

A Novel Approach For Diagnosis of Diabetes Mellitus by HS/GC-MS Analysis of Earwax Volatiles

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Abstract

In this work, HS/GC-MS was used to evaluate earwax volatile compounds to discriminate normal subjects from diabetics.

Introdução

Diabetes Mellitus (DM) is a metabolic disorder characterized by chronic hyperglycemia due to derangement in carbohydrate, fat and protein metabolism that are associated with absolute or relative deficiencies in insulin secretion, insulin action and both¹.

Some approaches were reported linking volatile organic compounds (VOCs) in biological fluids as breath^{2,3}, urine^{2,4}, plasma⁵ and saliva⁶ to blood glucose profile. Ethanol, for instance is produced via alcoholic fermentation of glucose by gut bacteria and yeast, while ketones, including acetone, are derived from oxidations of free fatty acids and influenced by glucose metabolism³. In this work, for the first time, analyzing earwax VOCs was presented as a potential fast, cheap and non-invasive approach for diagnosis of diabetes types (I and II) in addition to its ability to discriminate the two classes.

Resultados e Discussão

The results have permitted the detection of a normal earwax VOC profile and helped define the range of individual shifts in the levels of some components indicative of metabolic disorders related to diabetes. The findings evidence an increased excretion of ketones and low aliphatic alcohols in diabetes mellitus. The concentrations of these components were found to be enhanced in earwax of diabetic patients. With the increased concentrations of the samples studied, ethanol and acetone were seen as most indicative of DM. Multivariate statistical analysis using PCA was performed on the metabolomic data derived from both HS/GC-MS for discrimination between healthy and diabetic populations of both types I & II.

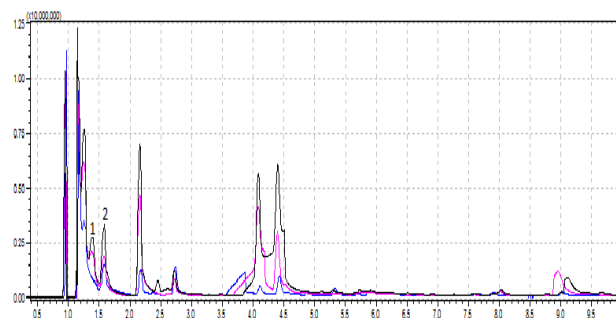


Figura 1. Representative total ion chromatograms (TICs) of the first ten minutes of the chromatographic run of earwax samples from a healthy volunteer (blue), patient with insulin dependent diabetes mellitus (type 1) (black) and patient with non-insulin dependent diabetes mellitus (type 2) (pink) showing difference in concentrations of (1) ethanol and (2) acetone which are the most important volatile compounds to indicate DM and discriminate its types.

Conclusões

Nevertheless, the field of earwax research is just beginning but when performed to exacting standards and interpreted correctly, it can provide an inexpensive non-invasive screening aid for diseases as diabetes mellitus including discrimination between its types I and II.

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