PREFACE

Although the concept of microdialysis evolved in the 1960s, more than 40 years have passed since the report by Ungerstedt and Pycock (*Bull. Schweiz. Akad. Med. Wiss.*, 1974, 30: 44–55) describing the use of hollow fibers to implement microdialysis. As the report states "we still lack the means of closely following the actual release of the endogenous transmitter in a functional situation." The methodology described included microdialysis, retrodialysis, and pharmacological studies of rat brain DA levels coupled additionally to behavior measured with a rotometer. The framework thus established has inspired facilitating enhancements to improve spatial and temporal resolution and the ability to simultaneously monitor several components.

This volume thus deals primarily with microdialysis and, in particular, with the enhancements that have made possible the detection of multiple components in the dialysate. This aspect is exemplified by the work of Lunte, Kennedy, Kehr and Li in the development of detection methodology for analytes that are not electroactive such as peptides, especially the application of mass spectrometry. Significant effort has been devoted to improving the time resolution into the 1–3 minute range by Andrews and Weber. Attention has also been paid to free flow systems by Shippy and Jeffries that make the sampling probe smaller and sampling more rapid. There have also been enhancements in detection systems through the use of microfluidics (Lunte, Mao). Although the results of microdialysis studies are expressed in concentrations, the probe generates fluxes of the analytes of interest which are also influenced by the delivery through the tissue of these analytes to the probe/tissue interface as described by Stenken. Since the microdialysis probe removes analyte from the surrounding area, it is necessary to establish that the endogenous concentration can be maintained by supplies in the surrounding tissue. This condition is further complicated by damage to the surrounding tissue by the probe implantation as described by Michael.

A number of important applications are described. The ability to simultaneously sample multiple analytes in the same or different locations has been effective in providing a complete pharmacokinetic picture: adsorption, distribution, metabolism, excretion (ADME), essential time and concentration dependent information in the study of drug delivery (Lunte and Hammarlund-Udenaes). Microdialysis is also being applied in the human brain to study traumatic injury (Boutelle) and the development of therapy strategies such as deep brain stimulation in treating Parkinson's (Buchanan). Behavior and reward has also been studied (Kehr, Wise and Wassum). The wide range of applications is a testimony to the challenge defined by the original work of Ungerstedt.

The cover illustration is by Andrea Jaquins-Gerstl, University of Pittsburgh Andrea is a co-author for Chapter 16.

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