Electronic nose technology can distinguish COPD patients who are colonized with Aspergillus fumigatus from COPD patients who are not

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Introduction

Colonization with *Aspergillus fumigatus* in chronic obstructive pulmonary disease (COPD) is diagnosed by sputum culture, but diagnostic accuracy is low and culturing takes about seven days. An electronic nose could be a fast alternative to diagnose *Aspergillus fumigatus*. Therefore, the aim of this research was to investigate the ability of electronic nose technology (ENT) to detect *Aspergillus fumigatus* colonization in COPD patients.

Electronic nose technology

An electronic nose (e-nose) is an artificial sensor which enables description of volatile mixtures and therefore may play a role in the diagnosis of several (respiratory) diseases. A difference in volatile organic compounds (VOCs), present in human breath, may reflect a change in metabolism or the onset of a disease.

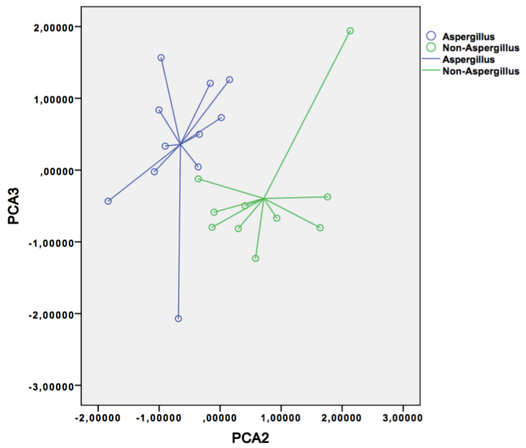
Methods

COPD patients with sputum samples positive for *Aspergillus fumigatus* (cases) and patients with negative sputum samples (controls), who visited the outpatient respiratory department in June or July 2016 for a regular lung function were included in this study. Patients were measured with ENT and - if possible - a sputum sample was collected. Data of the electronic nose was analyzed in SPSS and a t-test was used to compare the case and control group.

Table 1: Baseline characteristics of study population

	Aspergillus	Controls	p-value
	n=11	n=10	-
GOLD stage (II/III/IV)	7/2/2	8/2/0	0.24
Age (years)	68.4 (8.51)	65.8 (8.60)	0.49
Gender (M/F)	6/5	5/5	0.85
BMI	27.0 (3.59)	28.5 (6.41)	0.54
FEV1/FVC	0.44 (0.12)	0.48 (0.13)	0.51
FEV1 (%pred)	54.1 (17.6)	56.3 (13.7)	0.76
Current/Ex/Never-smoker	(3/8/0)	(3/7/0)	0.90
Packyears	41.1 (14.33)	43.9 (21.17)	0.75
CCQ score	2.12 (0.88)	2.77 (1.06)	0.17

Values are denoted as mean (SD). BMI = Body Mass Index. FEV1 = Forced Expiratory Volume within one second. FVC = Forced Vital Capacity. %pred = percentage of predicted value. CCQ = Clinical COPD Questionnaire.



Results

Eleven COPD patients colonized with *Aspergillus fumigatus* were compared with ten COPD patients without *Aspergillus fumigatus*. The case and control group did not differ according to baseline characteristics.

After reducing the sensor data to four principal components, the two principal components with the most discriminating potential (PC2 and PC3) were used for a discriminant analysis. Discriminant analysis showed a cross-validated accuracy of 90.5% between both groups. The cross-validated sensitivity and specificity were respectively 91% and 90%.

Conclusion

The results suggest that colonization with *Aspergillus fumigatus* leads to a distinctive breathprint in patients with COPD. (sensitivity = 91%, specificity = 90%)

Additional research including external validation is needed to confirm these results.

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