DRUG DELIVERY

BOOK OF ABSTRACTS

SCHOLARS CONFERENCES

SCHOLARS WEBINAR ON:

DRUG DELIVERY AND NANOMEDICINE

THEME: "EXPERIMENTAL CHALLENGES IN DRUG DELIVERY AND NANOMEDICINE"

24-25 MAR 2021

WEBINAR

https://scholarsconferences.com/drugdelivery-nanomedicine-webinar/

SCIENTIFC PROGRAM

DAY 1 | 24 MARCH | Wednesday

11:00-17:00 (GMT)

11:00-11:10 Introduction

KEYNOTE FORUM

11:10-11:45 **12:10-12:45** (Speaker Local Time)

Title: Supercritical CO^2 assisted processes: advanced strategies to produce bio-carriers from micro- to nanoscale for drug delivery

Lucia Baldino, University of Salerno, Italy

11:45-12:20 **12:45-13:20** (Speaker Local Time)

Title: Intranasal drug delivery systems: importance of type and composition for inducing systemic or brain delivery of drugs

Giovanna Rassu, University of Sassari, Italy

12:20-12:55 **14:20-14:55** (Speaker Local Time)

Title: Functional Materials for Precision Medication

Hongbo Zhang, Åbo Akademi University, Finland

SPECIAL SESSION

12:55-13:25 **21:55-22:25** (Speaker Local Time)

Title: Overview of CNS-Targeted Gene Delivery across the BBB: Non-Invasive Delivery Strategies

Seigo Kimura, Hokkaido University, Japan

13:25-13:45 - REFRESHMENTS BREAK

13:45-14:15 **14:45-15:15** (Speaker Local Time)

Title: Marinosolv® - The technology platform for novel aqueous formulations

Cornelia Siegl, Marinomed Biotech AG, Austria

KEYNOTE FORUM

14:15-14:50 **15:15-15:50** (Speaker Local Time)

Title: Gateway to the Brain: Tailored Nanomedicine

Giovanni Tosi, University of Modena and Reggio Emilia, Italy

SCIENTIFC PROGRAM

14:50-15:30 **10:50-11:30** (Speaker Local Time)

Title: Emerging Platforms for Targeted and Optimized Drug Delivery

Donald Turner, Neosinus Health, USA

SCIENTIFIC SESSION

15:30-15:50 **10:30-10:50** (Speaker Local Time)

Title: Development, Evaluation and Application of Insulin Solution and Film Dosage Forms for Sublingual Administration

Anuja Paprikar, Capstone Development Services, USA

15:50-16:10 **19:50-20:10** (Speaker Local Time)

Title: Novel dosage forms to Improve Transplant Care

Mullaicharam Bhupathyraaj, National University of Science and Technology, Oman

16:10-16:20 - REFRESHMENTS BREAK

16:20-16:40 **16:20-16:40** (Speaker Local Time)

Title: Lipid- and Polymer-based nanosystems for gene delivery

Henrique Manuel dos Santos Faneca, University of Coimbra, Portugal

16:40-17:00 **09:40-10:00** (Speaker Local Time)

Title: Formulation of Temozolomide Loaded Magnetic Nanoparticles: In-Vitro and In-Vivo Evaluation for Glioblastoma Multiforme

Khushboo Jani, St. John's University, USA

17:00-17:15 - B2B MEETINGS AND NETWORKING

DAY 2 | 25 MARCH | Thursday

11:00-17:00 (GMT)

11:00-11:10 Introduction

KEYNOTE FORUM

11:00-11:35 **14:00-14:35** (Speaker Local Time)

Title: Synergistic and Antagonistic Latent Bioenergetic Memory Forces of Magic Magnetic Nanoparticles

Ozan Emre EYUPOGLU, Istanbul Medipol University, Turkey

SCIENTIFC PROGRAM

11:35-12:10 **07:35-08:10** (Speaker Local Time)

Title: The rubbery and amoeba property of RNA Nanoparticles that lead to efficiency cancer targeting, little organ accumulation and fast renal excretion without detectable toxicity

Peixuan Guo, The Ohio State University, USA

SCIENTIFIC SESSION

12:10-12:30 **13:10-13:30** (Speaker Local Time)

Title: How can the application of the Quality by Design approach assist the design and development process of liposomes?

Zsófia Németh, University of Szeged, Hungary

12:30-12:50 **13:30-13:50** (Speaker Local Time)

Title: Fabrication of a microfluidic platform for the assessment of permeability across the blood-brain barrier of nanotherapeutic agents for Alzheimer's disease

Sujey Palma-Florez, Institute for Bioengineering of Catalonia, Spain

12:50-13:10 **12:50-13:10** (Speaker Local Time)

Title: Peptide decorated light-responsive nanoparticles for the brain targeting

Akhilesh Rai, University of Coimbra, Portugal

13:10-13:30 - REFRESHMENTS BREAK

13:30-13:50 **19:30-19:50** (Speaker Local Time)

Title: Polymeric Nanostructured Nordihydroguaiaretic acid analog-A promising Drug-carrier system

Geraldine Sandana Mala, C/o TAKENEN, India

13:50-14:10 **19:50-20:10** (Speaker Local Time)

Title: Polymer Nanocomposite Scaffolds for Tissue Engineering

Sabu Thomas, Mahatma Gandhi University, India

14:10-14:30 **10:10-10:30** (Speaker Local Time)

Title: Pharmacokinetics and bio-distribution studies for exploring the role of lymphatics in the oral absorption of double-coated Doxorubicin loaded nanoparticles

Neeraj Kaushal, St. John's University, USA

14:30-14:50 **07:30-07:50** (Speaker Local Time)

Title: Development of Multi-dose oral abuse deterrent formulation of loperamide using hot melt extrusion

Pavan Kumar Nukala, Bioduro San Diego, USA

14:50-15:10 **22:50-23:10** (Speaker Local Time)

Title: Local Transdermal Therapy for the Treatment of Breast Cancer

Usha Sundralingam, Monash University Malaysia, Malaysia

15:10-15:30 **15:10-15:30** (Speaker Local Time)

Title: Recent advances in topical drug delivery to the posterior eye segment

Ayah Mohammad Burhan, Waterford Institute of Technology, Ireland

Poster Presentation

15:30-15:50 **16:30-16:50** (Speaker Local Time)

Title: The preparation of hyaluronic acid nanoparticles as potential drug delivery carrier

Nikola Mannová, University of Pardubice, Czech Republic

15:50-16:10 **16:50-17:10** (Speaker Local Time)

Title: Model Drugs for Designing a Thermosensitive Liposome Formulation

Raafay Mehmood, Charles University, Czech Republic

16:10-17:00 - Networking and B2B Meetings

SCHOLARS CONFERENCES

SCHOLARS WEBINAR ON:

DRUG DELIVERY AND NANOMEDICINE

MARCH 24-25, 2021 | WEBINAR

KEYNOTE SPEAKERS
Day 1

DRUG DELIVERY

Lucia Baldino
University of Salerno, Italy

Biography

Lucia Baldino graduated in Chemical Engineering, summa cum laude, in 2011, at the University of Salerno, Italy, discussing a thesis on the "Production of polymeric membranes by supercritical phase separation for active packaging applications". She gained the PhD degree in Chemical Engineering, in 2015, at the same University, with a thesis on "Green processes based on SC-CO2: application to materials of biomedical interest", obtaining an outstanding judgment. Starting from 2015, she is a research fellow at the Department of Industrial Engineering, University of Salerno, Italy. In 2018, she got the Abilitazione Scientifica Nazionale (ASN) to become Associate Professor (SSD ING-IND/25).

Supercritical CO_2 assisted processes: advanced strategies to produce bio-carriers from micro- to nanoscale for drug delivery

Supercritical fluid technologies, for the production of pharmaceutical bio-carriers, are achieving substantial attention thanks to their advantages over the conventional methods, as, in particular, a significant decrease or complete elimination of the use of organic solvents, absence of post-processing methods, and a considerable increase in experimental reproducibility. Moreover, these technologies can be easily scaled-up from laboratory to industrial scale. Supercritical carbon dioxide (SC-CO2), an inexpensive, inert, non-toxic, nonflammable and environmentally friendly alternative to organic solvents, has been successfully used for the production of micro- and nanoparticles, liposomes, and niosomes, due to its unique properties as high diffusivity, negligible surface tension, low viscosity and high density. Besides, SC-CO2 exhibits mild-critical parameters that avoid the degradation of thermosensitive biomolecules and can be easily achieved and controlled during an industrial process.

In this context, two innovative processes assisted by SC-CO2 are presented: supercritical assisted electrospaying and supercritical assisted liposomes formation technology. In particular, in both processes, the addition of SC-CO2 to a starting solution allows to achieve an expanded liquid, characterized by reduced viscosity and surface tension. Thanks to these peculiarities, polyvinylpyrrolidone microparticles loaded with quercetin were produced by supercritical assisted electrospaying, and liposomes loaded with curcumin were produced by supercritical assisted liposomes formation technology, for drug delivery applications. The influence of the main process parameters on the final bio-carriers chemical, physical and morphological properties is described and critically discussed in this work.

Giovanna Rassu
University of Sassari, Italy

Biography

Giovanna Rassu is Associate Professor at the Department of Chemistry and Pharmacy of the University of Sassari, where she performs her research and teaching activities in the drug delivery field. Her research activity is mainly focused on the development of micro- and nanoparticles for different routes of administration (nasal, oral, and cutaneous); these studies are in collaborations with various national and international research groups. To date, she is (co)authored of 65 scientific publications and more than 90 congress communications/proceedings. She reviews manuscripts submitted to different prestigious journals of the drug delivery categories and she is Review Editor for Frontiers in Medical Technology. Moreover, she is Guest Editor of Special Issue "Mucoadhesive and Mucosal Drug Delivery Systems" of Pharmaceutics. She is inventor of Italian Patent titled "Permeation Cells" (number: 102017000089514; European extension application (PCT / IB2018 / 055726) required) suitable for the permeation studies of substances through membranes or tissues.

Intranasal drug delivery systems: Importance of type and composition for inducing systemic or brain delivery of drugs

Intranasal administration is a non-invasive route for drug delivery and an interesting alternative to conventional drug administration (e.g. oral, parenteral). Due to the different anatomical and physiological characteristics of nasal cavity, the intranasal administration can strongly affect the bioavailability of drugs and, then, the pharmacotherapy. Nasally administered drugs can be deposited on the respiratory and olfactory epithelia. From the respiratory epithelium, the drugs can be absorbed into the systemic circulation with rapid onset of action, and avoidance of first-pass metabolism. The drugs deposited on the olfactory epithelium can have a direct access to the central nervous system (CNS) via a paracellular or transcellular transport through olfactory neurons or olfactory epithelial cells. Trigeminal nerves are also potential way of drug access in the brain. The nose-to-brain transport of drugs allows to bypass blood-brain barrier, to reduce the systemic exposure and, thus, the adverse effects of the drugs and to lower the doses to be administered. However, due to the mucociliary clearance and the poor mucosal permeability of several drugs, an important requirement for this route is the development of appropriate delivery systems. In fact, the predominant pathway depends on the properties of the therapeutic, but also on the characteristics of the formulation and excipients, and on the delivery device that obviously influence the deposition site. Aim of this presentation is to show how the type and composition of formulation affects drug permeation across the nasal mucosa and induces systemic or brain delivery of the drug. As example, the performances of particulate formulations based on chitosan and its salts for nose-to-brain delivery of drugs will be presented and compared with those obtained using methyl-β-cyclodextrin alone or in combination. The recent results on nasal nanoparticles will be described.

Hongbo Zhang

University of Turku and Åbo Akademi University, Finland

Biography

Dr. Hongbo Zhang has multidisciplinary background in pharmacy, biology and biomedical engineering. He did his Postdoc in Harvard University and establish his research group in 09.2016. He has accumulated experiences in microfluidics, nanotechnology, electrospinning, 3D printing and he aims to develop novel and effective solutions for the challenging biological and clinical problems. In most of the projects, the clinical doctors are involved. The projects start from a clinical problem, and Dr. Zhang will use the toolbox that his group has, to assemble a therapeutical nanoparticle/microparticle/scaffold or the combination of them. In last 5-year time, he has published 90 papers with total impact factor of 900, the 5-year citation is 3100, 5-year H-index is 35.

Functional Materials for Precision Medication

Nanotechnology has provided revolutionary impacts for the traditional medication. The nanometer size is highly relevant to many biological conditions, for example 50-200 nm particles tend to accumulate in tumor tissue due to the enhanced permeability and retention (EPR) effect. Moreover, the nanoparticles can be endowed with character of smart, responsive, targeted, and multi-functional properties. Nanotechnology has also shown its capability on drug delivery, including the delivery of small molecular drugs, plasmid, nuclear acids, proteins and cells. Our group synthesize all kinds of nanomaterials, and we are especially interested in mesoporous silica nanoparticles (MSN), the metal organic framework (MOF), synthetic and nature polymers, DNA nanoparticles and etc. We also apply microfluidic technology for nanoparticles and microparticles fabrication. Moreover, we use electrospinning to produce nanofiber-based scaffolds. Here we present the examples on how we utilized nanotechnology to delivery small molecular drug and drug combinations, CRISPR/Cas9 plasmids, protein kinase A (PKA) protein, stem cells and etc. We found that those systems have greatly contributed the cancer treatment, cardiovascular diseases, wound healing etc. We collaborate with clinical doctors and we hope very much that we will find hints from those projects on the clinical translational potential.

Giovanni Tosi
University of Modena and Reggio Emilia, Italy

Biography

Dr Giovanni Tosi is a Full Professor in Department of Life Sciences at University of Modena and Reggio Emilia, Italy.

His works on Nanoparticles for CNS delivery and targeting were honored with national prices and awards, and he is author or co-author of more than 100 publications in international journals (of which 5 are reviews and 3 are book chapters) and gave over 200 presentations (invited speaker, oral presentations and posters) in international and national congresses. He participated as collaborator in several Italian projects supported by the Italian Research Ministry as well as International Grant (EU, US, UK grants) in the field of Nanomedicine and Brain Disorders. He is now collaborating with a broad network of scientists in Italy and mainly around the world. He currently acts as referee for the top journals in nanotechnology and nanomedicine such as Journal of Controlled Release, Biomaterial, Nanomedicine and many other journals dealing with Nanotechnology, Drug Delivery and Nanomedicine.

The research activity is based on the development of lipid and polymeric systems for the delivery and the targeting of drugs to diseased tissues or cells. In particular, drug delivery to the Central Nervous System, by using nanoparticulate vectors (NP). He is or has been PI of a number of national and international research programmes, especially focused on nanomedicine application to neurodegenerative and neruometabolic disorders.

Gateway to the Brain: Tailored Nanomedicine

The research of non-invasive therapy for the treatment of neurodegenerative diseases is one of the most important topics of the last years by the pharmaceutical technology. Even if less than 1% of both industrial and university research projects on neuroscience displays of a Blood-Brain Barrier (BBB) crossing and CNS targeting aims, the study and progress of drug delivery strategies to cross the BBB are supposed to be widely addressed. Above a wide overview on the most interesting and recent applications of nanomedicines to the CNS targeting, in this talk, the most recent works on poly-lactide-co-glycolide and other polymer-based NPs differently modified for BBB crossing will be reviewed. In particular, different strategies based on different ligands for BBB crossing, as exogenous-like peptides, endogenous-like peptides BBB-receptor antibodies and glyco-peptides will be detailed. In vivo and in vitro results will be commented to underline which mechanism is responsible for BBB crossing, which pathways are exploited for cell entry and specific accumulation-tropism in brain areas and even in cell type are present, dependently on type of ligands. With this talk, we will therefore try to draw an overview of the main advantages of the use of nanomedicine-based approach for innovation in crossing the most "defensive" barrier in our body, with particular relevance to neurodegenerative diseases. Besides these aspects, a critical analysis on the main causes that slow the application of nanomedicine to brain disorders will be discussed along with the identification of possible solutions and possible interventions. Moreover, a short overview of recently started IMI2 project (IM2PACT) will be described in order to show the idea and the tendency of both academic and industrial research in terms of novel ways and strategies for BBB crossing.

Don Turner

CEO, Neosinus Health and University of North Carolina Center for the Business of Health, USA

Biography

Don Turner has more than 25 years of experience building world-class companies, with a passion for commercializing innovations globally. He currently serves as the CEO for Neosinus Health and Board Member for University of North Carolina's Center for the Business of Health. Previously, Don served as the Global Head of Commercialization for IBM Watson Health, SVP and Global Head of Commercialization at Merge Healthcare, Managing Director for Millennium Pharmaceuticals, Committee Chairman at Mass Biotechnology Council, and Advisory Board Member for Cisco Systems.

He is an industry recognized thought leader and public speaker, with noted expertise in areas such as advanced research and development, precision medicine, innovation commercialization, healthcare transformation, and digital health. Don has served as a keynote and guest speaker on Healthcare Transformation and Precision Medicine at Johns Hopkins University, Emory University, American Diabetes Association, Southeast Medical Device Association, eHealth Forum, BioIT Conference, Innovators Association, and others.

Emerging Platforms for Targeted and Optimized Drug Delivery

As noted by the World Health Organization, neurological and psychiatric disorders represent the greatest global economic and health burden, where more than 1 billion people are affected, and the number is rapidly growing because of the global pandemic. Even though this medical demand has been known for decades, the clinical development pipelines from the pharmaceutical industry are largely deficient, where the most recent commercialized drug for Depression was approved by the FDA after three decades of effort by the entire pharmaceutical industry.

The lack of clinical advancements is not a strategic failure, but rather a direct result of well-known physiological impedance to drug delivery such as the first-pass effect and the blood-brain-barrier, which either produce significant side effects and/or prevent drugs from reaching the therapeutic target. Thankfully, researchers have discovered viable therapeutic pathways to bypass drug delivery barriers, and advancements in nanomedicine will further enable drug delivery, but the greatest potential resides in emerging non-invasive medical device innovations that will provide both targeted and fully optimized drug delivery.

This keynote presentation will provide a view into the evolution of drug delivery, clinical dynamics that are motivating emerging classes of therapeutics, existing barriers that could impede advancements, and the latest developments that represent great potential for global health transformation. Specific examples of current research and development will be given, with a focus on the role of non-invasive medical devices to produce targeted and optimized drug delivery via local, systemic, and nose-to-brain routes. Lastly, the talk will discuss how emerging medical devices can also serve to substantially improve the well-known problem of treatment and medicine adherence, which itself is a $300 billion per year problem, and poor adherence will continue to impede even the greatest of advancements in drug delivery and nanomedicine if the problem is not resolved.

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SCIENTIFIC TRACKS & ABSTRACTS

Day 1

DRUG DELIVERY

Seigo Kimura
Hokkaido University, Japan

Biography

Mr. Seigo Kimura is a first year doctoral student in the field of drug delivery especially in gene delivery at Hokkaido University studying under Professor Hideyoshi Harashima. The aim of his studies is to develop safe and efficient drug delivery system for nucleic acid medicine and gene therapy. He focuses on lipid-based carriers to address some of issues that exist in the process of nucleic acid delivery in vivo. Specifically, he has been working on the development of non-viral vectors using plasmid DNA-encapsulated lipid nanoparticles (LNPs). His previous studies regarding LNPs capable of *in vivo* gene transfer to immune cells and those applicability to DNA vaccines have been published in J Control Release. Currently, he has begun work on gene delivery to the brain and is working to develop LNPs for the delivery of therapeutic genes to the brain through a non-invasive delivery route.

Overview of CNS-Targeted Gene Delivery across the BBB: Non-Invasive Delivery Strategies

The era of the aging society has arrived, and this has been accompanied by an increase in the absolute numbers of patients with neurological disorders, such as Alzheimer's disease and Parkinson's disease. The most important point in the current situation is that there is no effective treatment despite the fact that the number of patients increase with the aging of the population. The bottleneck in drug development for CNS diseases is the absence of effective drug delivery system (DDS) technology for delivering the therapeutic agents into the brain. While gene therapy has great promise for the treatment of neurological disorders, gene therapy is the field where DDS technology is most needed due to low membrane permeability and low stability of nucleic acids in vivo. Thus, the development of brain-targeted DDS is as important as or even important than drug itself. Nanotechnologies such as viral and non-viral vectors allow efficient brain-targeted gene delivery systems to be created. In 2019, the FDA approved a gene therapy for spinal muscular atrophy (SMA), Zolgensma. The advent of Zolgensma confirmed that *in vivo* targeted gene therapy is a clear possibility and is expected to further accelerate the development of DDS technology in anticipation of gene therapy. The topic of this session is an overview of CNS-targeted gene delivery across the blood brain barrier (BBB) via non-invasive delivery strategies based on currently published my review article entitled with "Current Status and Challenges Associated with CNS-Targeted Gene Delivery across the BBB". This session mainly address two aspects of this situation: (1) BBB receptors/transporters in terms of BBB crossing; (2) non-invasive brain-targeted strategies mainly by non-viral methods. Although the present state of CNS-targeted drug development is still in the initial stage, the purpose of this session is to provide current situations and to inspire future persistent researches.

Cornelia Siegl
Marinomed Biotech AG, Austria

Biography

Dr. Cornelia Siegl is project manager at Marinomed Biotech AG since 2015 and has since then concentrated on the development of the Marinosolv technology platform, and thereby creating an IP protection of the technology, in a companywide teamwork. Her primary objectives were focused on solubility and stability studies of well-known active product ingredients, that are currently marketed as suspension, due to their low water solubility and / or their poor stability in aqueous formulations. Some of these substances were then chosen for a potential product development for a dedicated indication, resulting in formulation development for clinical phases. During clinical development and for market product development she is responsible for manufacturing process development and validation together with and at the CDMO´s.

Marinosolv® - The technology platform for novel aqueous formulations

Marinosolv is an IP protected technology platform which allows the solubilization of a wide series of insoluble drugs, such as the corticosteroids budesonide or fluticasone propionate or macrolide immunomodulators such as tacrolimus. Those compounds are currently only be delivered as a suspension, due to their low water solubility. The technology enables novel aqueous formulations with applications in sensitive tissue such as nose, eyes and lungs. Dissolved drugs permeate faster into nasal and/or oral mucosa, as well as into ocular compartments such as cornea and conjunctiva, facilitating efficient drug delivery and a faster onset of action. Furthermore, the improved bioavailability may result in reduced dose application.

Several ex-vivo studies of fluorescently labeled estradiol dissolved in Marinosolv, developed as model compound, showed remarkable amounts of estradiol in porcine cornea compared to estradiol formulated as suspension (1). Furthermore, in-vivo studies in pigs were performed on tacrolimus, developed as topical non-steroidal treatment option for anterior and posterior eye diseases, called Tacrosolv (1). Tacrolimus dissolved in Marinsolv showed a concentration-dependent increased permeation into porcine cornea, choroidea and retina when dissolved in Marinosolv compared to topical application of suspensions or oral treatment (1). We developed further an aqueous nasal formulation of budesonide, based on the Marinosolv technology called Budesolv, for the indication of allergic rhinitis (2). The anti-inflammatory activity of Budesolv was characterized in vivo in BALB/c mice, in comparison to CD-solubilized budesonide and the commercial product Rhinocort® aqua 64 micrograms, nasal spray (2). Both Tacrosolv and Budesolv were proven in-vivo on their local tolerance for their intended application (1,2).

Preclinical results were recently verified in a pivotal challenge chamber study designed to demonstrate efficacy and onset of action exposing allergic subjects to grass pollen thereby inducing symptoms (2;3). Results demonstrated that Budesolv can effectively control AR nasal symptoms and demonstrated clinical benefit after the first Budesolv treatment on Day 1 (3).

(1) Siegl et al., European Journal of Pharmaceutics and Biopharmaceutics 134, 2019, 88-95, Pharmacokinetics of topically applied tacrolimus dissolved in Marinosolv, a novel aqueous eye drop formulation

(2) Nakowitsch et al., Pharmaceutics 2020, 12 (9), 847, Saponin Micelles Lead to High Mucosal Permeation and In Vivo Efficacy of Solubilized Budesonide

(3) Ziegelmayer et al., Clin Exp Allergy, 2020, 00:1-3, Fast effectiveness of a solubilized low-dose budesonide nasal spray in allergic rhinitis

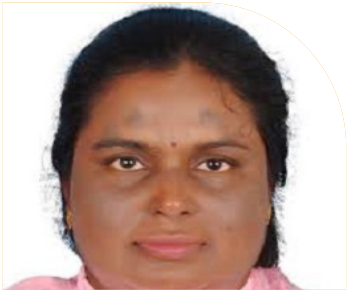
Anuja Paprikar
Capstone Development Services, USA

Biography

Dr. Anuja Paprikar endeavors to apply her accumulated experience in the field of in vitro permeation studies to support the design and execution of studies for generic topical drug development in her current role. Although she has gained experience in formulation and characterization of small as well as large molecules, the aim of her studies presented here was to develop and evaluate a feasible formulation approach for insulin sublingual administration.

Development, Evaluation and Application of Insulin Solution and Film Dosage Forms for Sublingual Administration

The major barrier for sublingual absorption of large molecules like insulin is low permeability owing to the hydrophilic nature of insulin. One approach to overcome this barrier is to sublingually co-administer insulin with permeation enhancers (HPβCD and poloxamer 188). *In vitro* performance of permeation enhancers was screened across cellulose acetate membrane to select the concentrations of both enhancers, which were further evaluated across four models (MatTek tissue model, MDCK cell line, rat and porcine esophagus). The insulin solution with combination of HPβCD (5%) and poloxamer 188 (0.5%) indicates higher permeation as compared to that of only insulin across all the four models. Subsequently, porcine esophagus was selected as a tool for *in vitro* permeation studies for sublingual insulin solution. Furthermore, insulin-induced hypoglycemic effect was observed for insulin solution formulations with combination of HPβCD and poloxamer 188 after sublingual administration to Sprague-Dawley rats. An increase in dose of insulin from 5, 10, and 15 IU/kg along with HPβCD and poloxamer 188, maximum reduction of glucose level increased. After exploring the feasibility of HPβCD and poloxamer 188 for sublingual insulin solution administration, permeation of insulin solution was optimized using three-level resolution III fractional factorial design. In this design, the independent (X1: concentration of insulin; X2: concentration of HPβCD; X3: concentration of poloxamer 188) and dependent (Y: cumulative amount permeated at 60 minutes) variables were used. Based on the generated equation from this design, not only contour and interaction plots were generated but also an optimized formulation, and two checkpoint formulations were obtained to validate the design. Thereafter, insulin at three doses for the optimized formulation and safety of permeation enhancers was evaluated. Based on the optimized sublingual insulin solution, polymeric sublingual films were formulated and evaluated. The sublingual insulin films were found to have comparative mechanical properties to that of commercial film (Listerine®). Based on in vitro dissolution and *in vitro* permeation, it can be concluded that the film on dissolution could behave like insulin solution and hence is a feasible approach for sublingual administration.



Mullaicharam Bhupathyraaj

National University of Science and Technology, Sultanate of Oman

Biography

Prof. (Dr). Mullaicharam is working as Professor of Pharmaceutics at College of Pharmacy, National University of Science and Technology, Muscat, Sultanate of Oman.

She has 24 years of teaching and research experience in the pharmacy field and has received awards and many research grants in the area of advanced drug delivery systems at national and international level. She has authored many book chapters and text books.

She developed many courses in pharmaceutics. She has published more than 80 research articles in peer reviewed journals and presented many papers in various conferences in UK, India, Oman and UAE. Also she is professional auditor as external reviewer for quality assurance in higher education institutions in Oman.

She has authored many book chapters and text books. She is on the panel of external examiner committee for PhD theses of various universities and is on the panel of reviewer of peer-reviewed Journals. She is a registered Pharmacist, India and life member of IPA, APTI, IPGA and ISTE.

Novel dosage forms to Improve Transplant Care

The accomplishment of solid organ transplantation lies in the suitable use of immunosuppressive medications. Tacrolimus, a lipophilic 23-member macrolide lactone is an important immunosuppressant widely used in transplant patients, but with a narrow therapeutic window. Many formulation approaches have been investigated for resolving the problems of tacrolimus.

The purpose of the current research is to reduce dosing frequency and improve patient compliance by designing and systematically evaluating sustained release microbeads of Tacrolimus. The present research high-lights the formulation and evaluation of Tacrolimus loaded microbeads prepared by ionotropic gelation and crosslinking technique by using polymers such as chitosan and xanthan gum while sodium alginate being the common polymer with a cross linking agent being calcium chloride. Formulated microbeads were evaluated for particle size, percent yield, drug entrapment efficacy, in-vitro release, release kinetic and stability study. In this present research influence of method on rate of drug release and concentration of polymer coat on rate of drug release from the Tacrolimus microbeads was studied. The drug and polymer compatibility was studied by FTIR studies. No significant drug-polymer interaction were observed in FTIR studies. The release studies were obtained up to 24 hrs. from various batches. The in-vitro release data were fit to different equations and kinetic models to explain release profiles. The kinetic models used were zero order, Higuchi's and Peppa's. The correlation coefficient value (r) indicates the kinetic of drug release was zero order and the mechanism of drug release was found to be super case II transport. The microbeads were evaluated for surface morphology and shape by scanning electron microscopy (SEM).

Henrique Faneca

Centre for Neuroscience and Cell Biology, University of Coimbra, Portugal

Biography

Henrique Faneca obtained his master degree in Cell Biology in 2001 and a Ph.D. degree in Biochemistry in 2005 at University of Coimbra. He is Principal Investigator, under the FCT Investigator Program, at Center for Neuroscience and Cell Biology (CNC), University of Coimbra, since November 2016, leading the research group: Nanosystems and targeted antitumor strategies. The activity of his research group is essentially focused on the development and characterization of nanosystems that allow an efficient and specific delivery of therapeutic agents into target cells, and in the generation of new multitarget antitumor strategies, such as those involving the combination of gene therapy and chemotherapy.

Lipid- and Polymer-based nanosystems for gene delivery

Cancer is one of the major causes of death, since conventional available treatments, in most of the cases, do not allow a cure of the disease. The lack of effective and well-tolerated cancer treatments highlights the urgent need for the development of new therapeutic approaches, such as those involving the combination of gene therapy and chemotherapy. However, there are several obstacles that limit its clinical application, namely the barriers that genetic material has to surpass to reach the final target. In this regard, one of our main goals is to develop nanosystems to efficiently mediate antitumor strategies.

We have developed several cationic liposomes- and cationic polymers-based formulations. Regarding the cationic liposomes-based nanosystems, our results showed that the association of ligands such as asialofetuin to cationic liposomes, promotes a substantial increase in their transfection activity both in vitro and in vivo. The biological activity obtained with these lipoplexes was much higher than that observed with highly efficient commercial formulations and is due to their specific interaction with the asialoglycoprotein receptor. Regarding the cationic polymers-based nanosystems, our data demonstrated that the best mixtures between PDMAEMA and PβAE homopolymers presented a much higher transfection activity, in the presence of serum, than that obtained with bPEI-based or block copolymer-based polyplexes. Regarding the physicochemical properties, the developed nanosystems presented high protection of genetic material and reduced sizes, which are suitable features for in vivo applications.

Our data show that the developed nanosystems present a noticeable ability to efficiently deliver genetic material into target cells, even in the presence of serum, consequently constituting new platforms to mediate gene therapy-based antitumor strategies.

Khushboo Jani
St John's University, USA

Biography

Khushboo worked on targeting brain tumor by formulating and characterizing magnetic nanoparticles loaded with the chemotherapeutic agent. She also performed Pharmacokinetic analysis and biodistribution studies to ensure the brain targeting efficacy of the formulation. Prior to her PhD, she worked in DMPK department at Glenmark Pharmaceuticals, where she developed a model for In vitro and *in vivo* screening of acetaminophen induced hepatotoxicity and modulation by co-administered drugs. She is recipient of 'Best Abstract' award, AAPS PharmSci 360 2020. Her team was awarded the 'Best Student Chapter' in AAPS PharmSci 360, Nov 2019). She has led and hosted regional conference GRASP in 2018 at St John's University.

Formulation of Temozolomide Loaded Magnetic Nanoparticles: In Vitro and In Vivo Evaluation for Glioblastoma Multiforme

Glioblastoma multiforme (GBM) is the most common and malignant form of astrocytoma. Although, temozolomide (TMZ) is considered as a standard chemotherapy agent, at least 50% of treated patients do not respond to TMZ due to multidrug resistant phenotype exhibited by GBM cells. This can be overcome by using nano particulate delivery in presence of external physical field to enhance permeation. Thus, a polymeric nanocarrier system encapsulated with TMZ, targeted by the magnetic field, offers a potential alternative to the GBM treatment. The purpose of this study was to synthesize OAMNP as the magnetic core. And then, load in poly(lactic-co-glycolic acid) (PLGA) and poly(lactic acid)-methoxy poly(ethylene oxide) (PLA–PEG) nanoparticles (NPS) by single emulsion solvent evaporation technique. The synthesized OAMNP core was characterized for magnetic activity and particle size (i.e., 9 ± 0.3 nm). Transmission electron microscopy analysis exhibited a spherical morphology of the particle. The in vitro characterization for OAMNP TMZ NPS included morphology, particle size, zeta potential, encapsulation efficiency and physical stability. Further, for OAMNP TMZ NPS, drug loading was optimized such that the particle size (i.e., 206.7 ± 1.5 nm) and an encapsulation efficiency of 43% was obtained. The polydispersity index of 0.188 ± 0.002 represented monodispersed system with particles being positively charged (+1.04 ± 0.05 mV). Cytotoxicity assay revealed the IC50 values for TMZ loaded nanoparticles were significantly lower ($p<0.05$) as compared to the TMZ solution. Transport studies revealed a 10-fold reduction in P-gp mediated efflux of TMZ (based on efflux ratio) observed for OAMNP TMZ NPS in comparison to TMZ in solution. In *in vivo* study, at the magnetic field strength of 1.6 T, the TMZ exposure in rats increased by 4.6-fold when compared with lower magnetic field exposure and 3.6-fold increase in TMZ distribution was found when compared to the group not exposed to magnetic field.

SCHOLARS CONFERENCES

SCHOLARS WEBINAR ON:

DRUG DELIVERY AND NANOMEDICINE

MARCH 24-25, 2021 | WEBINAR

KEYNOTE SPEAKERS
Day 2

DRUG DELIVERY

Ozan Emre EYUPOGLU
Istanbul Medipol University, Turkey

Biography

Dr. Ozan Emre Eyupoglu is an Assistant Professor in School of Pharmacy at Istanbul Medipol University, İstanbul, Turkey He received his PhD Degree from Graduate School of Natural & Applied Sciences, Chemistry (Biochemistry), Karadeniz Technical University, Turkey in 2017. His area of interest includes Health Sciences, Medicine, Basic Medical Sciences, Biochemistry, Biophysics, Biomolecules, Proteomics and Biological Spectroscopy. He has published number of researches and conference articles about the chromatographic analysis and antioxidant activities of medicinal plants in reputed journals. He is closely related to topics such as artificial intelligence, machine learning, and innovative techniques, and plans studies for processing biochemical data for disease diagnosis. He is an interdisciplinary scientist who specializes in developing on-line chromatographic methods. He supervised 2 Master degree candidates who are making thesis on the coagulation system and aromatherapy recently.

The Prevention Of Viral Particles In Nano-Liposomic Aerosol Form By Herbal Molecules

Aerosol particle films are dispersed in the Z space direction according to the orbital coordinates with a collision energy of 0.3 eV per atom on the alumina substrate surface through the nebulizer nozzle (<4 μm), taking into account the structure and physical properties, size distribution and morphology of the particles, as well as Langevin dynamics and Monte Carlo pore width. The volatile herbal molecules absorbed into the cartridge effective liposomal nanofiber filter technology were sent with aerosol particles on the respiratory fluids and gases in the magnetic field created against gravity formed with a copper cable wrapped in a combined silicon nanowire transistor coil, simulating the change of covid-19 virulence. Extracts containing herbal molecules in nebulized aerosol form in nano liposome were successful with 90% efficiency on virulence. Viral particle propagation was also pictured with

Peixuan Guo
The Ohio State University, USA

Biography

Dr. Peixuan Guo was the first to prove the concept of RNA nanotechnology, has held three Endowed Chair Professor positions at three prestigious universities including the College of Pharmacy at the University of Kentucky; and the College of Pharmacy at The Ohio State University (OSU), and was a Distinguished Faculty Scholar of Purdue. Currently he is Sylvan G. Frank Endowed Chair Professor in Pharmaceutics and Drug Delivery; the director of the Center of RNA Nanobiotech and Nanomedicine at OSU; the president of the International Society of RNA Nanotechnology and Nanomedicine (ISRNN). He is also the Chairman of the Board of Directors for ExonanoRNA LLC, and Foshan Weina Biomedicine Inc both focusing on the development of RNA therapeutics for cancers using the RNA Nanotechnology he invented and leads internationally. He received his Ph.D. in Microbiology and Genetics from University of Minnesota, then postdoctoral training at NIH under Bernard Moss, a member of the National Academy of Science. He was an Assistant Professor of molecular virology at Purdue in 1990, tenured in 1993, became full Professor in 1997 and was honored as a Purdue Distinguished Faculty Scholar in 1998. He was the Director of NIH Nanomedicine Development Center from 2006-2011 and the director of NCI Cancer Nanotechnology Platform Partnership Program on RNA Nanotechnology for Cancer Therapy from 2012-2017. As early as 1987 he envisioned that cells have many small RNA molecules with undiscovered novel functions, and named them "sRNA" (Guo et al. A small viral RNA is required for in vitro packaging of bacteriophage phi29 DNA. Science 1987; 236:690). He invented meteor to produce function mRNA capping enzyme (PNAS, 1991) that is used currently in the production of mRNA vaccine for COVID-19. He also constructed the first viral DNA packaging motor (PNAS 1986); was the first to report that viral DNA packaging is driven by ATPase, and identified the protein sequence for ATP binding (JBC 1986) that is the same sequence motif that 8 years later James Walker received his Novel Price in 1995; determined that one ATP is used to package two bp of dsDNA (JBC 1986); revealed pRNA hexamer (Mol Cell 1998) that has led to the emergence of the field of RNA Nanotech; pioneered RNA nanotechnology (Mol Cell 1998, featured in Cell; and 4 papers in Nature Nanotech 2010,2011,2018); developed a TIRF Photobleaching dual imaging System to count single-fluorophores (EMBOJ 2007); incorporated phi29 motor channel into membrane (Nature Nanotech 2009) for single pore sensing and RNA and peptide sequencing (licensed to Oxford Nanopore); discovered a third class of biomotor using revolution mechanism; developed approaches for ultra-potent drug development. He was honored for Pfizer Distinguished Faculty Award; Purdue Faculty Scholar Award; Lions Club Cancer Res Award; Distinguished Alumni of U of Minnesota; 100 Years Distinguished Chinese Alumni of U of Minnesota. He has been editor or on the editorial board of 7 nanotech journals including the Executive Deputy Editor of Molecular Therapy/Nucleic Acids and the co-founder of Nanomedicine BMN. He was reported numerous times by TV or media such as ABC, NBC, ACS; featured by NIH, NSF, MSNBC, NCI and ScienceNow as well as by NIH director Francis Collins' office. He has been the organizer or founding chair of 8 international conferences and GRC conferences on RNA Nanotechnology; and was previously a member of two prominent national nanotech initiatives by NSF, NIH, National Council of Nanotechnology and NIST, as well as the member of two NIH steering committees in nanotechnology. Committee member for the 2019-2020 Life-Time Achievement Award for the American Association for Cancer Research (AACR).

The rubbery and amoeba property of RNA Nanoparticles that lead to efficiency cancer targeting, little organ accumulation and fast renal excretion without detectable toxicity

Rubber is a fascinating material in both industry and daily life. The development of elastomeric material in nanotechnology is imperative due to its economic and technological potential. By their distinctive physicochemical properties, nucleic acids have been extensively explored in material science. The Phi29 DNA packaging motor contains a 3WJ with three angles of 97°, 125°, and 138°. The rubber-like property of RNA architectures was investigated using optical tweezers and in vivo imaging technologies. The 3WJ 97° interior angle was contracted or stretched to 60°, 90°, and 108° at will to build elegant RNA triangles, squares, pentagons, cubes, tetrahedrons, dendrimers, and

prisms. RNA nanoarchitecture was stretchable and shrinkable by optical tweezer with multiple extension and relaxation repeats like a rubber. Comparing to gold and iron nanoparticles of the same size, RNA nanoparticles display stronger cancer-targeting outcomes, with less accumulation in healthy organs. Generally, the upper limit of renal excretion is 5.5 nm; however, the 5, 10, and 20 nm RNA nanoparticles passed the renal filtration and resumed their original structure identified in urine. These findings solve two previous mysteries: (1) Why RNA nanoparticles have an unusually high tumor targeting efficiency since their rubber or amoeba-like deformation property enables them to squeeze out of the leaky vasculature to improve the EPR effect; and (2) why RNA nanoparticles remain non-toxic since they can be rapidly cleared from the body via renal excretion into the urine with little accumulation in the body. Considering its controllable shape and size plus its rubber-like property, RNA holds great promises for industrial and biomedical applications, especially in cancer therapeutics delivery.

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DRUG DELIVERY AND NANOMEDICINE

MARCH 24-25, 2021 | WEBINAR

SCIENTIFIC TRACKS & ABSTRACTS
Day 2

DRUG DELIVERY

Zsófia Németh
University of Szeged, Hungary

Biography

Dr. Zsófia Németh graduated as a pharmacist and an English-Hungarian medical translator and interpreter at the University of Szeged in 2018 and is currently a third-year Ph.D. student in the Doctoral School of Pharmaceutical Sciences under Ildikó Csóka's and Edina Pallagi's supervision at the University. Her interest in pharmaceutical-, and nanotechnology began in 2015 when she joined the nanomedicine research group of the Institute of Pharmaceutical Technology and Regulatory Affairs and has remained unbroken ever since. In her research work, she follows the Quality by Design quality management model principles and works on developing and investigating liposomal formulations. Her scientific research work is supported by the Gedeon Richter's Talentum Foundation. In addition to the scientific activities, social interactions are also crucial for Zsófia; thus, she assumes the president's duties in the János Kabay College for Advanced Studies of the Faculty since September 2019.

How can the application of the Quality by Design approach assist the design and development process of liposomes?

Although liposomes, nanoscale drug delivery systems, significantly contributed to medical technology progression, specified regulatory authorization processes are still missing in their case. The Quality by Design (QbD) approach maintains the quality of the products by following risk management-based strategies during the development and manufacturing phases, systematizes the required knowledge and rationalizes the experiments, thus improving the pharmaceutical formulation processes [1, 2].

This study applies the QbD method to systemize the essential factors of the liposome formulation process. It determines the Quality Target Product Profile (QTPP) of a liposome-based formulation; the Critical Quality Attributes (CQAs) of the vesicles; the potential Material Attributes (MAs); and the Process Parameters (PPs) of the thin film hydration manufacturing method that might influence the properties of the endproduct [3].

After the aimed QTPP is created, and the CQAs are defined, the critical factors (CMAs, CPPs) can be chosen from the list of MAs and PPs by performing a Risk Assessment (RA).

In this general case, the quality of phospholipids, the active substance content, the surface modifiers, the ratio between the phospholipids and the cholesterol, the phase transition temperature of the lipophilic phase, the quality of the hydration media and the cryoprotectant were identified as the most affecting CMAs; while the working temperature, the time of sonication and the number of filtrations as the basic CPPs. The effectiveness of the RA based experimental design can be proved by investigations (size, surface charge, thermodynamic behaviour and structural analyses).

The work shows the critical points of the thin-film hydration technique-based liposome formulation process. Thereby, it presents how the QbD methodology could help achieve the aimed quality of the pharmaceutical products.

Sujey Palma-Florez

Institute for Bioengineering of Catalonia (IBEC), Spain

Biography

Monica Mir received the Degree in Chemistry in 1998 and in 2006 her PhD in biotechnology. She realized different predoctoral stages in Greece and UK. From 2007, she held a postdoctoral position in Max Planck Institute, Germany. Since 2008, she joins the Institute for Bioengineering of Catalonia (IBEC), as Senior CIBER researcher, combined with her teaching as associate professor in the University of Barcelona. Along her carrier she was managing European, National and industrial research projects, supervising PhD students and collaborating in congresses as scientific committee. Her main interests are electrochemical biosensor, point-of-care technologies, implantable-sensors and organ-on-a-chip for biomedical applications.

Sujey Palma-Florez graduated as a pharmacist from the University of Chile in 2017. She worked in several projects related to nanomedicine focused on nanocarriers based on metallic nanoparticles and extracellular vesicles. She served as a research assistant at Advanced Center for Chronic Diseases (ACCDis) and at Institutional Program (PiDi), Chile. She carried out research on nanostructures for drug delivery, therapy and diagnosis for chronic diseases and also about microfluidic devices to study nanoparticle interactions. In 2019, she studied a Master's degree in Nanoscience at University of Barcelona (UB) and performed her master's thesis at the Institute for Bioengineering of Catalonia (IBEC), Spain, where she was developing a BBB-on-a-chip platform. In 2020, she worked in nanotechnology industry (AINTECH Chile) using the benefits of copper nanoparticles as a tool against COVID-19 infection. Currently, she is starting her PhD in biomedicine at the UB and her thesis is carried out at IBEC.

Fabrication of a microfluidic platform for the assessment of permeability across the blood-brain barrier of nanotherapeutic agents for Alzheimer's disease.

Alzheimer's disease (AD) is a chronic neurodegenerative disorder associated to the accumulation of toxic aggregates of amyloid β peptide (Aβ) in the brain that produce oxidative stress and neurotoxicity [1]. Therefore, new therapeutic agents have being developed for AD's treatment based on the disaggregation of Aβ cumulates [2]. However, most of them do not reach the action site due the strict permeability in the brain by the blood brain barrier (BBB).

Nanotechnology is a cutting-edge field that extends different possibilities for the diagnosis and treatment of AD. In this direction, a nanosystem for AD treatment was reported that consists in gold nanorods (GNRs) functionalized with polyethylene glycol (PEG), a β sheet breaker peptide (D1) and a peptide to shuttling through the BBB (Angiopep-2). The results revealed that the GNRs-PEG-Ang2/D1 nanosystem inhibited Aβ growth in vitro and decreased the toxicity of Aβ aggregates in an in vivo model [2]. However, it is required to evaluate the permeability of promising therapy agents quickly and easily. BBB-on-a-chip is an interesting platform due their versatile and lower cost design to mimic both in vivo physiological and pathological conditions for the study of drug permeability [3].

In this work, we synthetized and characterized GNR-PEG-Ang2/D1 by absorption spectrophotometry, dynamic light scattering, laser Doppler micro-electrophoresis and transmission electron microscopy. Then, BBB-on-a-chip device was fabricated consisting in a neural chamber with human astrocytes and pericytes and a lateral channel with human brain endothelial cells in order to mimic the BBB. We determined the cytotoxic effect of GNR-PEG-Ang2/D1 over the above mentioned cells. Finally, the permeability of the nanosystems was evaluated through the BBB-on-a-chip device by confocal microscopy. The results confirm that GNR-PEG-Ang2/D1 was successfully synthetized and functionalized with the peptide Angiopep-2 and D1. In addition, GNR-PEG-Ang2/D1 showed non-toxic effect for the tri-culture at the given range of concentration for 24 hours. BBB-in-a-chip results showed the development of tight junctions between the adjacent endothelial cells in the chip which are crucial for permeability assays. Lastly, GNRs permeability assay revealed differences between the chip control and the chip exposure to GNRs.

Akhilesh Rai
University of Coimbra, Portugal

Biography

Akhilesh Rai is a FCT assistant Investigator at Faculty of Medicine, University of Coimbra from 2017. Previously, he was an assistant Investigator at Center for Neuroscience and Cell Biology (CNC), University of Coimbra from 2013 to 2017. He has been involved in several European Union projects. He has more than 15 years of experience in the area of nanomaterials, antimicrobial nanoformulations and the application of nanoparticles in drug delivery applications. I am recognized expert in area of nanotechnology and biomaterials with more than 24 publications, 2 book chapters and 1 patent. Our work related to antimicrobial nanoparticles have been recognized and I have been conferred the prestigious Bluepharma-University of Coimbra Innovation award (2015) for the project Bug-killer. I was a co-founder of Spin-off Company "CureMat technologies", which had focused on development of peptide-NP based wound dressings.

Peptide decorated light-responsive nanoparticles for the brain targeting

Stimulation of adult neurogenesis by targeting the endogenous neural stem cells, located in hippocampus and subventricular zone (SVZ), has been proposed for brain repair in cases of neurodegenerative diseases [1]. One major drawback for the treatment of these diseases is the incapacity of drugs/carriers to cross efficiently the BBB [2]. Studies have demonstrated that nanoparticles (NPs), upon a intracerebroventricular administration, can deliver active molecules at the SVZ region, triggering the neurogenic process [3]. Nevertheless, this type of administration is very invasive and requires specific medical facilities, which lead to an increase interest in the identification of strategies to administer the NPs by intravenous route. So far, it is relatively unknown the required properties to facilitate NPs accumulation in the neurogenic niches.

Here, we have screened gold nanoparticle (AuNPs) formulations having variable morphology (spherical and rod shape), surface chemistry [different density of transferrin (Tf) peptide] and responsiveness to light for their capacity to cross the BBB and accumulate preferentially in the neurogenic niches. Results obtained in a human in vitro BBB model showed that AuNPs and gold nanorods (AuNRs) conjugated with Tf peptides between 169 and 230 crossed more efficiently than formulations with higher or lower peptide number per formulation, without affecting the barrier properties. The transcytosis of Tf conjugated AuNPs and AuNRs depend on avidity of Tf receptors with different densities of Tf peptide. We further show that AuNRs conjugated with Tf, administered intravenously in mice and activated by a near infrared light, had the highest accumulation in SVZ, due to a transient opening of the BBB probably induced by local heat. In summary, we show that controlling the properties of NPs formulations we can target more effectively the neurogenic niches, opening new possibilities for brain regeneration.

Geraldine Sandana Mala John

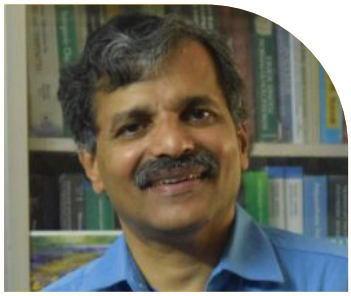
C/o TAKENEN, India

Biography

Dr. Geraldine Sandana Mala John holds a PhD in Biochemistry-Biotechnology (Inter-disciplinary) from the University of Madras in 2000 with a reputed National-level Doctoral Fellowship. She then pursued as Research Associate and then as a Senior Research Associate (Scientist Pool Scheme). She was also a Technology Consultant for about 3 years and was in collaboration with TAKENEN, Japan. She was awarded the prestigious 2013-2014 Fulbright-Nehru Senior Research Fellowship to work as Visiting Scientist at the Kreiger School of Arts and Sciences, Johns Hopkins University, Baltimore, MD, USA. Subsequently she worked as Project Scientist in the Department of Biotechnology, IIT Madras. Presently, she is a Research Coordinator for TAKENEN, in collaboration with IIT Madras and Sri Ramachandra Institute of Higher Education and Research. She has authored 3 books, 6 Chapters and has several peer-reviewed International publications. Her recent interests are in Nanomedicine, Cancer biology and Microbial Nanotechnology.

Polymeric Nanostructured Nordihydroguaiaretic acid analog-A promising Drug-carrier system

The 20th century has witnessed the early beginnings and rapid development of a new and emerging field of science known as Nanotechnology, which has revolutionized the technology advancement in various facets of scientific research in materials science, physical and chemical sciences, medical and pharmaceutical sciences and disease biology. Nanoscale materials are of the order of 1-100 nm and offer extremely advantageous optical, electronic and structural properties that are characteristic due to size-controlled features than their bulk materials. In Nanomedicine, the role of Nanoparticles has been widely applicable in diagnosis of disease biomarkers, improved medical imaging, targeted delivery and in regenerative medicine. Nordihydroguaiaretic acid (NDGA) is a plant lignan obtained from creosote bush (*Larrea tridentata*), known to possess anti-oxidant, anti-cancer and anti-viral activities and is being used in traditional medicine in most parts of North America and Mexico. However, toxicity studies indicated liver toxicity and renal failure despite its immense medicinal properties. There has been recent interests in the chemical synthesis of NDGA derivatives for therapeutic applications. NDGA derivatives have been developed as better alternatives to NDGA without rendering toxicity effects. In this regard, an analog of NDGA, Acetyl NDGA (AcNDGA), has been synthesized by a facile acetylation process based on a previous procedure by Plaza et al (2008) and formulated as a nanostructured complex with Polycaprolactone/ Polyethylene glycol polymer matrices, by o/w emulsification-solvent evaporation method. The drug-incorporated polymeric nanospheres were evaluated for drug load, encapsulation efficiency and in vitro drug release profile. Further, the drug-loaded nanospheres have been characterized extensively by spectroscopic, microscopic and physico-chemical techniques to evaluate their suitability for therapeutic delivery. The present studies indicate a new and efficient formulation of the nanostructured AcNDGA with good therapeutic potential in liver cancer by cytotoxicity assay in HepG2 cells.



Sabu Thomas

Mahatma Gandhi University, India

Biography

Prof. Dr. SABU THOMAS is currently, the Director, School of Chemical Sciences and Hon. Director, and also the Hon. Director of Centre for Nanoscience and Nanotechnology at Mahatma Gandhi University, Priyadarshini Hills P. O. Kottayam, Kerala, India. He did his Ph.D from Indian institute of Technology (IIT), Kharagpur. Prof. Thomas has a h Index of 106 and has published 1090 international papers with 55000 total citations. He has 15 patents and 150 books to his credit. In 2008, Prof Thomas was cited in the list of most productive researchers in India.(5th Position).In 2018 he received the faculty Research award by Careers 360 for the most cited researcher in India in Material Science. He is a visiting professor in several foreign Universities including France, Germany, Belgium, Slovenia, Poland etc. In 2017 Prof. Thomas was awarded the Full bright fellowship

Our research group consists of PhD students, Post-doctoral associates, Visiting students and Project students. Almost 80 Ph D students have graduated from the group and are located in various parts of the world. Prof. Sabu Thomas has many research collaborations all around the world.

Polymer Nanocomposite Scaffolds for Tissue Engineering

Biodegradable polymer scaffolds are useful materials to integrate the femoral part of the implant with the bone, and provide a matrix for cellular growth. Synthetic biodegradable polymers can provide temporary scaffold for cell adhesion and expansion both in vitro and in vivo and guide tissue regeneration with defined sizes and shapes. The fibrillar structure is important for cell attachment, proliferation and differentiated function in tissue engineering. The structure allows for growth and is convenient for transport of nutrients. The synthetic polymers such as Polycaprolactone (PCL), Poly l-lactic acid (PLLA), and their copolymers have attracted wide attention for their biodegradation in the human body and are used for tissue engineering. Several methods have been practiced to create highly porous scaffold including fiber bonding, solvent casting/ salt leaching, gas foaming, phase separation and electrospinning. Out of which electrospinning is the simple and cost-effective technique for producing nanofibers from polymer solution. Introduction of organically modified clay in polymers leads to different types of structures which include intercalated or exfoliated morphology. The nano reinforcement increases the mechanical rigidity, mobility, stiffness and biodegradability in biodegradable polymers. Moreover, it also increases the porosity of the polymer nanocomposite. Nanoparticle reinforced scaffolds are yet to achieve importance. In fact they have wide range of interest in tissue engineering. Literature reports regarding nanoparticle reinforced scaffolds are very scant. Hence the present investigation will be interesting and will find application in tissue engineering in the foreseeable future. In the present talk the state of the art on the synthesis, morphology, structure, properties and applications of dual porous nanocomposite scaffolds will be presented.

Neeraj Kaushal
St. John's University, USA

Biography

Neeraj Kaushal received his Ph.D. from St. John's University, USA. Dr. Kaushal's research at St. John's was focused on the development of surface-modified drug-loaded biodegradable nanocarriers for partially overcoming the multi-drug resistant cancers as well as studying their brain-targeting potential. Prior to this time, Dr. Kaushal spent several years within the US pharmaceutical industry as a formulation and analytical scientist. He extensively worked towards development of various drug products (i.e. topical, ophthalmic, suppositories and extended-release oral suspension). While serving the pharmaceutical industry in various roles, Dr. Kaushal successfully executed pilot and pivotal batches of the developed products for the US market. Additionally, Dr. Kaushal developed robust analytical methods and protocols for analysis of various drug substances and products. He received a MS in Chemistry from Long Island University and BS in pharmacy from Rajiv Gandhi University of Health Sciences (India).

Pharmacokinetics and bio-distribution studies for exploring the role of lymphatics in the oral absorption of double-coated doxorubicin loaded nanoparticles

The objective of this study is to evaluate the brain targeting potential of oral poly(butyl cyanoacrylate) nanoparticulate delivery systems (PBCA-NPDS), double-coated with Tween 80 and polyethylene glycol (PEG) 20000 for brain delivery of doxorubicin. Brain uptake mechanism of double-coated doxorubicin-loaded PBCA-NPDS was evaluated using bEnd.3 cell line as an in vitro model. The results obtained in this model suggest that main absorption mechanism of doxorubicin-loaded PBCA-NPDS could be clathrin-mediated endocytosis. When Transwell® permeable supports were used for the cells, significant transport of doxorubicin across the monolayer was observed by the double-coated formulation, in comparison to doxorubicin solution. Furthermore, pharmacokinetic studies, after intravenous and oral administration in Sprague Dawley rats, revealed the role of lymphatics in the absorption of double-coated doxorubicin-loaded PBCA-NPDS. Finally, brain distribution study revealed the significant amount of doxorubicin accumulated in the brain following oral administration of double-coated doxorubicin-loaded PBCA-NPDS, in comparison to doxorubicin solution. Hence, it could be concluded that double-coated PBCA-NPDS could be used successfully for brain targeting of doxorubicin administered orally.

Pavan Kumar Nukala
Bioduro San Diego, USA

Biography

Dr. Pavan Kumar Nukala is an experienced scientist in the development of solid oral dosage forms. Dr. Nukala, uses his expertise in various techniques like solid dispersion, hot melt extrusion, 3D printing for solving complex issues in formulation development. During his doctoral training at St. John's University, Dr. Nukala received lot of recognition for his research work on developing abuse deterrent formulations. He is one (among five) of the recipient of IPEC graduate student award in 2019, additionally he is also a recipient of NJPhast Graduate student scholarship for the year 2019. Currently he serves as a reviewer in five peer reviewed journals and working as a formulation development scientist at Bioduro San Diego USA.

Development of Multi-dose oral abuse deterrent formulation of loperamide using hot melt extrusion

Loperamide, an over the counter anti-diarrheal drug, also infamously referred to as "poor man's methadone". Due to the ease of availability and low price, people/patients abuse it by consuming more than 30 tablets to achieve euphoric effect and to combat opioid withdrawal. But supratherapeutic doses of loperamide result in severe respiratory depression, cardiac dysrhythmia and mortality. To address this issue, we developed a unique and innovative technology to deter multi-dose oral abuse. The concept is to design a tablet which can immediate release loperamide in diarrheic patients (single tablet) while stops loperamide release in case of intentional multi-dose ingestion. Loperamide was molecularly dispersed into gastric soluble cationic polymers – Eudragit® EPO and Kollicoat® Smartseal 100P using hot melt extrusion to obtain filament. Filaments were milled and compressed into tablets ((Eudragit® EPO (SJU1) and Kollicoat® Smartseal (SJU2)) with optimized amount of L-Arginine. Dissolution in 250 mL of Fasted state simulated gastric fluid (FaSSGF) revealed that single tablet of Imodium® (marketed formulation) and SJU1 showed >85% of release within 15 min. Most importantly, in multi-unit dissolution (15 tablets), Imodium® exhibited >90% release but SJU tablets showed <2% of drug release thus demonstrating its ability to deter multi-dose oral abuse.

Usha Sundralingam
Monash University Malaysia, Malaysia

Biography

Dr. Usha Sundralingam, a budding researcher in the field of Pharmaceutics, endeavors to apply her experiences in the field of liposomal drug delivery. Her research interest is on the development of nanocarriers for drug delivery, particularly revolving around topical and transdermal applications, and also natural products. Dr. Usha has a keen interest in the skin permeation and lipid formulations of bioactives/natural compounds using very specific skin models such as animal skin and synthetic membranes.

Local Transdermal Therapy for the Treatment of Breast Cancer

Oral tamoxifen used in the prevention and treatment of ductal carcinoma in situ (DCIS) (estrogen-positive) patients has limited acceptance, due to its adverse side effects. The efficacy of tamoxifen is related to its major metabolite, 4-hydroxytamoxifen. Local transdermal therapy of 4-hydroxytamoxifen to the breast might avert the toxicity of oral tamoxifen, while maintaining efficacy. We aim to study the skin irritancy, as well as to evaluate the efficacy of the developed transfersome formulations, with/without emu oil, using a syngeneic mouse model of breast cancer. We also quantified tamoxifen/4-hydroxytamoxifen concentrations in blood plasma and performed histopathology. The skin irritancy test showed that the pure emu oil and transfersome formulations with or without the emu oil did not cause skin irritancy in the animals studied. A sensitive and specific LC–MS/MS method for the quantification of tamoxifen and 4-hydroxytamoxifen was developed and validated. Studies on tumor volume and necrosis (histopathology) using the breast cancer mouse model showed that the 4-OHT transfersomal formulations, with and without emu oil, showed comparable efficacy with that of orally administered tamoxifen. However, the transfersomal formulations, with and without emu oil, resulted in significantly lower (10.24 ± 0.07 and 32.45 ± 0.48 ng/mL, respectively) plasma concentrations of 4-hydroxytamoxifen, compared to the oral tamoxifen (TAMX) group (634.42 ± 7.54 ng/mL). This study demonstrated the potential use of emu oil in a local transdermal formulation for the treatment of breast cancer and its reduced adverse effects.

Ayah Mohammad Burhan
Waterford Institute of Technology, Ireland

Biography

Ayah Mohammad Burhan is a current PhD student at the Pharmaceutical and Molecular Biotechnology Research Center at Waterford Institute of Technology in Ireland. Her PhD is a part of the EU-funded ORBITAL MSCA ITN project where she works within a collaborative intersectoral and broadly international consortium (academia, industry, clinicians, patient advocacy groups and hospitals) composed of members from Europe, Canada and the US to address delivery challenges to the posterior eye segment. In her oral presentation, she will address recent advances in drug delivery to the posterior eye segment diseases.

Recent advances in topical drug delivery to the posterior eye segment

Posterior segment eye disease including age macular degeneration, retinitis pigmentosa, and diabetic retinopathy are amongst the major causes of irreversible blindness that affect millions of people worldwide[1]. The inability of orally and systemically administered drugs to achieve therapeutic drug concentrations in the posterior eye segment, due to blood retinal barriers, makes intravitreal administration the primary route of posterior eye drug delivery. However, intravitreal injections are highly invasive surgical procedures and can cause serious complications including infection, cataracts, retinal detachment, and vitreous haemorrhage [2]. Furthermore, they exacerbate the side effects of anti VEGF drugs that are used for the management of posterior eye diseases, where they have been reported to cause life threatening cardiovascular & cerebrovascular side effects including myocardial infarctions, transient ischemic attacks, deep vein thrombosis, pulmonary embolism and thrombophlebitis.

Thus, there is a clear unmet medical need for efficient, safe, non-invasive, and patient friendly alternatives for the management of posterior segment eye diseases. Nowadays, several delivery approaches including nanoparticle based formulations and the use of penetration enhancers have demonstrated significant progress. An overview of the potential nanosystems and permeation enhancement strategies will be presented. Furthermore, the challenges of preclinical to clinical translation will be highlighted.

SCHOLARS CONFERENCES

SCHOLARS WEBINAR ON:

DRUG DELIVERY AND NANOMEDICINE

MARCH 24-25, 2021 | WEBINAR

e-Posters
Day 2

DRUG DELIVERY

Nikola Mannová
University of Pardubice, Czech Republic

Biography

Nikola Mannová is a Ph.D. student of a scientific group of Immunology and Molecular Biology under the supervision of prof. Zuzana Bílková on Department of Biological and Biochemical Sciences at University Pardubice in Czech Republic. The theme of her dissertation thesis is: The preparation and functionalization of new nanomaterial carriers for drug delivery systems. She obtained her Master Degree in Nanotechnology at University Palacky in Czech Republic. From her bachelor studies, her research's focus was on bionanotechnology and the applications of nanotechnology in medicine.

The preparation of hyaluronic acid nanoparticles as potential drug delivery carrier

Hyaluronic acid (HA) is a naturally occurring long linear polysaccharide known for its biocompatibility, biodegradability and non-immunogenicity. It has an important ability to interact with a specific receptor (CD44) on the surface of cancer cells. Thus, HA has great potential as a carrier for drug delivery systems. In this study, we focused on the preparation of hyaluronic acid nanoparticles (HA-NPs) by the method of cross-linking the linear HA molecule. Specifically, N-(3-Dimethylaminopropyl)-N'-ethylcarbodiimide hydrochloride (EDC) and adipic acid dihydrazide (ADH) were used as cross-linking agents in acetone medium. Prepared HA-NPs were analyzed by dynamic light scattering (DLS) to obtain the information about the size distribution. The method has been optimized to lead to nanoparticles with narrow size distribution. Therefore, the following conditions were altered and studied – the incubation time and the number of steps in the final acetone addition, the amount of ADH and the speed of mixing during incubation as well as the type of motion.

The amount of ADH and acetone additions are the variables in altering the final size of nanoparticles. Two steps addition of acetone with incubation time 10 minutes led the nanoparticles of the size around 120 nm. Nanoparticles with the size around 100 nm were obtained with two steps of acetone addition and 20 minutes incubation. And for nanoparticles with size around 80 nm the three additions of acetone for 30 minutes each were the best.

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Model Drugs for Designing a Thermosensitive Liposome Formulation

Background: The delivery of cancer drugs such as topotecan and doxorubicin poses risks such as off-target tissue interactions and systemic toxicity. The use of thermosensitive liposomes provides a targeted manner to deliver such drugs with minimal risk, with drug release occurring upon administration of a stimuli, such as focused ultrasound at the target site. Topotecan and doxorubicin were tested for their suitability in the design of a thermosensitive liposome formulation.

Methods: The film hydration method was used to produce thermosensitive liposomes. The lipid film was hydrated with ammonium sulphate buffer (300mM pH 4.0) under sonication, with subsequent gas extrusion. The exterior of the liposomes was adjusted to pH 7.4 with buffer. Drugs were loaded into the liposomes by incubation at 38^{0}C. Differential scanning calorimetry, differential light scattering, and fluorescence measurements were carried out as characteristic tests.

Results: Thermosensitive liposomes with a TM of 46^{0}C and an approximate diameter of 100nm were produced. Variation in lipid composition did not alter characteristics. A larger amount of doxorubicin was loaded in the liposomes compared to topotecan. Doxorubicin's self-quenching properties prevented accurate release profile fluorescence readings.

Conclusion: Topotecan is a better suited drug for the design of thermosensitive liposomes compared to doxorubicin.

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