A membrane-free system for continuous glucose monitoring

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Technology description

Summary

Current internal sensors used for continuous glucose monitoring in diabetic patients rely on physical barriers to isolate the glucose, making them less responsive and adaptive. This technology is a membrane-free, graphene-based system that responds to glucose in a concentration-dependent manner and enables rapidly responsive, reliable, and continuous measurement of blood glucose levels. Development of this technology could help create the next generation of blood glucose monitors that are simple, fast, sensitive, and help diabetic patients monitor their blood glucose more easily and accurately.

Polymer functionalized graphene allows for continuous detection of blood glucose based on changes in conductance

This technology achieves membrane-free, continuous glucose monitoring by detecting miniscule changes in the conductance of graphene functionalized with a glucose sensitive polymer. In this system, the graphene is coated with a single layer of a polymer that can form transient interactions with glucose in solution. These polymer-glucose interactions alter the conductive properties of the graphene, allowing for sensitive, responsive, and continuous measurement of blood glucose. Additionally, because of its high sensitivity and rapid sensing capabilities, this technology has the potential for incorporation into a non-invasive contact lens-based sensor.

A prototype of this technology has been shown to be responsive to changes in glucose levels from 0 to 200 mg/dL, demonstrating the utility and applicability of this system for developing continuous glucose monitors.

Publications

Zhu, Y., Yan, J., Wang, C., Wang, X., Xu, K., Li, D., Wang, Q., Lin, Q., “A graphene-based affinity glucose nanosensor” Transducers. 2015 June 21; 1405-1408.

Application area

Sensor for internal, continuous glucose monitoring

Membrane-free monitor for faster, real-time sensing
External glucose-monitoring device for physicians and lab technicians testing patients’ blood samples
Contact lens-based system would allow non-invasive testing
Can interface with existing technologies such as insulin pumps or health monitors

Advantages

Does not require a membrane or other semi-permeable barrier for accurate measurements
Allows for continuous, real-time monitoring of glucose levels
Improved sensitivity over a wide range of glucose concentrations
Simplified fabrication of device
Can be used to develop less invasive glucose sensing devices

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