2,5-dimethylfuran as a validated biomarker of smoking status

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Abstract

Introduction

Exposure biomarkers are required in tobacco use studies to accurately assess smoking status since self-reporting usually results in misclassification estimates. This study uses breath analysis and assesses some volatile organic compounds (VOCs) as potential biomarkers of tobacco smoke exposure.

Methods

Forced-expiratory breath samples were obtained from 377 volunteers (174 smokers and 203 non-smokers). Exhaled breath levels of different VOCs previously related to tobacco smoke were evaluated. The toluene-to-benzene ratio was evaluated as this ratio has been found to be different in atmospheric samples and tobacco smoke emissions. Finally, breath analyses from 64 patients attending a clinical practice were evaluated and the results were compared to their self-reporting status.

Results

Univariate analysis shows that all compounds evaluated gave significant differences (p<0.001). Receiver operating characteristic (ROC) curves suggest that xylenes and toluene are not able to accurately determine smoking status, and benzene and the T/B ratio present potential utility in certain conditions. The highest discriminant capacity was obtained for 2,5-dimethylfuran (AUC=0.982, 95% CI: 0.969–0.995), with a cut-off value of 0.016 ppbv (sensibility=0.965, specificity=0.896). Drinking coffee was the only confounding parameter that can give low breath levels for this compound. The evaluation of the results obtained from the patients attending a clinical practice showed that 8% of people who claim to be non-smokers hid their real smoking status.

Conclusions

The results obtained confirm that the determination of 2,5-dimethylfuran in breath samples is a good and simpler alternative to conventional blood or urine tests for assessing smoking status.

Implications

Analysis of 2,5-dimethylfuran in breath samples results in a simple and fast method for the determination of the smoking status of a person. This methodology presents multiple advantages as it is neither invasive nor embarrassing for patients attending clinical practices. Moreover, analysis of biomarkers in breath samples is simpler and faster than using conventional methods based on urine or blood analysis.

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