

Development of non-invasive point-of-care sampling and analysis of biological fluids

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Exhaled breath is probably the most abundant diagnostic sample and belongs to completely non-invasive human biological samples (other non-invasive samples: human sweat, saliva, urine). On average, 10,000 L of air is inhaled and subsequently exhaled by a person every day. Except O₂, CO₂ and other gases, the exhaled breath contains water vapors and hundreds of different compounds exo- and endogenous origin in trace concentration. Part of the exhaled breath (mainly water, water soluble volatile gases, CO₂ and aerosolized particles of airway lining fluid) and can be transformed into a liquid phase by simple procedure based on cooling and subsequent condensation of exhaled air - exhaled breath condensate (EBC). The aerosolized particles contribute to the non-volatile EBC constituents, such as inorganic ions, small organic molecules, proteins. The collection of EBC sample is relatively simple procedure, in which a person exhales into a sampling device – cooled condensation tube, on the walls of which the water vapor containing dissolved compounds condenses and is eventually collected for the analysis. In our group we have developed in-house build EBC sampler with maximum simplicity, low cost and wide availability of the consumables. EBC samples obtained from patients with various respiratory diseases (chronic obstructive pulmonary disease, asthma, pulmonary fibrosis, sarcoidosis, cystic fibrosis) were compared with the EBC samples from a group of healthy individuals. Another objective was to develop a portable capillary electrophoresis system (P-CE) equipped with C4D detection that allows repeated injections of microliter volumes of biological fluids.

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