Dr Damian Marshall, Principal Scientist for Cell Biology said

*"This novel tool offers the opportunity to improve the quality of life for a significant number of people with diabetes. This could only be achieved through collaborative research bringing together specialist skills, resources and knowledge from across the whole of the UK."*

The pancreatic islet transplant programme is funded in the UK by the NHS following a bid coordinated by Prof James Shaw from Newcastle University on behalf of the UK Islet Transplant Consortium. It aims to improve clinical outcomes for patients and reduce the burden to the NHS of treatment for uncontrolled diabetes. The current work is focused around three of the UK clinical islet transplant centres in London, Newcastle upon Tyne and Edinburgh.

This research described in this case study was funded by Regener8 and the UK National Measurement System.

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For further information, contact:

**LGC**, Queens Road, Teddington, Middlesex TW11 0LY, UK

Tel: **+44 20 8943 7000** Email: [info@lgcgroup.com](mailto:info@lgcgroup.com) Web: [www.lgcgroup.com](http://www.lgcgroup.com)

**NMS Helpdesk**

Tel: **+44 20 8943 7393** Email: [nmshelp@lgcgroup.com](mailto:nmshelp@lgcgroup.com) Web: [www.nmschembio.org.uk](http://www.nmschembio.org.uk)

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