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CHROMATOGRAPHY AND MASS SPECTROMETRY IN ANALYSES OF PHYTONUTRIENTS IN FOOD SAMPLES

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Plants (e.g. vegetables, fruits, grains, legumes, nuts, spices) are rich sources of many plant secondary metabolites called phytonutrients or phytochemicals. The major groups of phytonutrients are: polyphenols (e.g. flavonoids, phenolic acids), carotenoids, phytosterols, some triterpenoids, isothiocyanates, etc. Due to their diverse chemical structures and bioactivities (antioxidant activity, enhancement of immune response or cell-to-cell communication, lowering blood pressure and/or cholesterol level, etc.) many daily consumed phytonutrients are still unknown. Many phytonutrients have still not been properly investigated, but several phytonutrients are already used as ingredients of food supplements or functional foods. An increased use of phytonutrients in such products created the demand for new sources of these bioactive compounds. Methods based on chromatographic and hyphenated techniques are an indispensable tool in the discovery of new sources of phytonutrients, development of new food products as well as control of food quality and safety. The lecture will focus on targeted and non-targeted analyses of phytonutrients in food samples (e.g., food supplements, food waste, bee pollen, medicinal plants). The methods based on high-performance thin-layer chromatography (HPTLC-densitometry, HPTLC-image analysis, HPTLC-MS/(MS) and high-performance liquid chromatography (HPLC-UV/Vis, (U)HPLC- MS/(MS)), as well as (HP)TLC-effect-directed analysis (EDA) will be discussed. Examples of challenges in development of chromatographic methods will include the lack of chromophores, isomeric structures, stability of the analytes, unknown impurities in standards, lack of commercial standards and standard reference materials. The influence of different parameters (e.g. stationary phase, time, etc.) on (HP)TLC-EDA analyses of antioxidants and enzyme inhibitors in extracts of different samples (e.g. bee pollen, Japanese knotweed, etc.) will also be addressed.

Keywords: Phytonutrients, Chromatography, Mass spectrometry, Effect-Directed Analysis

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