Screening of *Candida albicans* urinary tract infections by electronic nose

Afonso, Helga, Escola Superior de Saúde - IPPorto; Faculdade de Medicina da Universidade do Porto, Portugal
Mota, Inês, Instituto de Ciências Biomédicas Abel Salazar, Portugal
Sousa, Ana, Escola Superior de Saúde - IPPorto, Portugal
Vieira, Mónica, Escola Superior de Saúde - IPPorto; Ciências Químicas e das Biomoléculas/CISA, Portugal
Rufo, João C, ISPUP; Faculdade de Medicina da Universidade do Porto, Portugal

Abstract

Fungus caused urinary tract infections (UTIs) are often misdiagnosed. Since culturing procedures are time-consuming, practitioners prophylactically prescribe antibiotics, which are ineffective. Hence, there is a need for reliable methods to detect infectious concentrations of fungi in urine. Since Candida spp is the main responsible for mycological UTI, this study focuses on the detection of candiduria by analysing volatile compounds (VOCs) profiles released by the fungus´ metabolic activity in urine.

The aim of this study was to develop and internally validate a detection algorithm for identifying the presence of pathological levels of *Candida albicans* in urine, using an electronic nose.

To identify the VOCs profiles, the Cyranose 320 (Sensigent, USA) eNose, composed of 32 conducting polymer sensors, was used. Firstly, to optimize the eNose settings, urinary VOCs emissions were tested in terms of substrate heating temperature, as well as acquisition and purging times. Subsequently, 10 glass assay tubes containing urine from a healthy donor and 10 tubes containing urine inoculated with infectious levels (2.3 x 10^7 CFU/mL) of *Candida albicans* were analysed, in duplicate, with the eNose and resulting data were used to build the detection algorithm through recursive partitioning regression trees. The algorithm was then internally validated and efficacy measurements were retrieved. The Mann-Whitney test was then used to study the hypothesis of sensor 6 (S6) response between the groups.

There was clear differentiation between healthy and infected urine samples (Figure 1). The algorithm reported optimal discrimination of samples using S6 with a cut-off sensor response of 239 x10^-6, with a sensitivity of 85.0%, a specificity of 90.0% and an accuracy of 87.5%. The S6 response was significantly different between groups ($p<0.001$).

In conclusion, this study is promising and, in the future, with further validation using real UTI patients, it may contribute for better diagnosis.

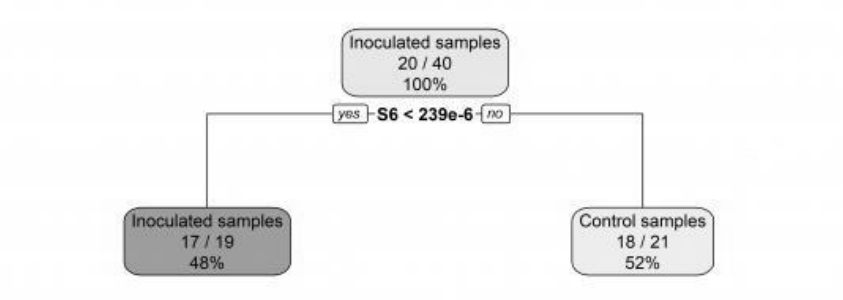


Figure 1