RUHRLAND KLINIK
Westdeutsches Lungenzentrum

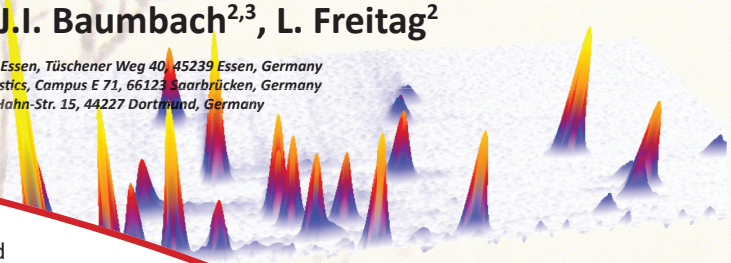
KIST Europe
Korea Institute of Science and Technology

B&S Analytik

Volatile Organic Compounds in Chronic Obstructive Pulmonary Disease

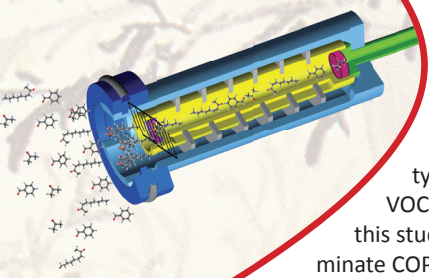
V. Besa[1], K. Darwiche[1], H. Teschler[1], I.Kurth[1], T. Rabis[1], O.Anhenn[1], U. Sommerwerck[1], J.I. Baumbach[2,3], L. Freitag[2]

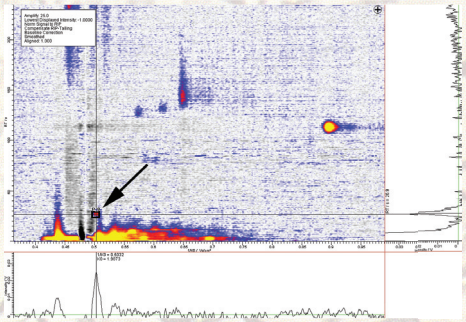
1 Ruhrlandklinik, Clinic for Pulmonology, University Hospital Essen, Tüschener Weg 40, 45239 Essen, Germany
2 KIST Europe, Department Microfluidics and Clinical Diagnostics, Campus E 71, 66123 Saarbrücken, Germany
3 B&S Analytik, BioMedicalCenter Dortmund, Otto-Hahn-Str. 15, 44227 Dortmund, Germany

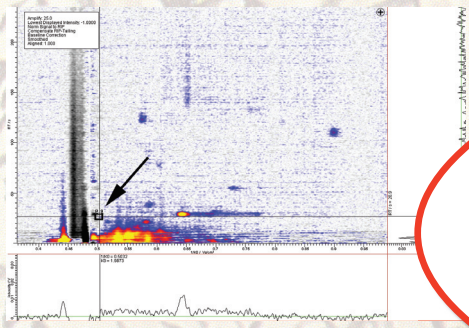


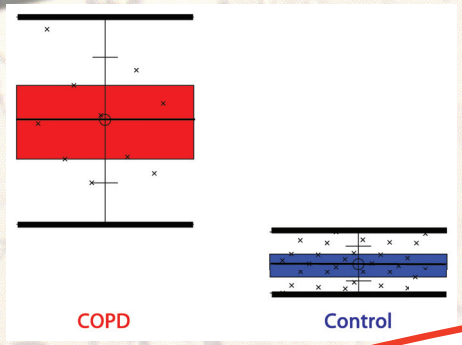
Part of a IMS-Chromatogram of human breath

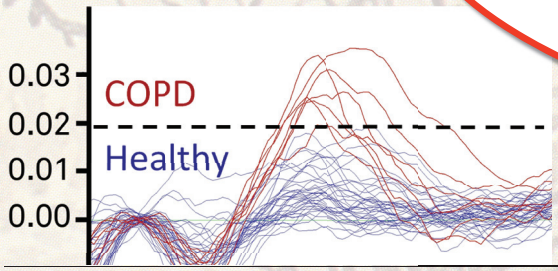
Chronic obstructive pulmonary disease (COPD) is a chronic inflammatory disease of the airways. The spirometry is the gold-standard in the diagnosis of the disease and Forced Expiratory Volume in 1 second (FEV1) is used to grade the severity of the disease and is the strongest predictor of the mortality in these patients. However, COPD patients have systemic inflammation that is not actually reflected by FEV1. The analysis of breath air is not a new concept. Volatile organic compounds (VOC) are until now investigated by several methods in lung diseases, such as airway infections, lung cancer, sarcoidosis, asthma and COPD. In our study we used the technology of the ion mobility spectrometry to detect VOCs in the exhaled breath of patients with COPD. The ion mobility spectrometry allows a non-invasive, easy and fast detection of VOCs and especially in very low concentrations. The purpose of this study was to identify peaks of VOCs that could discriminate COPD patients from healthy subjects as well as to determine whether specific VOC peaks could differentiate COPD patients with different severity groups.











COPD patients and healthy subjects were included in the study. The subjects were requested to exhale through a mouth piece connected to a Teflon tube. The sample air was collected and through a sample loop was transferred to a multi/capillary column for a first chromatographic separation. The pre-separated analytes entered then the ionization chamber of the IMS, where through a radiation source the ionization takes place. The ionized analytes are detected by a Faraday-plate at the end of the drift tube. Several peaks are detected and statistically evaluated by Wilcoxon-rank-sum test. Several peaks showed increased signal intensity in a subset of COPD patients especially in patients with more severe forms of the disease. These peaks could possibly correlate to a systemic inflammation. Consequently, further studies are required to elucidate whether these peaks are related to a systemic inflammation existing to these patients.

Acknowledgements

The financial support of the Ministry of Education, Science and Technology (MEST) of the Republic Korea is acknowledged thankfully. Part of the work on this paper has been supported by Deutsche Forschungsgemeinschaft (DFG) within the Collaborative Research Center (Sonderforschungsbereich) SFB 876 „Providing Information by Resource-Constrained Analysis", project TB1 "Resource-Constrained Analysis of Spectrometry Data".

In addition, the work was supported partly by the German Federal Ministry of Economics and Technology based on a decision of the German Bundestag within the project KF2368102AKO.

* Korea Institute of Science and Technology Europe Forschungsgesellschaft mbH (KIST Europe)
Campus E 7 1 - 66123 Saarbrücken - Germany
phone + 49 (0) 681 9382 229 - fax + 49 (0) 681 9382 240

http://www.kist-europe/r_cd_jibb.html
http://www.kist-europe.com
http://www.kist-europe.de

Contact: PD Dr. Jörg Ingo Baumbach
Head of Department Microfluidics and Clinical Diagnostics
baumbach@kist-europe.de