

Smart nanotechnology for more accurate delivery of insulin

March 14 2023



Credit: Towfiqu Barbhuiya via Unsplash

More efficient and longer lasting glucose-responsive insulin that eliminates the need for people with type 1 diabetes to measure their glucose levels could be a step closer thanks to a Monash University-led project.

Published in the journal *Advanced Materials*, the preclinical study engineered a superior artificial pancreas system to release insulin precisely and smartly only when the body actually needs it, making control of blood [glucose](#) more reliable.

The researchers from Monash University, RMIT University, The University of Melbourne and the Baker Institute developed the system to respond to glucose, which current insulin does not.

Co-first author Dr. Rong Xu, from the Monash University Central Clinical School's Australian Center for Blood Diseases, and Dr. Sukhvir Kaur Bhangu from RMIT University and the University of Melbourne said if it worked in humans, only two injections would be needed per day.

Current insulin therapy requires people to monitor their [blood sugar](#) throughout the day and take multiple, carefully calculated doses based on [food intake](#), exercise, stress, illness and other factors.

Some must inject themselves up to five times a day. Continuous glucose monitoring devices remove, or at least reduce, the need for finger pricks, and insulin pumps can automatically deliver insulin, but they are very expensive and still are not always able to calculate the correct amount of insulin to be given.

The multidisciplinary team developed a new "artificial pancreas system" using phytyloglycogen nanoparticles, which are chains on glucose molecules dubbed a "nanosugar platform" as they are made of glucose, to deliver and release insulin in response to [glucose levels](#) in the blood.

This engineered nanosugar platform enabled rapid and sustained glucose-responsive insulin delivery, which was longer lasting and smarter than other systems.

Dr. Xu said it required only one injection every 12 hours and self-regulated. "This system would mean fewer injections and, potentially, no need to measure glucose," Dr. Xu said.

The research emerged from an NHMRC Ideas Grant awarded to co-lead author and Head of Monash University's Australian Center for Blood Diseases NanoBiotechnology Laboratory, Professor Christoph Hagemeyer, co-lead author and RMIT Associate Professor Francesca Cavalieri, and co-author Professor Frank Caruso at the University of Melbourne to develop this revolutionary type of insulin.

Professor Hagemeyer said more research was needed but the results were promising. He said the nanosugar platform was biodegradable, which enabled rapid and extended glucose control in two different models of type 1 diabetes with a single injection.

"The nanosugar particles are engineered to control [insulin](#) release and absorption through the lymphatic system into the [blood](#)," he said.

Professor Cavalieri said the [research](#) team, which includes several clinicians, now hoped to secure funding to continue the project and eventually undertake [clinical trials](#). "This new method is not only efficient, it's biodegradable and uses natural methods, which significantly reduces the chances of adverse affects or immune reactions," she said.

More information: Rong Xu et al, An Engineered Nanosugar Enables Rapid and Sustained Glucose-Responsive Insulin Delivery in Diabetic Mice, *Advanced Materials* (2023). [DOI: 10.1002/adma.202210392](https://doi.org/10.1002/adma.202210392)

Provided by Monash University

Citation: Smart nanotechnology for more accurate delivery of insulin (2023, March 14) retrieved 26 April 2024 from

<https://phys.org/news/2023-03-smart-nanotechnology-accurate-delivery-insulin.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.