Analysis of Exhaled Breath with Electronic Nose and Diagnosis of Lung Cancer by Multifactorial Logistic Regression Analysis

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Background
Exhaled breath of lung cancer patients contains specific pattern of volatile organic compounds (VOCs).

Objective
The aim of our study was to test the potential of multifactorial logistic regression (MLRA) analysis in diagnosis of lung cancer.

Methods

Study population
Exhaled breath of morphologically verified lung cancer patients (cancer group) and mixed group of patients with COPD, asthma, pneumonia, bronchiectasis and healthy volunteers (no cancer group) was examined.

Air sample collection
Subjects inspired VOC-filtered air by tidal breathing for 5 minutes, through T-shape two-way non-rebreathing valve (Hans Rudolph Ltd, USA). Single expiratory vital capacity was collected and sampled by electronic nose (Cyanose 320, Smith Detection, USA) within 5 minutes after breath sample collection.

Statistical analysis
Optimal detector parameter combination and mathematical model for discrimination of lung cancer was calculated by MLRA backward stepwise method. In mathematical model were included all detector parameters who have statistically significant (p<0.05) and trend to significant influence (p<0.1) on lung cancer prognosis.

Results
475 patients in total, 252 of them lung cancer patients, and 223 patients with different lung diseases and healthy volunteers, were recruited in the study. 265 were current nonsmokers and 210 were smokers.

Optimal detector parameter combination for discrimination of lung cancer in non-smokers and ex-smokers (current non-smokers) and smokers is shown in Figure 1 and 2.

Sensitivity, specificity, PPV and NPV of both mathematical models is shown in Table 1 and Table 2.

Conclusions
Finding of optimal detector parameter combination and division of patients in smokers and nonsmokers give very high lung cancer prediction accuracy with MLRA in training group.

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