Blood Brain Barrier In Drug Discovery Optimizing Brain Exposure Of Cns Drugs And Minimizing Brain Side Effects For Peripheral Drugs

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Drug Delivery to the Brain Margareta Hammarlund-Udenaes 2013-12-03 The development of new CNS drugs is notoriously difficult. Drugs must reach CNS target sites for action and these sites are protected by a number of barriers, the most important being the blood –brain barrier (BBB). Many factors are therefore critical to consider for CNS drug delivery, e.g. active/passive transport across the BBB, intra-brain distribution, and central/systemic pharmacokinetics, to name a few. Neurological disease and trauma conditions add further complexity because CNS barriers, drug distribution and pharmacokinetics are dynamic and often changed by disease/trauma. Knowledge of all these factors and their interplay in different conditions is of utmost importance for proper CNS drug development and disease treatment. In recent years much information has become available for a better understanding of the many factors important for CNS drug delivery and how they interact to affect drug action. This book describes small and large drug delivery to the brain with an emphasis on the physiology of the BBB and the principles and concepts for drug delivery across the BBB and distribution within the brain. It contains methods descriptions for studying drug delivery, routes and approaches of administering drugs into the brain, the influence of disease, and drug industry perspectives. Therewith, it contributes to an in-depth understanding of the interplay between brain (patho)-physiology and drug characteristics. Furthermore, the content is designed to be both cutting-edge and educational, so that the book can be used in high-level training of academic and industry scientists with full references to original publications.

Lead Generation J?rg Holenz 2016-06-27 In this comprehensive two-volume resource on the topic senior lead generation medicinal chemists present a coherent view of the current methods and strategies in industrial and academic lead generation. This is the first book to combine both standard and innovative approaches in comparable breadth and depth, including several recent successful lead generation case studies published here for the first time. Beginning with a general discussion of the underlying principles and strategies, individual lead generation approaches are described in detail, highlighting their strengths and weaknesses, along with all relevant bordering disciplines like e.g. target identification and validation, predictive methods, molecular recognition or lead quality matrices. Novel lead generation approaches for challenging targets like DNA-encoded library screening or chemical biology approaches are treated here side by side with established methods as high throughput and affinity screening, knowledge- or fragment-based lead generation, and collaborative approaches. Within the entire book, a very strong focus is given to highlight the application of the presented methods, so that the reader will be able to learn from `real life? examples. The final part of the book presents several lead generation case studies taken from different therapeutic fields, including diabetes, cardiovascular and respiratory diseases, neuroscience, infection and tropical diseases. The result is a prime knowledge resource for medicinal chemists and for every scientist involved in lead generation.

New Approaches to Drug Discovery Ulrich Nielsch 2016-03-30 This volume gives an overview of state of the art technologies and future developments in the field of preclinical pharmaceutical research. A balanced mix of experts from academia and industry give insight in selected new developments in the drug discovery pathway. The topics cover the different parts of the drug discovery process, starting with new developments in the target identification and validation area. The lead generation part as a next step focuses on the requirements and technologies to identify new small molecules as lead compounds for further optimization; in a second section the technologies to identify biologics as leads are addressed. The final part focuses on the pharmacological models and technologies to characterize new compounds and the impact of biomarkers to facilitate the transfer of drug candidates into the development phase.

Nanomedicines for Brain Drug Delivery Javier O. Morales 2021-12-04 This volume explores the latest research in central nervous system (CNS) targeted nanocarriers, methods for their synthesis, and its characterization process. Chapters in this book cover topics such as polymeric nanoparticles and liposomes; self-assembled peptide-based scaffolds for lesions of the nervous system; use of peptides as CNS drugs and as potential carriers to optimize brain-targeted delivery; ways to model and assess blood brain barrier absorption of drugs; and the role of neurodegeneration progress of nanomaterials and their potential toxicity concerns. In the Neuromethods series style, chapters include the kind of detail and key advice from the specialists needed to get successful results in your laboratory. Thorough and cutting-edge, Nanomedicines for Brain Drug Delivery is a valuable resource that will help researchers guide and advance the field of nanomedicines for the brain and nervous system.

Drug Discovery Efforts Targeting Mutant P53 for the Treatment of Glioblastoma Randa R. Barsoom 2014 Targeted approaches to treating cancers including glioblastoma multiforme (GBM) are limited and partially effective, at best. By attacking specific oncogenic drivers for a tumor, an on-target and effective drug might be possible. The transcription factor p53 is a cell control tumor suppressor protein responsible for maintaining the integrity of a cell's genome and eliminating cells with DNA mutations. Mutant p53 is found, and believed to be causative, in 50% of all human cancers. The oncogenic driver for a high percentage of GBM is thought to be mutant p53. In this thesis, a drug discovery effort that targets mutant p53 in GBM cells is described. The goal is to identify compounds that reactivate mutant p53 and allow normal biological function of p53 in the GBM cells. The process of identification of lead structures and efforts in developing new analogues that optimize potency, selectivity, metabolic stability and other drug-like properties, including the ability of the compounds to cross the blood brain barrier, BBB, are explained. Crossing the BBB is a critical step for drugs used in central nervous system (CNS) diseases. Here, seven synthesized compounds in two classes, quinoline and benzimidazoles, are discussed. Six of these compounds reactivate mutant p53 in the GBM cells and allow for production of proteins downstream of p53. Of these six active compounds, three cross the blood brain barrier. A structure activity relationship, SAR, regarding in-cell potency, selectivity, metabolic stability and the ability to cross the BBB is then developed. This SAR and drug discovery effort can be further expanded to develop compounds with an optimized biological profile that would lead to potential drug candidates for the treatment of glioblastoma multiforme.

Optimization in Drug Discovery Zhengyin Yan 2004 Recent reports of drug attrition rates have revealed that a significant number of drug candidates fail in the later stage of clinical development due to absorption, distribution, metabolism, elimination and toxicity issues. Lead optimization in drug discovery, a process of attempting to uncover and correct these defects, is highly beneficial in lowering the cost and time to develop therapeutic drugs by reducing drug candidate failures in development. This book provides the assays utilized in drug discovery to rapidly screen for compounds with favorable drug-like properties. A total of 25 chapters, contributed by many experts in the field, cover a wide spectrum of subjects including physicochemical properties, absorption, plasma binding, metabolism, drug interactions, and toxicity, making this an essential book for all pharmacologists and pharmaceutical scientists.

BACE Varghese John 2010-03-05 BACE inhibitors and their use in the treatment of Alzheimer's Disease BACE (β-site of APP cleaving enzyme) is a critical component in Alzheimer's Disease (AD), and the development of BACE inhibitors shows great potential as a therapy for the disease. BACE: Lead Target for Orchestrated Therapy of Alzheimer's Disease covers virtually all aspects of BACE from initial identification, discovery of inhibitors, and challenges in clinical development, while providing a global understanding essential for productive and successful drug discovery. This book details the story of the discovery of BACE and its role in AD and comprehensively discusses: The development of BACE inhibitors as therapeutics for Alzheimer's disease The research that led to the identification of BACE New BACE inhibitors currently being clinically tested ADME (absorption, distribution, metabolism, excretion) and clinical trial design—topics not addressed in current field literature Cutting-edge technology such as high-throughput screening, structure-based drug design, and QSAR in context of BACE inhibitors and Alzheimer's drug discovery Other approaches to BACE inhibition based on interaction with the precursor protein APP By enhancing the reader's understanding of the various aspects of the BACE drug-discovery process, this much-needed reference will serve as a key resource for all scientists involved in Alzheimer's research—and inspire new approaches to treatment of AD.

Successful Drug Discovery János Fischer 2016-11-04 Retaining the successful approach found in the previous volume in this series, the inventors and primary developers of drugs that successfully made it to market tell the story of the drug's discovery and development and relate the often twisted route from the first candidate molecule to the final marketed drug. 11 selected case studies describe recently introduced drugs that have not been previously covered in textbooks or general references. These range across six different therapeutic fields and provide a representative cross-section of the current drug development efforts. Backed by copious data and chemical information, the insight and experience of the contributors makes this one of the most useful training manuals that a junior medicinal chemist can hope to find and has won the support and endorsement of IUPAC.

Nanoscale Fabrication, Optimization, Scale-up and Biological Aspects of Pharmaceutical Nanotechnology Alexandru Mihai Grumezescu 2017-12-11 Nanoscale Fabrication, Optimization, Scale-up and Biological Aspects of Pharmaceutical Nanotechnology focuses on the fabrication, optimization, scale-up and biological aspects of pharmaceutical nanotechnology. In particular, the following aspects of nanoparticle preparation methods are discussed: the need for less toxic reagents, simplification of the procedure to allow economic scale-up, and optimization to improve yield and entrapment efficiency. Written by a diverse range of international researchers, the chapters examine characterization and manufacturing of nanomaterials for pharmaceutical applications. Regulatory and policy aspects are also discussed. This book is a valuable reference resource for researchers in both academia and the pharmaceutical industry who want to learn more about how nanomaterials can best be utilized. Shows how nanomanufacturing techniques can help to create more effective, cheaper pharmaceutical products Explores how nanofabrication techniques developed in the lab have been translated to commercial applications in recent years Explains safety and regulatory aspects of the use of nanomanufacturing processes in the pharmaceutical industry

High-Throughput Lead Optimization in Drug Discovery Tushar Kshirsagar 2008-03-04 A Single Source on Parallel Synthesis for Lead Optimization The end of the previous millennium saw an explosion in the application of parallel synthesis techniques for making compounds for high-throughput screening. Over time, it became clear that more thought in the design phase of library development is necessary to generate high qualit

Molecular Pathomechanisms and New Trends in Drug Research Gyorgy Keri 2002-11-14 Knowledge of the basic mechanisms of human disease is essential for any student or professional engaged in drug research and development. Functional gene analysis (genomics), protein analysis (proteomics), and other molecular biological techniques have made it possible to understand these cellular processes, opening up exciting opportunities for no

Discovery and Development of Antibodies for Drug Delivery Across the Blood-brain Barrier Loukas Goulatis 2018 The cure and management of the majority of diseases affecting the brain is hampered by the blood-brain barrier (BBB). In the brain endothelia adjacent endothelial cells are sealed together, redirecting molecular trafficking from the paracellular route to transcellular trafficking and preventing the vast majority of therapeutics from entering the brain from the blood. The lack of effective treatments for brain diseases motivates the development of non-invasive methods for brain drug delivery. A widely researched method for non-invasive delivery across the BBB is to target via antibodies the brain's endogenous transport mechanisms particularly transporters that utilize receptor mediated transcytosis (RMT) to ferry therapeutics into the brain. Current RMT systems suffer from low trans-BBB transport capacity, as well as ubiquitous expression throughout the periphery, necessitating the research for novel antibody-RMT pairs. In this work, we aim to discover and develop such brain penetrating antibodies. First, we describe a novel, combinatorial methodology to screen a phage display antibody library against a stem cell-derived model of the human BBB specifically for transcytosing antibodies that can traffic the BBB in vivo and target human antigens. We move forward to describe the production, purification, and validation for both in vitro and in vivo brain transport of our lead antibodies. A panel of novel antibodies able to transport across the BBB through RMT mechanisms is identified and evaluated. Next, we aim to develop an antibody functionalization platform to integrate our brain penetrating antibodies and enable further downstream in vivo evaluation. To this end, we describe the optimization of a semi-synthetic protein functionalization platform developed previously in our laboratory. Through fusing antibodies with an intein and secreting the fusion in yeast it is possible to append site-specifically a chemical handle to the protein of interest thereby enabling a controlled functionalization. By optimizing key amino acid residues at the protein-intein interface critical for cleavage and culture conditions we increase the total capacity of our system for site-specific protein functionalization. Thus, this body of work presents the discovery and development of brain penetrating antibodies as potential vectors for drug delivery.

Advanced Drug Formulation Design to Optimize Therapeutic Outcomes Robert O. Williams 2007-09-25 This title demonstrates how advanced formulation designs and delivery technologies can be used to improve drug efficacy and treatment outcomes in particular therapeutic categories or disease states. It discusses nanoparticle systems for cancer treatments, and also presents cutting edge immono-regulation agents for transplantation and the local targ

Molecular Docking for Computer-Aided Drug Design S. Mohane Coumar 2021-02-17 Molecular Docking for Computer-Aided Drug Design: Fundamentals, Techniques, Resources and Applications offers in-depth coverage on the use of molecular docking for drug design. The book is divided into three main sections that cover basic techniques, tools, web servers and applications. It is an essential reference for students and researchers involved in drug design and discovery. Covers the latest information and state-of-the-art trends in structure-based drug design methodologies Includes case studies that complement learning Consolidates fundamental concepts and current practice of molecular docking into one convenient resource

Pharmacokinetic Optimization in Drug Research Bernard Testa 2001-03-26 In this age of combinatorial chemistry and high-throughput technologies, bioactive compounds called hits are discovered by the thousands. However, the road that leads from hits to lead compounds and then to pharmacokinetically optimized clinical and drug candidates is very long indeed. As a result, the screening, design, and optimization of pharmacokinetic properties has become the bottleneck and a major challenge in drug research. To shorten the time-consuming develop-ment and high rate of attrition of active compounds ultimately doomed by hidden pharmacokinetic defects, drug researchers are coming to incorporate structure-permeation, structure-distribution, structure-metabolism, and structure-toxicity relations into drug-design strategies. To this end, powerful biological, physicochemical, and computational approaches are being developed whose objectives are to increase the clinical relevance of drug design, and to eliminate as soon as possible compounds with unfavorable physicochemical properties and pharmacokinetic profiles. Toxicological issues are also of utmost importance in this paradigm. There was, hence, an urgent need for a book covering this field in an authoritative, didactic, comprehensive, factual, and conceptual manner. In this work of unique breadth and depth, international authorities and practicing experts from academia and industry present the most modern biological, physicochemical, and computational strategies to optimize gastrointestinal absorption, protein binding and distribution, brain permeation, and metabolic profile. The biological strategies emphasized in the book include cell cultures and high-throughput screens. The physicochemical strategies focus on the determination and interpretation of solubility, lipophilicity, and related molecular properties as factors and predictors of pharmacokinetic bahavior. Particular attention is paid to the lipophilicity profiles of ionized compounds, to lipophilicity measurements in anisotropic media (liposomes/water, IAM columns), and to permeability across artificial membranes. Computational strategies comprise virtual screening, molecular modelling, lipophilicity, and H-bonding fields and their importance for structure-disposition relations. This book is both about theoretical and technological breakthroughs. Thus, molecular properties are contemplated from a dual perspective, namely a) their interpretation in biological and/or physicochemical terms, and b) their value in screening, lead optimization, and drug-candidate selection. In addition to its 33 chapters, the book includes a CD-ROM containing the invited lectures, oral communications and posters (in full version) presented at the Second LogP Symposium, 'Lipophilicity in Drug Disposition—Practical and Computational Approaches to Molecular Properties Related to Drug Permeation, Disposition and Metabolism', held at the University of Lausanne in March 2000.

Transporters in Drug Development Yuichi Sugiyama 2013-09-16 Transporters in Drug Development examines how membrane transporters can be dealt with in academic–industrial drug discovery and pharmaceutical development as well as from a regulatory perspective. The book describes methods and examples of in vitro characterization of single transporters in the intestines, liver and kidneys as well as characterization of substrate overlap between various transporters. Furthermore, probes and biomarkers are suggested for studies of the transporters' impact on the pharmacokinetics of drug substrates/candidates interacting on transporters. The challenges of translating in vitro observed interaction of transporters into in vivo relevance are explored, and the book highlights perspectives of applying targeted proteomics and mechanistic modeling in this process.

Human Pluripotent Stem Cell-based Modeling of the Blood-brain Barrier Hannah Kathryn Wilson 2016 The vasculature of the central nervous system, collectively termed the blood-brain barrier (BBB), is composed of specialized brain microvascular endothelial cells (BMECs) that restrict the movement of substances between the blood and the brain. This barrier is necessary for proper brain function, but also presents a major obstacle for brain drug delivery. In vitro models of the BBB have been widely used as complements to in vivo studies for basic science and translational research. Yet traditional BMEC sources, such as primary or immortalized cell lines, have been hampered by limited cell availability and model fidelity. Human pluripotent stem cells (hPSCs), which have the ability to both self-renew and to differentiate into specialized cell types, are an attractive source of cells for constructing a human in vitro BBB model. Previous work in our lab established methods to differentiate hPSCs into BMEC-like cells that possess key attributes of the in vivo BBB. However, full realization of the potential of hPSC-derived BMECs requires the development of well-defined, robust, and scalable differentiation methods. In this work, we present a series of studies optimizing the hPSC-BMEC differentiation to increase its utility, particularly for the application to new stem cell lines and for drug screening studies. Initial hPSC density has been noted as an important variable in a number of stem cell differentiation protocols but had not been systematically investigated in the hPSC-BMEC differentiation system. Therefore, we developed a singularized cell seeding approach for controlling hPSC density and further evaluated the effect of the hPSC starting cell density on BMEC differentiation efficiency, yield, and phenotype. The optimized differentiation methods enabled efficient cryopreservation of differentiated BMECs, which maintained key functional and phenotypic properties upon thaw. Next, we leveraged these scalable differentiation approaches to screen a nuclear receptor ligand library for compounds that modulated P-glycoprotein efflux activity in the hPSC-derived BMEC model. Finally, we initiated efforts to generate a transcriptomic database of the in vivo human BBB, which should help elucidate the molecular mediators of barrier biology. Taken together, this work should enhance the utility of hPSC-derived BBB models to enable greater understanding of the human BBB.

Brain Targeted Drug Delivery Systems Huile Gao 2018-09-20 Brain Targeted Drug Delivery Systems: A Focus on Nanotechnology and Nanoparticulates provides a guide on nanoparticulates to both academic and industry researchers. The book discusses key points in the development of brain targeted drug delivery, summarizes available strategies, and considers the main problems and pitfalls evidenced in current studies on brain targeted drug delivery systems. As the brain is the most important organ in the human body, and disorders of the central nervous system (CNS) are the most serious threat to human life, this book highlights advances and new research in drug delivery methods to the brain. Provides an overview of brain targeting drug delivery that is useful to both academic and industry-based researchers Discusses key points in developing brain targeting drug delivery systems Summarizes and presents currently available strategies for brain targeting drug delivery Covers not only current studies and their strengths, but also gives insight into the pitfalls of current research

Drug-Like Properties Li Di 2015-12-17 Of the thousands of novel compounds that a drug discovery project team invents and that bind to the therapeutic target, only a fraction have sufficient ADME (absorption, distribution, metabolism, elimination) properties, and acceptable toxicology properties, to become a drug product that will successfully complete human Phase I clinical trials. Drug-Like Properties: Concepts, Structure Design and Methods from ADME to Toxicity Optimization, Second Edition, provides scientists and students the background and tools to understand, discover, and develop optimal clinical candidates. This valuable resource explores physiochemical properties, including solubility and permeability, before exploring how compounds are absorbed, distributed, and metabolized safely and stably. Review chapters provide context and underscore the importance of key concepts such as pharmacokinetics, toxicity, the blood-brain barrier, diagnosing drug limitations, prodrugs, and formulation. Building on those foundations, this thoroughly updated revision covers a wide variety of current methods for the screening (high throughput), diagnosis (medium throughput) and in-depth (low throughput) analysis of drug properties for process and product improvement. From conducting key assays for interpretation and structural analysis, the reader learns to implement modification methods and improve each ADME property. Through valuable case studies, structure-property relationship descriptions, and structure modification strategies, Drug-Like Properties, Second Edition, offers tools and methods for ADME/Tox scientists through all aspects of drug research, discovery, design, development, and optimization. Provides a comprehensive and valuable working handbook for scientists and students in medicinal chemistry Includes expanded coverage of pharmacokinetics fundamentals and effects Contains updates throughout, including the authors' recent work in the importance of solubility in drug development; new and currently used property methods, with a reduction of seldom-used methods; and exploration of computational modeling methods

Retrometabolic Drug Design and Targeting Nicholas Bodor 2012-08-29 Innovative approach to drug design that's more likely to result in an approvable drug product Retrometabolic drug design incorporates two distinct drug design approaches to obtain soft drugs and chemical delivery systems, respectively. Combining fundamentals with practical step-by-step examples, Retrometabolic Drug Design and Targeting gives readers the tools they need to take full advantage of retrometabolic approaches in order to develop safe and effective targeted drug therapies. The authors, both pioneers in the fields of soft drugs and retrometabolic drug design, offer valuable ideas, approaches, and solutions to a broad range of challenges in drug design, optimization, stability, side effects, and toxicity. Retrometabolic Drug Design and Targeting begins with an introductory chapter that explores new drugs and medical progress as well as the challenges of today's drug discovery. Next, it discusses: Basic concepts of the mechanisms of drug action Drug discovery and development processes Retrometabolic drug design Soft drugs Chemical delivery systems Inside the book, readers will find examples from different pharmacological areas detailing the rationale for each drug design. These examples set forth the relevant pharmacokinetic and pharmacodynamic properties of the new therapeutic agents, comparing these properties to those of other compounds used for the same therapeutic purpose. In addition, the authors review dedicated computer programs that are available to support and streamline retrometabolic drug design efforts. Retrometabolic Drug Design and Targeting is recommended for all drug researchers interested in employing this newly tested and proven approach to developing safe and effective drugs.

Optimizing the "Drug-Like" Properties of Leads in Drug Discovery Ronald Borchardt 2007-12-31 This book arises from a workshop organized by the American Association of Pharmaceutical Scientists entitled "Optimizing the Drug-Like Properties of Leads in Drug Discovery," which took place in Parsippany, NJ in September 2004. The workshop focused on the optimization of the drug-like properties of leads in drug discovery. The volume outlines strategies and methodologies designed to guide pharmaceutical and biotechnology companies through the drug discovery and development process.

Molecular Computing and Bioinformatics Xiangxiang Zeng 2019-07-11 This text will provide the most recent knowledge and advances in the area of molecular computing and bioinformatics. Molecular computing and bioinformatics have a close relationship, paying attention to the same object but working towards different orientations. The articles will range from topics such as DNA computing and membrane computing to specific biomedical applications, including drug R&D and disease analysis.

Development of a Physiologically Accurate 3D Blood-brain Barrier Hydrogel Model Sophia Kioulaphides 2019 The blood-brain barrier (BBB) is a tightly interconnected network of cells that creates a semi-permeable barrier between the central nervous system and the rest of the human body, taking in nutrients and blocking/excreting waste/potentially toxic chemicals from the brain, maintaining the brain's health and stability. When toxins are able to make it past the BBB, the BBB is degraded and can lead to further neurodegenerative disorders such as Alzheimer's and dementia. In order to better understand the structure of the BBB, the causes of its degradation, and potentially curing diseases, drug delivery experiments have been performed on the brain. However, since the drug carriers tested often may be perceived as toxins to the brain due to their large size or composition, researchers have leaned towards making in vitro 3D hydrogel models of the BBB. This project aims at making an in vitro 3D BBB hydrogel model that is physiologically accurate as possible. Components in the biological BBB were researched and these gels containing these polymers were created in order to determine if homogenous gels could be made and if they would support healthy human astrocyte (HAst) growth. Numerous compositions of hyaluronic acid, collagen IV, and a crosslinker were found to both create homogenous gels and support healthy astrocyte growth. Additionally, the processing steps for making these hydrogels was optimized further in order to ensure as much homogeneity as possible in the final gel.

The Medicinal Chemist's Guide to Solving ADMET Challenges Patrick Schnider 2021-08-20 The Medicinal Chemist's Guide to Solving ADMET Challenges summarizes a series of design strategies and tactics that have been successfully employed across pharmaceutical and academic laboratories to solve common ADMET issues. These are exemplified with a curated collection of concrete examples displayed in a highly visual “table-of-contents” style format, allowing readers to rapidly identify the most promising approaches applicable to their own challenges. Each ADMET parameter is introduced in a concise yet comprehensive manner and includes background, relevance and screening strategies. Medicinal chemistry knowledge of how best to modify molecular structure to solve ADMET issues is challenging to retrieve from the literature, public databases and even corporate data warehouses. The Medicinal Chemist's Guide to Solving ADMET Challenges addresses this gap by presenting state-of-the-art design strategies put together by a global group of experienced medicinal chemists and ADMET experts across academia and the pharmaceutical industry.

The ADME Encyclopedia Alan Talevi

Lead Optimization for Medicinal Chemists Florencio Zaragoza Dörwald 2013-02-04 Small structural modifications can significantly affect the pharmacokinetic properties of drug candidates. This book, written by a medicinal chemist for medicinal chemists, is a comprehensive guide to the pharmacokinetic impact of functional groups, the pharmacokinetic optimization of drug leads, and an exhaustive collection of pharmacokinetic data, arranged according to the structure of the drug, not its target or indication. The historical origins of most drug classes and general aspects of modern drug discovery and development are also discussed. The index contains all the drug names and synonyms to facilitate the location of any drug or functional group in the book. This compact working guide provides a wealth of information on the ways small structural modifications affect the pharmacokinetic properties of organic compounds, and offers plentiful, fact-based inspiration for the development of new drugs. This book is mainly aimed at medicinal chemists, but may also be of interest to graduate students in chemical or pharmaceutical sciences, preparing themselves for a job in the pharmaceutical industry, and to healthcare professionals in need of pharmacokinetic data.

Pharmacokinetic Challenges in Drug Discovery O. Pelkonen 2013-03-09 Despite increased spending on research and development, the number of new medicines marketed successfully continues to decline. The Pharmaceutical industry is therefore focussing on ways to reduce attrition by addressing frequent reasons for clinical drug failures very early in the drug discovery process. One of the biggest challenges is the pharmacokinetic (PK) optimisation of drug candidates tailored and predicted to have appropriate absorption, distribution, metabolism and excretion (ADME) characteristics in human. This book describes how traditional pharmacokinetic approaches and methods are being re-invented' to meet specific needs dictated by the dynamics of the drug discovery process. The book gives an overview of state-of-the-art tools and their use in the decision-making process is discussed by a number of scientists from leading pharmaceutical companies.

Virtual Drug Design Daniela Schuster 2020-01-13 In the current drug research environment in academia and industry, cheminformatics and virtual screening methods are well established and integrated tools. Computational tools are used to predict a compound's 3D structure, the 3D structure and function of a pharmacological target, ligand-target interactions, binding energies, and other factors essential for a successful drug. This includes molecular properties such as solubility, logP value, susceptibility to metabolism, cell permeation, blood brain barrier permeation, interaction with drug transporters and potential off-target effects. Given that approximately 40 million unique compounds are readily available for purchase, such computational modeling and filtering tools are essential to support the drug discovery and development process. The aim of all these calculations is to focus experimental efforts on the most promising candidates and exclude problematic compounds early in the project. In this Research Topic on virtual activity predictions, we cover several aspects of this research area such as historical perspectives, data sources, ligand treatment, virtual screening methods, hit list handling and filtering.

Advances in Personalized Nanotherapeutics Ajeet Kaushik 2017-12-08 Personalized health care to manage diseases and optimized treatment is crucial for everyone to maintain health quality. Significant efforts have been made to design and develop novel nano-enabling therapeutic strategies to cure and monitor diseases for personalized health care. As state-of-the-art, various strategies have been reported to develop personalized nanomedicine to combat against target diseases with no side effects. In this book proposal, we are trying to describe fundamentals of personalized nanomedicine, novel nanomaterials for drug delivery, role of nanotechnology for efficient therapeutics approach, nano-pharmacology, targeted CNS drug delivery, stimuli responsive drug release and nanotechnology for diseases management. This book would serve as a platform for new scholars to understand state-of-the-art of nanotechnology for therapeutics and designing their

future research to develop effective personalized nanomedicine against targeted diseases. As of now, various studies have been reported to design and develop nanomedicines of higher efficacy but unfortunately, such products are up to laboratory research only and need to be well-tested using pre-clinical or human models. Our book would be a call for experts to explore multidisciplinary research for developing novel and efficient approaches to explore smart efficient nanocarriers for site-specific on-demand controlled drug delivery to combat against targeted diseases to personalized health care.

Preclinical Development Handbook Shayne Cox Gad 2008-03-21 A clear, straightforward resource to guide you through preclinical drug development Following this book's step-by-step guidance, you can successfully initiate and complete critical phases of preclinical drug development. The book serves as a basic, comprehensive reference to prioritizing and optimizing leads, dose formulation, ADME, pharmacokinetics, modeling, and regulations. This authoritative, easy-to-use resource covers all the issues that need to be considered and provides detailed instructions for current methods and techniques. Each chapter is written by one or more leading experts in the field. These authors, representing the many disciplines involved in preclinical toxicology screening and testing, give you the tools needed to apply an effective multidisciplinary approach. The editor has carefully reviewed all the chapters to ensure that each one is thorough, accurate, and clear. Among the key topics covered are: * Modeling and informatics in drug design * Bioanalytical chemistry * Absorption of drugs after oral administration * Transporter interactions in the ADME pathway of drugs * Metabolism kinetics * Mechanisms and consequences of drug-drug interactions Each chapter offers a full exploration of problems that may be encountered and their solutions. The authors also set forth the limitations of various methods and techniques used in determining the safety and efficacy of a drug during the preclinical stage. This publication should be readily accessible to all pharmaceutical scientists involved in preclinical testing, enabling them to perform and document preclinical safety tests to meet all FDA requirements before clinical trials may begin.

Drug-like Properties: Concepts, Structure Design and Methods Li Di 2010-07-26 Of the thousands of novel compounds that a drug discovery project team invents and that bind to the therapeutic target, typically only a fraction of these have sufficient ADME/Tox properties to become a drug product. Understanding ADME/Tox is critical for all drug researchers, owing to its increasing importance in advancing high quality candidates to clinical studies and the processes of drug discovery. If the properties are weak, the candidate will have a high risk of failure or be less desirable as a drug product. This book is a tool and resource for scientists engaged in, or preparing for, the selection and optimization process. The authors describe how properties affect in vivo pharmacological activity and impact in vitro assays. Individual drug-like properties are discussed from a practical point of view, such as solubility, permeability and metabolic stability, with regard to fundamental understanding, applications of property data in drug discovery and examples of structural modifications that have achieved improved property performance. The authors also review various methods for the screening (high throughput), diagnosis (medium throughput) and in-depth (low throughput) analysis of drug properties. * Serves as an essential working handbook aimed at scientists and students in medicinal chemistry * Provides practical, step-by-step guidance on property fundamentals, effects, structure-property relationships, and structure modification strategies * Discusses improvements in pharmacokinetics from a practical chemist's standpoint

Structure-Based Drug Design for Diagnosis and Treatment of Neurological Diseases Rona R. Ramsay 2017-03-24 European Cooperation in Science and Technology (COST) supports the collaboration of nationally-funded science and technology research through the creation of networks. COST is the longest-running European framework enhancing cooperation among researchers, engineers and scholars across Europe. The COST Action CM1103 "Structure-based drug design for diagnosis and treatment of neurological diseases: dissecting and modulating complex function in the monoaminergic systems of the brain" is a good example of the advances possible through interdisciplinary collaboration on difficult problems. COST Action CM1103 brought together 28 research groups from 18 countries to collaborate for four years on multi-target drug design for complex neuropathologies. The interdisciplinary expertise of the members is spans the range from computational enzymology to human studies, providing outstanding opportunities for the interdisciplinary development of trainees, and is reflected in the articles in this e-book. This Research Topic covers progress in multi-target drug design for the complex neuropathologies of the monoamine system that are apparent, for example, in Alzheimer's disease. After a mini-review to introduce the topic of multi-target drug design, the other articles review the Research topic from their own perspective, two from computational approaches, three from medicinal chemistry, two from molecular pharmacology, and two from studies in whole brain. This multi-faceted approach describes new compounds, new methodology, and advances in the basic science of understanding the brain. This Ebook is based upon work from COST Action (CM1103 "Structure-based drug design for diagnosis and treatment of neurological diseases: dissecting and modulating complex function in the monoaminergic systems of the brain"), supported by COST (European Cooperation in Science and Technology). COST (European Cooperation in Science and Technology) is a pan-European intergovernmental framework. Its mission is to enable break-through scientific and technological developments leading to new concepts and products and thereby contribute to strengthening Europe's research and innovation capacities. It allows researchers, engineers and scholars to jointly develop their own ideas and take new initiatives across all fields of science and technology, while promoting multi- and interdisciplinary approaches. COST aims at fostering a better integration of less research intensive countries to the knowledge hubs of the European Research Area. The COST Association, an International not-for-profit Association under Belgian Law, integrates all management, governing and administrative functions necessary for the operation of the framework. The COST Association has currently 36 Member Countries. www.cost.eu

Drug-like Properties Li Di 2016-01-12 Of the thousands of novel compounds that a drug discovery project team invents and that bind to the therapeutic target, only a fraction have sufficient ADME (absorption, distribution, metabolism, elimination) properties, and acceptable toxicology properties, to become a drug product that will successfully complete human Phase I clinical trials. Drug-Like Properties: Concepts, Structure Design and Methods from ADME to Toxicity Optimization, Second Edition, provides scientists and students the background and tools to understand, discover, and develop optimal clinical candidates. This valuable resource explores physiochemical properties, including solubility and permeability, before exploring how compounds are absorbed, distributed, and metabolized safely and stably. Review chapters provide context and underscore the importance of key concepts such as pharmacokinetics, toxicity, the blood-brain barrier, diagnosing drug limitations, prodrugs, and formulation. Building on those foundations, this thoroughly updated revision covers a wide variety of current methods for the screening (high throughput), diagnosis (medium throughput) and in-depth (low throughput) analysis of drug properties for process and product improvement. From conducting key assays for interpretation and structural analysis, the reader learns to implement modification methods and improve each ADME property. Through valuable case studies, structure-property relationship descriptions, and structure modification strategies, Drug-Like Properties, Second Edition, offers tools and methods for ADME/Tox scientists through all aspects of drug research, discovery, design, development, and optimization. Provides a comprehensive and valuable working handbook for scientists and students in medicinal chemistry Includes expanded coverage of pharmacokinetics fundamentals and effects Contains updates throughout, including the authors' recent work in the importance of solubility in drug development; new and currently used property methods, with a reduction of seldom-used methods; and exploration of computational modeling methods

Nanotechnology Methods for Neurological Diseases and Brain Tumors Yasemin Gürsoy Özdemir 2017-07-14 Nanotechnology Methods for Neurological Diseases and Brain Tumors: Drug Delivery across the Blood-Brain Barrier compiles the latest (and future potential) treatment strategies for brain tumors and neurological diseases, in particular Alzheimer's, Parkinson's and stroke, those that bypass the blood/brain barrier. The current understanding of brain drug delivery and access is discussed in Chapter One, with the next section focusing on the implementation of the nose-to-brain intranasal route in brain-targeted drug delivery. In addition, nanotechnology-based brain drug delivery is covered in Chapter Three. This avenue offers impressive improvement in the treatment of neurological diseases and brain tumors by using bio-engineered systems that interact with biological systems at a molecular level. In Chapter Four, emphasis is placed on the need for brain-targeted experimental models that mimic disease conditions. Final chapters discuss the very latest advances in targeted treatment strategies for neurological diseases and brain tumors. Comprehensive guide for up-to-date views on the latest advances in targeted treatment strategies for brain tumors and neurological diseases Designed with a multidisciplinary approach that links neurology, neuro-oncology and nanoscience to drug delivery to the brain with an emphasis on the blood-brain-barrier Written in a language that makes it easy to understand nanotechnology drug delivery techniques Presents a unique book that also covers advanced treatment approaches of neurological diseases and brain

Lazaroid Formulations for Brain Delivery

Organotypic Models in Drug Development

Essential CNS Drug Development

ADME-Enabling Technologies in Drug Design and Development Donglu Zhang 2012-04-13 A comprehensive guide to cutting-edge tools in ADME research The last decade has seen tremendous progress in the developmentof analytical techniques such as mass spectrometry and molecularbiology tools, resulting in important advances in drug discovery,particularly in the area of absorption, distribution, metabolism,and excretion (ADME). ADME-Enabling Technologies in Drug Design and Developmentfocuses on the current state of the art in the field, presenting acomprehensive review of the latest tools for generating ADME datain drug discovery. It examines the broadest possible range ofavailable technologies, giving readers the information they need tochoose the right tool for a given application, a key requisite forobtaining favorable results in a timely fashion for regulatoryfilings. With over thirty contributed chapters by an internationalteam of experts, the book provides: A thorough examination of current tools, covering bothelectronic/mechanical technologies and biologically based ones Coverage of applications for each technology, including keyparameters, optimal conditions for intended results, protocols, andcase studies Detailed discussion of emerging tools and techniques, from stemcells and genetically modified animal models to imagingtechnologies Numerous figures and diagrams throughout the text Scientists and researchers in drug metabolism, pharmacology,medicinal chemistry, pharmaceutics, toxicology, and bioanalyticalscience will find ADME-Enabling Technologies in Drug Design andDevelopment an invaluable guide to the entire drug developmentprocess, from discovery to regulatory issues.

Prajakta Gadgil 2016 Purpose and Specific Aims: There are several limitations associated with the current glioblastoma therapy, namely radiation induced lipid peroxidation and resistance to chemotherapy, resulting in recurrence of glioblastoma. In order to overcome these problems, alternative agents such as lazaroid U74389-G (LAZ) need to be explored. LAZ, a 21-aminosteroid, is a known lipid peroxidation inhibitor in vivo and has also demonstrated anti-proliferative activity in vitro. However, LAZ a potential substrate of P-glycoprotein (P-gp) efflux transporter, is extensively metabolized by Phase I enzymes and has shown high hepatic clearance on intravenous administration leading to poor brain penetration and restricting its potential in treating glioblastoma. One approach to overcome the limitations associated with LAZ is to design drug-loaded nano-carriers engineered to have surface properties and sub-micron size conducive for delivery across the blood brain barrier (BBB) while escaping the clearance by liver. The goal of this study was to investigate the utility of LAZ loaded nano-carriers such as nanostructured lipid carriers (NLCs), increasing the brain exposure while decreasing the liver exposure of LAZ. Three specific aims were proposed in order to achieve our goal; 1) Development, optimization and in-vitro characterization of lazaroid loaded NLCs, 2) development and validation of UPLC-MS/MS for quantification of lazaroid in bio-matrices and 3) evaluation of pharmacokinetics and bio-distribution of lazaroid formulations in Sprague-Dawley rat model. Method: A 2-factor, 5-level Central Composite Design (CCD) along with response surface plots were used to determine the effect of independent variables (amount of DSPE-PEG 2k and % liquid lipid) on dependent variables (particle size, zeta potential and encapsulation efficiency), and providing numerical optimization for LAZ-NLC composition. The optimal LAZ-NLCs were characterized for their physico-chemical properties such as particle size and morphology, surface charge, encapsulation efficiency, crystallinity, hemolytic potential and storage stability using various analytical techniques. A sensitive UPLC/MS-MS analytical method was developed and validated for the analytical quantification of LAZ in rat plasma and brain, liver and lung tissue samples. Male Spargue-Dawley rat groups were dosed intravenously with optimal LAZ-NLC (15 mg/kg) and comparative LAZ citrate (5 mg/kg) and LAZ co-solvent (15 mg/kg) solutions and the plasma pharmacokinetics and brain, liver and lung bio-distribution profiles were evaluated for up to 8 hours. Additionally, male Spargue-Dawley rats were dosed intravenously with increasing dose of the optimal LAZ-NLC from 15 to 60 mg/kg. The brain levels of LAZ 20 minutes post-dose were evaluated in each dose group and were evaluated using ANOVA and power model for assessing dose linearity. Results: The DSPE-PEG 2k had an inverse effect on particle size and zeta potential and a synergistic effect on encapsulation efficiency of LAZ-NLCs. The liquid lipid Labrasol had an inverse effect on particle size and a slight synergistic effect on zeta potential without having any effect on encapsulation efficiency of LAZ-NLC. The optimal LAZ-NLCs measured 172.3 ± 3.54 nm in diameter with surface charge of -4.54 ± 0.87 mV and encapsulation efficiency of 85.01 ± 2.60 %. The optimal LAZ-NLCs were spherical in shape as per transmission electron microscopy and in vitro hemolytic potential was within acceptable limits (

Blood-Brain Barrier in Drug Discovery Li Di 2015-02-02 Focused on central nervous system (CNS) drug discovery efforts, this book educates drug researchers about the blood-brain barrier (BBB) so they can affect important improvements in one of the most significant – and most challenging – areas of drug discovery. • Written by world experts to provide practical solutions to increase brain penetration or minimize CNS side-effects • Reviews state-of-the-art in silico, in vitro, and in vivo tools to assess brain penetration and advanced CNS drug delivery strategies • Covers BBB physiology, medicinal chemistry design principles, free drug hypothesis for the BBB, and transport mechanisms including passive diffusion, uptake/efflux transporters, and receptor-mediated processes • Highlights the advances in modelling BBB pharmacokinetics and dynamics relationships (PK/PD) and physiologically-based pharmacokinetics (PBPK) • Discusses case studies of successful CNS and non-CNS drugs, lessons learned and paths to the market

Monika Schäfer-Korting 2021-03-25 This book provides latest findings in organotypic models in drug development and provides the scientific resonance needed in an emerging field of research in disciplines, such as molecular medicine, physiology, and pathophysiology. Today the research on human-based test systems has gained major interest and funding in the EU and the US has increased over the last years. Moreover, so-called 3R (reduce, replace, refine animal experiments) centres have been established worldwide.

Application of Yeast Surface Display Screening Methods to Antibody Discovery and Proteomics of the Blood-brain Barrier Jason M. Lajoie 2016 The blood-brain barrier (BBB), comprised of tightly joined endothelial cells lining the brain vasculature, represents a significant bottleneck in the development of efficacious neuro-therapeutics as the majority of both small and large molecule drugs are restricted from entering the brain. Thus, development of efficient non-invasive drug delivery strategies is of paramount importance. One approach uses receptor-targeting antibodies to piggyback on endogenous endocytosis and vesicular trafficking routes, collectively termed receptor-mediated transport (RMT), to ferry drug payloads to the brain. The current state-of-the-art RMT-targeting antibodies have met with some success in animal models but face numerous limitations that reduce their efficiency. As a result, significant effort has been spent over the past 15 years to discover and develop novel RMT-targeting reagents. The studies presented in this dissertation sought to augment this work through the development and application of innovative yeast surface display screening approaches for discovery of antibodies against the RMT machinery at the BBB. First, we developed a functional yeast display immunoprecipitation (fYDIP) screen capable of detecting membrane protein complex association with the endocytosis adaptor protein Adaptin-2. After screening a non-immune human antibody library via fYDIP, two lead antibodies were identified that target intracellular proteins expressed at the BBB with known roles in endocytosis and membrane trafficking. Next, we developed and implemented an innovative screening platform taking advantage of a novel class of antigen recognition molecules from lamprey, variable lymphocyte receptors. An immune variable lymphocyte receptor library was created by immunization of lamprey with brain capillary plasma membranes from mice and cloning of the resultant repertoire into the yeast surface display platform. The library was screened via a novel two-step workflow aimed at enriching clones that targeted extracellular epitopes of in vivo-relevant membrane proteins. Three lead candidates identified from this screening procedure were shown to target the brain vasculature after intravenous administration and were found to endocytose and traffic within the brain capillary endothelial cells. Given further characterization and optimization these lead molecules hold promise as novel brain drug delivery agents.

Amir Kalali 2012-06-07 Central Nervous System disorders have an enormous impact on individuals and on society as a whole. The development of better treatments is crucial and is a major focus of pharmaceutical and biotechnology companies. This book explains the complicated process of CNS drug development in a way that is engaging for any interested professional or student. Chapters cover each stage of drug development, from pre-clinical research through all phases of clinical trials, to reporting to the regulatory authorities. Other key issues covered include strategic considerations, regulatory constraints, dissemination of results and ethical considerations. The user-friendly format and style enable readers to find important information quickly and easily. Written and edited by experts from different sectors actively engaged in CNS drug development, this is a unique resource for drug developers, investigators, academics and clinicians.