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## Chapter 1 : Microdialysis - Wikipedia

*3 Analytical Considerations for Microdialysis Sampling 37 A common cm long column with a 4-mm i.d. and packed with 5  $\mu$ m particles typically results in peak volumes of the order of IL.*

Machine generated contents note: Introduction to Applications of Microdialysis in Pharmaceutical Sciences. Microdialysis in Drug Discovery. Phases of Drug Development. Role of Biomarkers in Drug Development. Role of Microdialysis in Drug Development. Analytical Considerations for Microdialysis Sampling. Monitoring Dopamine in the mesocorticolimbic and nigrostriatal systems by microdialysis: Pathophysiology of Serotonin-Dopamine Interaction: Implication for Mood Disorders. Dopamine Depletion in the Nigrostriatal System: Monitoring Neurotransmitter Amino Acids by Microdialysis: Monitoring neurotransmitter amino acids by microdialysis. Basic Research on receptors. Psychostimulants and addictive drugs. Microdialysis as a tool to unravel neurobiological mechanisms of seizures and antiepileptic drug action. Microdialysis to characterise the seizure-related neurobiological and metabolic changes in animal models and in humans. Microdialysis as chemoconvulsant delivery tool in animal seizure models. Microdialysis as an elegant tool to elucidate mechanisms of electrical brain stimulation and neuronal circuits involved in the generation and control of seizures. Microdialysis to unravel the mechanisms of action of established antiepileptic drugs and new therapeutic strategies. Microdialysis studies in search for mechanisms of adverse effects of clinically used drugs, drugs of abuse and toxins. Combination of microdialysis with other complementary neurotechniques to unravel mechanisms of seizures and epilepsy. The advantage of microdialysis to sample biophase levels of antiepileptic drugs and to monitor central neurotransmitters as pharmacodynamic markers for their anticonvulsant activity. Microdialysis as a tool to study relationships between epilepsy and its comorbidities. Monitoring of exogenous and endogenous compounds. Special aspects associated with lung microdialysis compared to microdialysis in other tissues. Insertion of microdialysis probes into lung tissue. Insertion of microdialysis probes in the bronchial system.

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### Chapter 2 : Applications of microdialysis in pharmaceutical science - ECU Libraries Catalog

*In this chapter, a wide variety of analytical techniques that can be used in combination with microdialysis sampling will be described. Most of these methods are also commonly used for other.*

Microdialysis probes[ edit ] Schematic illustration of a microdialysis probe There are a variety of probes with different membrane and shaft length combinations available. The molecular weight cutoff of commercially available microdialysis probes covers a wide range of approximately kD, but also 1MD is available. While water-soluble compounds generally diffuse freely across the microdialysis membrane, the situation is not as clear for highly lipophilic analytes, where both successful e. Recovery and calibration methods[ edit ] Due to the constant perfusion of the microdialysis probe with fresh perfusate, a total equilibrium cannot be established. In order to correlate concentrations measured in the dialysate with those present at the distant sampling site, a calibration factor recovery is needed. The recovery can be determined at steady-state using the constant rate of analyte exchange across the microdialysis membrane. In theory, the extraction efficiency of a microdialysis probe can be determined by: At steady-state, the same extraction efficiency value is obtained, no matter if the analyte is enriched or depleted in the perfusate. To date, the most frequently used calibration methods are the low-flow-rate method, the no-net-flux method, [7] the dynamic extended no-net-flux method, [8] and the retrodialysis method. Supportive in vitro experiments prior to the use in animals or humans are therefore recommended. Its actual value therefore needs to be determined in every in vivo experiment. At high flow-rates, the amount of drug diffusing from the sampling site into the dialysate per unit time is smaller low extraction efficiency than at lower flow-rates high extraction efficiency. This concept is applied for the low-flow-rate method, where the probe is perfused with blank perfusate at different flow-rates. Concentration at the sampling site can be determined by plotting the extraction ratios against the corresponding flow-rates and extrapolating to zero-flow. The low-flow-rate method is limited by the fact that calibration times may be rather long before a sufficient sample volume has been collected. If analyte concentrations in the perfusate are equal to concentrations at the sampling site, no-net flux occurs. Respective concentrations at the no-net-flux point are represented by the x-intercept of the regression line. The strength of this method is that, at steady-state, no assumptions about the behaviour of the compound in the vicinity of the probe have to be made, since equilibrium exists at a specific time and place. To overcome this limitation, several approaches have been developed that are also applicable under non-steady-state conditions. One of these approaches is the dynamic no-net-flux method. The design of the DNNF calibration method has proven very useful for studies that evaluate the response of endogenous compounds, such as neurotransmitters, to drug challenge. In principle, retrodialysis can be performed using either the analyte itself retrodialysis by drug or a reference compound retrodialysis by calibrator that closely resembles both the physiochemical and the biological properties of the analyte. Although microdialysis is still primarily used in preclinical animal studies e. Exogenous drugs to be analyzed by microdialysis include new antidepressants , antipsychotics , as well as antibiotics and many other drugs that have their pharmacological effect site in the brain. The first non-metabolite to be analyzed by microdialysis in vivo in the human brain was rifampicin. The latter may even be incorporated into an artificial pancreas system for automated insulin administration. Microdialysis has also found increasing application in environmental research, [16] sampling a diversity of compounds from waste-water and soil solution, including saccharides, [17] metal ions, [18] organic acids, [19] and low molecular weight nitrogen. Advantages[ edit ] To date, microdialysis is the only in vivo sampling technique that can continuously monitor drug or metabolite concentrations in the extracellular fluid of virtually any tissue. Depending on the exact application, analyte concentrations can be monitored over several hours, days, or even weeks. Free, unbound extracellular tissue concentrations are in many cases of particular interest as they resemble pharmacologically active concentrations at or close to the site of action. Combination of microdialysis with modern imaging techniques, such positron emission tomography , further allow for determination of intracellular concentrations. Insertion

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of the probe in a precise location of the selected tissue further allows for evaluation of extracellular concentration gradients due to transporter activity or other factors, such as perfusion differences. It has, therefore, been suggested as the most appropriate technique to be used for tissue distribution studies. Exchange of analyte across the semipermeable membrane and constant replacement of the sampling fluid with fresh perfusate prevents drainage of fluid from the sampling site, which allows sampling without fluid loss. Microdialysis can consequently be used without disturbing the tissue conditions by local fluid loss or pressure artifacts, which can occur when using other techniques, such as microinjection or push-pull perfusion. The semipermeable membrane prevents cells, cellular debris, and proteins from entering into the dialysate. Due to the lack of protein in the dialysate, a sample clean-up prior to analysis is not needed and enzymatic degradation is not a concern. Limitations[ edit ] Despite scientific advances in making microdialysis probes smaller and more efficient, the invasive nature of this technique still poses some practical and ethical limitations. For example, it has been shown that implantation of a microdialysis probe can alter tissue morphology resulting in disturbed microcirculation, rate of metabolism or integrity of physiological barriers, such as the blood-brain barrier. From a practical perspective, it has been suggested to perform microdialysis experiments within an optimal time window, usually 24-48 hours after probe insertion. While the temporal resolution is determined by the length of the sampling intervals usually a few minutes, the spatial resolution is determined by the dimensions of the probe. The probe size can vary between different areas of application and covers a range of a few millimeters intracerebral application up to a few centimeters subcutaneous application in length and a few hundred micrometers in diameter. Determination of the recovery may be time-consuming and may require additional subjects or pilot experiments. The recovery is largely dependent on the flow rate: However, in practice the flow rate cannot be decreased too much since either the sample volume obtained for analysis will be insufficient or the temporal resolution of the experiment will be lost. It is therefore important to optimize the relationship between flow rate and the sensitivity of the analytical assay. The situation may be more complex for lipophilic compounds as they can stick to the tubing or other probe components, resulting in a low or no analyte recovery. The Journal of Physiology.

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### Chapter 3 : BASi® | Microdialysis Training

*Applications of microdialysis in pharmaceutical science "This book emphasizes the applications of microdialysis in different organs and tissues for pharmacokinetic and pharmacodynamic studies, covering the range of current clinical uses for microdialysis.*

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### Chapter 4 : Table of Contents: Applications of microdialysis in pharmaceutical science

*Along with details of the basics of this analytical technique, topics in the book include applications for drug discovery, analytical consideration of samples, neurological disease investigations, sampling at different organs, diabetes evaluations, tumor response estimations and comparison of microdialysis"-- Provided by publisher.*

You see what a tiny place you occupy in the world. In more details, in this part the author outlines the research strategy, the research method, the research approach, the methods of data collection, the selection of the sample, the research process, the type of data analysis, the ethical considerations and the research limitations of the project. Rather, numerous pieces of previous academic research exist regarding the role of DMOs in promoting and managing tourist destinations, not only for Athens in specific, but also for other tourist destinations in Greece and other places of the world. As such, the proposed research took the form of a new research but on an existing research subject. The main characteristic of qualitative research is that it is mostly appropriate for small samples, while its outcomes are not measurable and quantifiable see table 3. Because it is more appropriate for small samples, it is also risky for the results of qualitative research to be perceived as reflecting the opinions of a wider population Bell, Recommended during earlier phases of Recommended during latter research projects. The design emerges as the study All aspects of the study are unfolds. Researcher is the data gathering Researcher uses tools, such as instrument. Data is in the form of words, pictures or Data is in the form of numbers and objects. Subjective " individuals interpretation Objective: Researcher tends to become Researcher tends to remain subjectively immersed in the subject objectively separated from the matter. Qualitative Data Analysis, available at <http://> According to this approach, researchers begin with specific observation, which are used to produce generalized theories and conclusions drawn from the research. The reasons for occupying the inductive approach was that it takes into account the context where research effort is active, while it is also most appropriate for small samples that produce qualitative data. The main advantage of personal interviews is that they involve personal and direct contact between interviewers and interviewees, as well as eliminate non-response rates, but interviewers need to have developed the necessary skills to successfully carry an interview Fisher, , Wilson, What is more, unstructured interviews offer flexibility in terms of the flow of the interview, thereby leaving room for the generation of conclusions that were not initially meant to be derived regarding a research subject. As far as data collection tools were concerned, the conduction of the research involved the use of semi-structured questionnaire, which was used as an interview guide for the researcher. Some certain questions were prepared, so as for the researcher to guide the interview towards the satisfaction of research objectives, but additional questions were made encountered during the interviews. Some sample questions that were included in the semi-structured questionnaire were the following: What do you think about the popularity of Greece as a tourist destination? What do you think about the popularity of Athens as a tourist destination? What have you done as an organization to promote Athens as a Tourist destination? Were your activities efficient? Please discuss Question 4: Do you think that Athens can become a more popular destination in the near future? How it can enhance its brand name as a tourist destination? What are the main problems and Challenges of Athens as a Tourist destination? What are the key advantages? What are these problems causing? Are they affecting their activities for promoting Athens as a destination? What activities your organization applies for addressing the problems that Athens faces as a tourist destination? In your view, which are the improvements that your organization should made in order to increase its efficiency and for promoting tourism more effectively? Do you have any recommendation for improvement? Do you have experience of DMOs in other countries? What can we learn from them? How do you manage the tourist product of Athens, except for marketing? Do you pay attention to sustainable tourism issues? How do the city and residents of Athens benefit from your management practices? Marketing and Destination Marketing can help Athens and Greece to develop their touristic offer more efficiently? With what actions and programs? A detailed form of the interview guide is

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presented in Appendixes A 3. According to this method, which belongs to the category of non-probability sampling techniques, sample members are selected on the basis of their knowledge, relationships and expertise regarding a research subject Freedman et al. In the current study, the sample members who were selected had special relationship with the phenomenon under investigation, sufficient and relevant work experience in the field of tourism, active involvement in several tourism initiatives and partnerships, as well as proven research background and understanding of raw data concerning destinations. Within this context, the participants of this study were executives of 6 famous DMOs operating both generally in Greece and specifically in Athens, namely: More specifically, the researcher came in touch with and asked them to participate in the research after explaining the nature and the scope of the study. In general terms the respondents were willing to participate in the research and the interviews were conducted between May and June of The discussions took place at the offices of the executives and lasted approximately 20 to 25 minutes. During the interviews were mainly kept notes, in order to help the researcher to analyze the gathered data. During the conduction of the interview, respondents were free to express their views even in topics which were not included in the discussed areas which were mentioned in paragraph 3. Finally, it should be noted that the conversations flowed smoothly and pleasantly. Data analysis Content analysis was used to analyze the data which was gathered from personal interviews. A main advantage of content analysis is that it helps in data collected being reduced and simplified, while at the same time producing results that may then measured using quantitative techniques. Moreover, content analysis gives the ability to researchers to structure the qualitative data collected in a way that satisfies the accomplishment of research objectives. As it was mentioned earlier, all participants reported their written acceptance regarding their participation in the research, through a signed Consent and Briefing Letter. At the same time, sample members were asked to sign a Debriefing and Withdrawal Letter. The aim of both letters was to reassure participants that their participation in the research is voluntary and that they were free to withdraw from it at any point and for any reason. Next to this, participants were fully informed regarding the objectives of the study, while they were reassured that their answers were treated as confidential and used only for academic purposes and only for the purposes of the particular research. Except from the above, participants were not harmed or abused, both physically and psychologically, during the conduction of the research. In contrast, the researcher attempted to create and maintain a climate of comfort.