MEMS MICRONEEDLES INTEGRATED WITH CONTINUOUS MONITORING AND DELIVERY MICRO SYSTEM FOR COMPOUNDS IN EPIDERMAL INTERSTITIAL FLUID

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ABSTRACT

Diabetes is a huge healthcare problem, and in particular the inability of diabetics to continuously monitor their glucose levels causes some of the most severe complications for this condition due to undetected hypoglycemic or hyperglycemic events. The traditional fingerstick test is an invasive, painful and inconvenient method of measuring glucose levels, and it often fails to detect rapidly fluctuating glucose levels. This manual method is also is not conducive to identifying hypoglycemia or hyperglycemia during sleep. Recently, devices that automatically and continuously monitor glucose levels have been introduced. However, these products either (a) don't provide accurate everyday glucose level control, (b) still require fingerstick test for calibration, and/or (c) require trained personnel to insert a sensor under the skin.

To address this tragic situation, researchers at the University of California, Berkeley have developed a MEMS-based continuous glucose monitor. This miniature monitor uses an array of hollow, out-of-plane microneedles to reach the interstitial fluid in the epidermal skin layer. The device samples glucose by diffusion, and therefore interstitial fluid does not need to be sampled. The glucose of the interstitial fluid permeates an integrated dialysis membrane and then is channeled to an electrochemical glucose sensor. The integrated system is fabricated using well-established MEMS processes and a novel in-device enzyme immobilization technique.

In comparison to currently available continuous glucose monitoring systems, this low-cost batch fabricated device is painless, easy to use, suitable for everyday operation, and doesn't require fingerstick calibration.

APPLICATIONS

Initially designed for continuously monitoring glucose levels but could also be used to monitor other compounds that can be automatically extracted from epidermal interstitial fluid

ADVANTAGES

- Painless
- Easy to use
- Suitable for everyday operation
- Self calibrating (does not require fingerstick testing)
- Inexpensive to manufacture

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	7,415,299	08/19/2008	2003-072

CONTACT

Michael Cohen
mcohen@berkeley.edu
tel: 510-643-4218.

OTHER INFORMATION

KEYWORDS

medical devices, non-invasive device, syringe/needles, sensors, diagnostic, diagnostic tool, detection

CATEGORIZED AS

- **Medical**
  - Other
- **Research Tools**
  - Other

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University of California, Berkeley Office of Technology Licensing
2150 Shattuck Avenue, Suite 510, Berkeley,CA 94704
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