Breathomics distinguishesbetween anti-IgE-treated and non-treated adults with severe asthma

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Omalizumab, an anti-IgE monoclonal antibody, is indicated in adults with severe persistent allergic asthma (GINA Guidelines, 2015).
Analysis of exhaled breath with electronic nose (eNose) and gas chromatography/mass spectrometry (GC/MS) (breathomics) identifies patients with asthma (Montuschi P et al, 2010). An eNose is an artificial sensor system that generally consists of an array of chemical sensors for detection of volatile organic compound profiles (breathprints) and an algorithm for patter recognition (Montuschi P et al., 2013). Exhaled molecular markers can provide phenotypic information in asthma.
The objective of this study was to determine whether adults with severe asthma who were being treated with omalizumab (anti-IgE+) had a different breathprint comparedwith those who were not being treated with anti-IgE therapy (anti-IgE-) as assessed by eNoses and GC/MS.
This was a cross-sectional analysis of the U-BIOPRED (Unbiased biomarkers for the prediction of respiratory disease outcomes) adult cohort. Severe asthma was defined by IMI-criteria (Bel EH et al., 2011). Anti-IgE+ patients were on a regular treatment with s.c. omalizumab (150-375 mg) every 2-4 weeks. Exhaledvolatile compounds trapped on adsorption tubes (Tenax GR) were analysed by a centralized eNose platform consisting of 5 eNoses (Owlstone Lonestar, two Cyranose 320, Comon Invent, Tor Vergata TEN), including a total of 190 sensors, and GC/MS. Recursive feature elimination(http://topepo.github.io/caret/rfe.html) was used for feature selection and random forests, which is more robust to overfitting, for classification.
Nine anti-IgE+ (females/males 2/7, age 52.6±16.3 years, mean±SD, 1/2/6 current/ex/nonsmokers, pre-bronchodilator FEV_1 70.6±21.1% predicted value) and 30 anti-IgE- patients (18/12 females/males, age 53.2±14.2 years, 0/16/14 current/ex/nonsmokers, pre-bronchodilator FEV_1 59.6±30.7% predicted value) were studied. Accuracy of classification with the defferent eNoses/techniques was as follows:Tor Vergata TEN, 0.87; Comon Invent, 0.87; Owlstone Lonestar,0.83; Cyranose 320 2, 0.82; Cyranose 320 1, 0.75; all eNoses, 0.85, GC/MS, 0.83; eNoses + GC/MS, 0.83. Number of variables used for building the model was as follows:Tor Vergata TEN, 4; Comon Invent, 2; Owlstone Lonestar, 71; Cyranose 3202, 12; Cyranose 320 1, 14; all eNoses, 110, GC/MS, 96; eNoses + GC/MS, 16. There was no significant between-group difference in FEV_1 values ($P>0.05$).
Preliminary results suggest that breathomics can distinguish between anti-IgE+ and anti-IgE- severe asthma patients. Large prospective studies are required to clarify the relationships betweenbreathprintsand therarpeutic effects of anti-IgE drugs.

Global Initiative for Asthma (GINA) Guidelines 2015. Available at: www.ginasthma.org/
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