

University of Massachusetts Medical School

eScholarship@UMMS

UMass Center for Clinical and Translational
Science Research Retreat

2014 UMass Center for Clinical and
Translational Science Research Retreat

May 20th, 12:30 PM

Point-of-Care Diabetes Monitoring via Breath Acetone Detection

Ronny Prierer

Western New England University

Et al.

Let us know how access to this document benefits you.

Follow this and additional works at: https://escholarship.umassmed.edu/cts_retreat



Part of the [Biomedical Devices and Instrumentation Commons](#), [Diagnosis Commons](#), [Equipment and Supplies Commons](#), [Nutritional and Metabolic Diseases Commons](#), and the [Translational Medical Research Commons](#)

Prierer R, Rust M. (2014). Point-of-Care Diabetes Monitoring via Breath Acetone Detection. UMass Center for Clinical and Translational Science Research Retreat. Retrieved from https://escholarship.umassmed.edu/cts_retreat/2014/posters/128

Creative Commons License



This work is licensed under a [Creative Commons Attribution-NonCommercial-Share Alike 3.0 License](#).

This material is brought to you by eScholarship@UMMS. It has been accepted for inclusion in UMass Center for Clinical and Translational Science Research Retreat by an authorized administrator of eScholarship@UMMS. For more information, please contact Lisa.Palmer@umassmed.edu.

Point-of-Care Diabetes Monitoring via Breath Acetone Detection

Ronny Priefer,¹ Michael Rust²

¹ Department of Pharmaceutical & Administrative Science, Western New England University,
Springfield, MA

² Department of Biomedical Engineering, Western New England University, Springfield, MA
Western New England University
ronny.priefer@wne.edu

Purpose

Diabetes can be a life-long disease which requires continuous blood-glucose monitoring. Currently technology, albeit good, does have its draw-backs; in particular that it is an invasive technique which causes discomfort to the individual. Therefore, low compliance can ultimately lead to other health issues. Approaches are underway to develop a portable, hand-held, noninvasive monitoring device to detect the biomarker, acetone, found in the breath of diabetics. By creating films of poly(4-vinylbenzeneboronic acid) and poly(allylamine hydrochloride), acetone can react with these via a Petasis reaction. This alters the physicochemical nature of the film, providing a quantification of acetone, and thus hopefully blood-glucose levels, in a non-invasive manner.

Methods

UV-transmitting poly(methyl methacrylate) slides are coated with a system of PAH/PVBBA at differing pH values and are then exposed to acetone/water vapor. Concentrations of acetone evaluated are 0.1–10 ppm. The slides are next subjected to the light emitted by a diode with a peak wavelength of 300 ± 5 nm. The transmitted light is detected by a UV-photosensor with an integrated transimpedance amplifier that produces a voltage output as a function of absorption.

Results

We have successfully synthesized poly(4-vinylbenzeneboronic acid) and multilayered with poly(allylamine hydrochloride). We have been able to cross-link these two polymers using only acetone vapor and are developing a hand-held device. Analyzing the difference in output voltage from exposed to unexposed slides at varying acetone concentrations, provides is a linear relationship up to 2500 ppb, which is above the high point for breath acetone concentration.

Conclusions

We have been able to develop a technology that accurately detects acetone vapor. We are engineering a hand-held breathalyzer device to detect acetone in the breath of diabetic individuals and are attempting to optimize its capabilities.