Boronic Acid Polymers for Monitoring and Controlling Insulin Delivery

Published date: May 14, 2019

Technology description

Encapsulates and Automatically Releases Insulin in Response to High Blood Glucose Levels for the Treatment of Diabetes

These boronic acid polymers combine glucose monitoring and insulin administration into a single, feedback-controlled composition. The boronic acid polymers are designed to release insulin when high blood glucose concentration is detected, assisting patients in their monitoring and administration of insulin throughout the day. Diabetes is caused by an insufficient production of insulin which leads to elevated glucose levels in the bloodstream. More than 21 million Americans have diabetes, and 6 million adults are insulin-dependent. While treatments are available for monitoring blood glucose levels and administering insulin, these methods require a strict regimen of constant monitoring and painful, frequent injections throughout the day, which can often lead to reduced patient compliance. Researchers at the University of Florida have developed boronic acid polymers that allow for simultaneous monitoring and administration of insulin in response to elevated blood glucose levels. This treatment would reduce the number of insulin injections since the insulin remains neutral until activated by high glucose levels, resulting in automatic glucose monitoring and controlled insulin delivery.

Technology

Patients with insulin-dependent diabetes typically have to monitor their blood glucose levels regularly throughout the day and perform injections of insulin as needed. This boronic acid polymer approach could help streamline the monitoring and administering process into a single feedback-controlled composition. University of Florida researchers developed boronic acid block copolymers that self-assemble into vesicles when dissolved in the bloodstream. The vesicles would encapsulate the insulin and release based on the glucose levels in the bloodstream, covalently bonding with glucose when it becomes present. The vesicles would have a biocompatible, non-immunogenic shell that may allow it to reside in the bloodstream for a longer time compared to traditionally used insulin therapeutics.

Application area

Controlled insulin delivery for insulin-dependent diabetes

Advantages

Uses boronic acid-containing polymer vesicles, allowing for responsive release and low toxicity
Reduces the frequency and active decision required for making injections, increasing patient compliance
Simultaneously monitors blood glucose and administers insulin, reducing the need for "carb counting" after meals

Institution

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