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Conclusion

This book clearly illustrates that advanced chiral CE can show real advantages over chromatographic methods in the field of chiral analysis of trace biologically active compounds present in complex matrices. Advanced chiral CE, including (i) sophisticated chiral separation mechanisms and CE formats, (ii) on-line sample preparation and (iii) hyphenation with the conventional, as well as current, top detection systems, enables automatization and miniaturization of the analytical method with the possibility of solving many real tasks based on chiral actions in biological systems.

CE offers tremendous flexibility for enantiomeric separations of new drugs, metabolites, biomarkers, etc., because of a wide variety of available chiral additives easily applicable into CE systems with the cooperation of proper electrophoretic effects (e.g., countercurrent migration of chiral selector vs. analyte). In this field the CD derivatives {especially various (selectively) sulphated CDs} dominate, but progress can also be seen in micelle systems (e.g., micelle polymers). Among a huge amount of other chiral selectors, as presented in this book, their success will be determined not only by their enantiorecognition capability, but also their compatibility with the detection system employed.

Advanced CE techniques based on effective on-line sample pretreatment (preconcentration, purification, derivatization) offer enhanced sensitivity and selectivity along with minimization of sample manipulation, simplifying the overall analytical procedure and allowing automatization and miniaturization of such systems. Although the analytical potential of the most effective and frequently used on-line sample preparation techniques based on electrophoretic principles (stacking techniques, CE-CE couplings), nonelectrophoretic principles (microextraction, microdialysis, flow injection, etc.) and their combinations is very significant, which can be demonstrated by their microscale implementations (MCE) and obtainable preconcentration factors 10^2-10^6 allowing performance of extremely fast and sensitive bioanalyses (pharmacokinetic studies, analysis of single cell contents, etc.), their utilization is still relatively rare and traditional off-line sample preparation procedures dominate. It is believed that future demands on effectivity and microscale analysis will stimulate their use.

Advanced CE methods based on hyphenated detection techniques enabling ultrasensitive quantification and/or providing structural information tend to increase their applicability in (chiral) bioanalyses. Thus, a single molecules analysis (LIF) and structural characterization of unknown biodegradation products and markers (MS) can be accomplished. However, these detection modes are still accompanied, besides their high cost, by many limitations, such as the need for analyte derivatization (LIF), restrictions in applicable buffers and chiral selectors (MS) and the need for further development. Probably, these are possible reasons

for the significant domination of universal detection modes like UV-VIS absorbance photometric detection or, to a lesser extent, electrochemical detection, accompanied essentially by a sample preparation in (enantioselective) bioanalytical applications. Although the sensitivity of these later mentioned detection techniques is not sufficient for the majority of bioanalytical problems, they still have great potential to create brand new advanced methods, e.g., utilizing some of the on-line sample preparation techniques presented herein.

It is concluded that the potential, effectivity and performance parameters of CE (and also MCE and CEC) for the enantioselective drug bioanalyses can improve with an appropriate combination of progressive enantioseparation, sample preparation and detection approaches, as it was comprehensively demonstrated in this book. Indeed, new advanced combinations could lead to the development of other interesting fully automatized microscale analytical procedures suitable for reference, as well as routine, use in (chiral) biomedical research. It is apparent that their importance will continually increase with new advanced analytical tasks.

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