'Organic' study of live pancreatic tissue yields new opportunities for diabetes research

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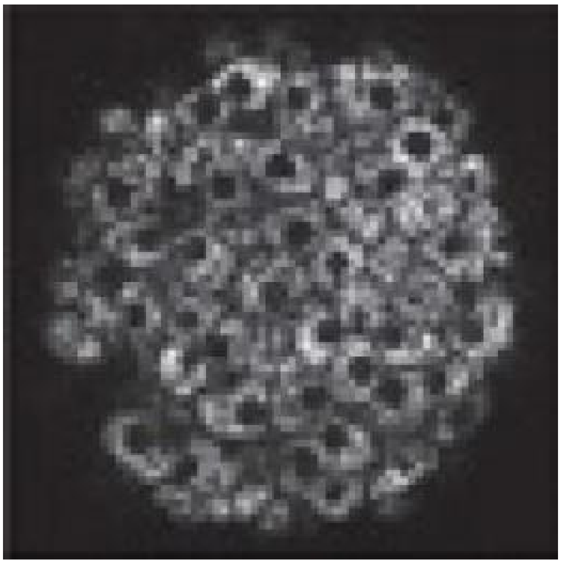

This is a pancreatic islet viewed with auto-fluorescence. Credit: Alan K. Lam

An 'all-natural' method for studying pancreatic islets, the small tissues responsible for insulin production and regulation in the body, has recently been developed by researchers at the University of Toronto's Institute of Biomaterials and Biomedical Engineering (IBBME) to try to track metabolic changes in living tissues in 'real time' and without additional chemicals or drugs.

It's an organically-minded approach that could lead to big changes in our understanding of diabetes and other diseases.

Assistant Professor Jonathon V. Rocheleau of the Institute of Biomaterials and Biomedical Engineering (IBBME), Department of Medicine, Division of Endocrinology & Metabolism, and Toronto General Research Institute Affiliated Scientist, along with third-year IBBME doctoral student Alan K. Lam, devised a small microfluidic tool to carry glucose and fatty acid solutions through small channels holding live pancreatic tissues.

The tissues are then caught against a 'dam', only a fraction of a millimeter in height, which keeps them stationary while the glucose solutions flow by, making it possible for scientists to monitor metabolic activities in the tissues to the glucose solutions as they happen.

The method represents a vital paradigm shift in metabolic research.

"We've created a new opportunity for tissue studies" stated Rocheleau. "Using our techniques, we're looking at metabolism as it occurs and as naturally as possible."

Standard studies involve either non-living pancreatic tissue, or require the addition of chemicals or drugs to track changes in living tissues. Now, with this new 'all-natural' approach, tissues are kept in conditions as close to their natural processes as possible.

Researchers are then able to track changes in the tissues in a pristine, natural state by viewing mitochondrial proteins in the tissue which are illuminated by their own, natural luminescence.

"We don't need to use any drugs," added Lam, the study's lead author.

The combined techniques and their results are the subject of a cover article for the current issue of *Integrative Biology*. And the results so far have been eye-opening.

Within just twenty minutes of being subject to a glucose cocktail, the pancreatic tissues stopped metabolizing fat, its natural source of food during fasting, leading to a sharp metabolic change in the cells and possible toxicity.

Now that Rocheleau and his lab have tracked normal physiological responses to sugar spikes, the same imaging study can be used in diabetic tissue models, leading to a deeper understanding of the disease.

But the new, integrative approach to research also offers hope for research into other diseases. "I would love cancer researchers to be able to pick this up and use it to see how cells change their metabolism," said Rocheleau.

"This method is absolutely translatable to other diseases," Lam added.

Provided by University of Toronto
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