Ingestible Physiological Status Monitoring (PSM) Device (the "PSM Pill")

Technology #16636

Applications

This invention provides real-time internal monitoring of vital signs with improved accuracy over external measurements, useful for field assessment of patients or home monitoring and management of chronic illnesses. This device may also be used for operational safety monitoring for military personnel or first responders, or to improve performance and safety for athletes. This device can detect a number of medical conditions including, sepsis, arrhythmias, aortic stenosis, hypertrophy, asthma and chronic obstructive pulmonary disease (COPD) exacerbations.

Problem Addressed

Physiological status monitoring (PSM) systems can provide data for necessary preventative interventions, improved performance, risk mitigation, or monitoring of illness or after injury. Current PSM devices are less than ideal due to a number of limitations including limited battery life, poor signal fidelity, and general ergonomic obtrusiveness. This invention is an ingestible, minimally intrusive PSM device that measures heart rate, breathing rate, and core temperature for reliable and rapid monitoring of physiological status.

Technology

This small ingestible PSM device enters the digestive tract as a pill and contains a thermistor to measure temperature and an electret hydrophone and processing circuitry to collect, amplify, and filter audio signals to derive heart and breathing rates from noisy data. The data is wirelessly transmitted to a receiver outside the patient. This device can collect data anywhere along the digestive tract regardless of contact with tissue. The PSM device can be either transient and excreted normally, or persistent and affixed in the digestive tract. The PSM device has a relatively long battery life of at least 4 days, but persistent devices may be powered through inductively coupled or wireless resonant recharging.

Advantages

- Inexpensive
- Extended battery life with optional recharging capabilities
- Operational anywhere in the GI tract and can be transient or persistent
- Improved patient comfort
- Measures true core temperature which isn’t currently obtainable except with rectal thermometry

Categories For This Invention:

255 Main Street, room NE 18-501
Cambridge, MA 02142-1601
Phone: 617-253-6966 Fax: 617-258-6790
http://tlo.mit.edu
Contact the Technology Manager: tlo-inquiries@mit.edu

Lincoln Laboratory
Medical Devices
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Intellectual Property:

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PCT
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Inventors:

Tadd Hughes
Robert Langer
Albert Swiston
Kerry Johnson
Giovanni Traverso

Publications:

A Tiny Pill Monitors Vital Signs From Deep Inside The Body
NPR
November 18, 2015
A New Way to Monitor Vital Signs Ingestible Sensor Measures Heart and Breathing Rates from within the Digestive Tract
MIT News
November 18, 2015
Ingestible Biosensor
Lincoln Laboratory Journal
2014

External Links:

Lincoln Laboratory
https://www.ll.mit.edu/index.html
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