Continuous glucose monitoring for diabetes care using MEMS based sensor

Technology #m11-111

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MEMS based differential affinity sensors for continuous glucose monitoring in diabetes patients

Continuous glucose monitoring is achieved by implanting wireless sensors under the skin of a patient. This technology utilizes recent developments in the field of microelectromechanical systems (MEMS) to improve upon existing continuous glucose monitoring solutions. Specifically, this technology is an implantable MEMS device containing a polymer material that interacts reversibly with glucose in proportion to the glucose concentration. The binding of the polymer and glucose changes the viscosity or capacitance of the fluid within the device, depending on the device configuration, which can be quantified and related to the glucose concentration in blood. Newer versions compare the reading to that from a glucose-insensitive reference polymer to eliminate the effects of environmental disturbances. The readout would subsequently be communicated through a wireless device.

MEMS sensor provides improved reliability and stability in continuous glucose monitoring

Diabetes care can greatly benefit from continuous glucose monitoring, either with an electrochemical or affinity sensor. Electrochemical sensors are most commonly used, but are highly susceptible to biofouling and interfering species, leading to significant drift. Affinity sensors, in contrast, are considerably more tolerant to such interference and have improved reliability and stability. However, they are generally more difficult to construct, which limits their widespread use. This technology is an affinity sensor that can be readily constructed using MEMS technology. In addition, it eliminates environmentally induced signal fluctuations by comparing measured signal with that from a glucose-insensitive reference unit that has an identical response to the environment. Thus, drift in the measured signal due to environmental factors is minimized.

The increased reliability and stability of this technology has been demonstrated through both in vitro and in vivo assays. Detecting fluctuations of blood sugar on the minute time scale combined with improved reliability and stability of the glucose monitoring system can improve the quality of life for the patient.

Applications:
- Continuous glucose monitoring for diabetics, including wireless diabetes management and closed-loop insulin delivery
- Glucose monitoring in non-diabetic patients, such as patients suffering from glycogen storage disease
- Monitoring levels of various biological interesting analytes, such as oxygen, lactase, insulin, hormones, cholesterol viruses, metabolites such as lactate, fatty acids, cysteines, etc., and other biomolecules
– Monitoring metabolites in industrial setting, such as the food industry or on poultry farms

Advantages:
– Improves the reliability and stability of continuous glucose monitoring
– Technology can be optimized for a variety of different metabolites and biomolecules
– Validated through in vitro and in vivo models


Licensing Status: Available for licensing and sponsored research support

Related Publications:

Inventors

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