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Highly Selective Molecular Recognition in Bio-Analytical Chemistry

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The highly selective molecular recognition is essential for the bio-analytical studies. In this paper, we review highly selective and sensitive liquid chromatographic methods coupled with mass spectrometry (MS) for the analysis of biological important materials and its applications. Liquid chromatography is a powerful tool for the separation and determination of polar and thermal unstable biological compounds. The *k'* values of an organic acid on an ODS column is dependent on the acidity of the eluent and can be estimated from the p*Ka* value of the organic acid and the pH of the eluent. The number, position and configuration of hydroxyl groups also affect the retention value, owing to the interaction with the stationary phase. These chromatografic behaviors are useful for the characterization of the structure of traced compounds. The LC/MS are the much more reliable methods for analysis of biological materials including proteins and peptides. Among numerous interfaces, the electrospray ionization (ESI) is more suitable for the detection of ionic trace compounds. In the ESI mode, the ionization efficiency of acidic compounds is markedly influenced by dissociation of electrolyte in the mobile phase. Based on these observations, analytical systems for the determination of ether and ester type glucuronides, sulfates of biological substances by LC coupled with MS have been established. The development of the novel type affinity labeling reagent having an acyl adenylate group, and the analysis of bile acids in rat brain are also discussed. The immunoaffinity extraction employing antibodies having the highly specific molecular recognition is also applied for the structural characterization of protein-bound small molecules with combined use of the proteomic technique.