Breath condensate analysis for disease diagnostics

Introduction:
Exhaled breath condensate (EBC) represents a rich source for countless biomarkers that can provide valuable information about respiratory as well as systemic diseases. Finding non-invasive methods for early detection of lung cancer, injury, inflammation and infectious complications in chronic diseases like Bronchial asthma (AB) would be highly beneficial.

Technology description:
Proteomic analysis of exhaled breath condensate (EBC) is a non-invasive method which detects the presence of minute amounts of biomarkers (proteins/peptides) expired from the respiratory system with unmatched precision. Compared to other approaches to extract and analyze breath condensate, our method is extremely sensitive and allows the detection of up to several hundred proteins. Exhaled breath condensate is obtained from patients who breathe freely for 5 minutes into a sampling device where condensation of exhaled air and its freezing occurs. Further laboratory processing is based on tryptic digestion, HPLC separation and subsequent analysis by high-resolution mass spectrometry which is followed by data processing and database search.

Advantages over existing solutions:
Similarly to the analysis of urine, EBC results are likely to mirror various pathophysiological states of the respiratory system and possibly also of other organs. Changes in exhaled breath condensate proteome may even precede clinical development and serum changes indifferent lung conditions such as cancer, acute inflammation or deterioration. Thus, if proven feasible, sensitive and specific enough, the EBC could not only reduce invasive and painful bronchoscopy for cancer diagnostics and blood sampling but also help to guide antibiotic or anti-inflammatory therapy, optimize long-term asthma therapy, monitor disease progression and other critical clinical decisions.

Development status:
Clinical study on Bronchial asthma (73 patients, 330 samples), Cystic fibrosis (22) and healthy controls (120). Clinical study on Lung cancer (163), COPD (77) and healthy controls (180). Highly selective and specific biomarkers were identified for asthma, COPD, CF and lung cancer individuals.

Publications:
Lacombe, M., C. Marie-Desvergne, F. Combes, A. Kraut, C. Bruley, Y. Vandenbrouck, V. Chamel Mossuz, Y. Coute, V. Brun. Proteomic characterization of human exhaled breath condensate. Journal of Breath Research. 2018, 12(2), 021001. ISSN: 1752-7163. IF: 3.489. PMID: 29189203 (less sensitive method)
Muccilli, V., R. Saletti, V. Cunsolo, J. Ho, E. Gili, E. Conte, S. Sichili, C. Vancheri, S. Foti. Protein profile of exhaled breath condensate determined by high-resolution mass spectrometry. Journal of Pharmaceutical and Biomedical Analysis. 2015, 105, 134–49. ISSN: 0731-7085. IF: 2.831. PMID: 25555262 (less sensitive method)vsensitive method) Muccilli, V., Saletti, R., Cunsolo, V., Ho, J., Gili, E., Conte, E., ... Foti, S. (2015). Protein profile of exhaled breath condensate determined by high resolution mass spectrometry. Journal of Pharmaceutical and Biomedical Analysis, 105, 134–49. http://doi.org/10.1016/j.jpba.2014.11.050 (less sensitive method)

IP protection:
Subject to confidentiality, protected know-how, biomarker protection is ongoing

Ownership:
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More information is available upon signing a CDA/NDA. Please contact IMTM´s director (director@imtm.upol.cz) or the technology transfer office (tto@imtm.upol.cz)