International Virtual Conference on Formulations in Food and Healthcare

CONFERENCE PROGRAMME

AND ABSTRACTS

ICFFH-2023

30 May - 1 June

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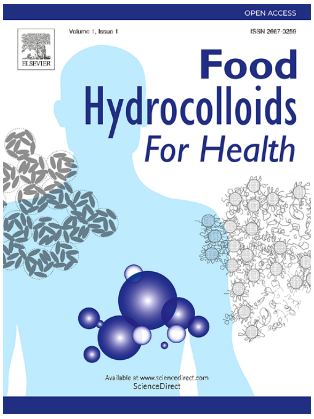

ABOUT THE CONFERENCE

Innovations in foods, healthcare and associated disciplines are being increasingly driven by novel microstructures which expand the scope of existing applications and offer novel applications. Such novel microstructures are underpinned by both new formulations and/or innovative processing methods. The novel formulations often tend to rely upon biologically sustainable materials, i.e. polysaccharides, proteins and plant-based lipids etc. Moreover, these materials form secondary non-covalent interactions, such as electrostatic, hydrophobic and H-bonds. Such supramolecular interactions enable the resultant microstructure to be tuneable by external parameters such as ionic strength, pH, polarity and temperature, which are relevant for many applications, especially in healthcare.

While partly dictated by the formulations, the method of fabrication also profoundly impacts the microstructure. New approaches in formulation, when combined with advanced processing, result into microstructures which offer advantages such as optimised drug delivery, enhanced nutrient absorption or appealing sensory perception.

Building on the success of International Conference on Formulations in Food and Healthcare 2021, ICFFH 2023 intended to bring together researchers working on formulations aimed at foods, healthcare and related applications, and to provide them with a platform where they can share their research and expand their professional network. The participants also have the opportunity to submit the proceedings in a special issue of an Elsevier Journal, Food Hydrocolloids for Health.

The conference organisers are immensely greatful to *Food Hydrocolloids for Health* for their very generous sponsorship to the conference which has allowed them to keep this event free for everyone.

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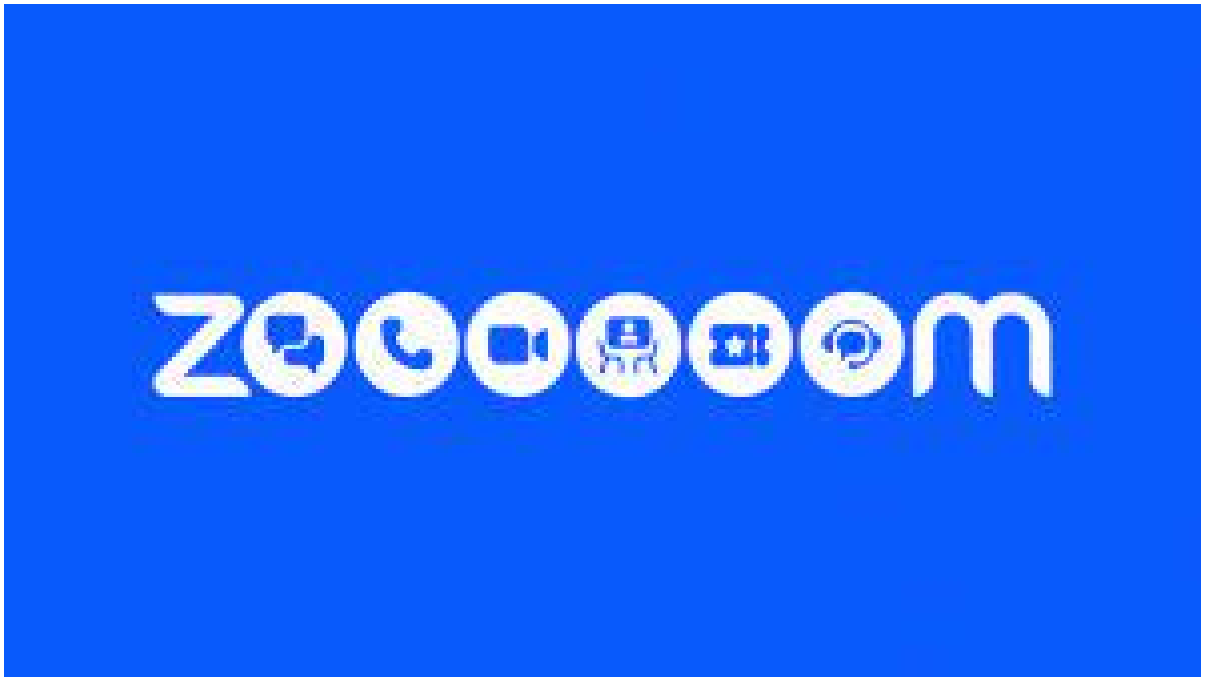

International Conference on Formulations in Food and Healthcare 2023

Oral Presentations

Tuesday 30 May

BST

08:00 Welcome

08:15 Introduction to University of Birmingham India Institute

Session 1 - Gels

08:30 Intermolecular interactions regulate in vitro digestion of whey protein emulsion gels: towards controlled lipid release

09:00 Development of an anthocyanin-hydrocolloid hydrogel for smart wound dressing applications

09:20 Assessment of the 3D printability of salt-induced -carrageenan hydrogels

09:40 Improving the survival of probiotics via in situ re-culture in calcium alginate gel beads

10:00 Feruloylated arabinoxylans and arabinoxylan gels: chemistry, nutritional functions and biomedical applications

10:20 Break

Session 2 - Formulations in Life Sciences

10:45	Dynamic Artificial Cells by Swarm Nanorobotics and Synthetic Life Chemistry
11:05	In silico Studies of Angiotensin II Receptor Blocker (ARBs) as Therapeutic Moiety in Tissue Regeneration by Modulating Pro-inflammatory Stimuli
11:25	Influence of self-assembly on the reactive sulfhydryl and antioxidant activity of aggregation-proneovalbumin-derived peptides
11:45	Break
12:00	Posters and Interactions
13:00	End of Day 1

Wednesday 31 May

Session-3 Probiotics

BST

08:15 Next Generation Prebiotics: Selective targeted delivery of protein to gut probiotics

08:45 Construction of high efficiency carrier systems for protecting probiotics in spray drying and gastrointestinal tract

09:05 Effect of Electric Fields on Probiotic Cells: Modulation of the Encapsulation, Drying, and Viability

09:25 Break

Session 4 - Delivery of Active Compounds

09:45 Structural factors determining the stability and bioavailability of liposomal forms of biologically active substances encapsulated with food biopolymers

10:15 Physicochemical characterisation of liposomes using light scattering techniques

10:45 Ionic liquids and deep eutectic solvents for drug delivery applications

11:15 An overview of protein-based edible film and coating as a carrier of active compounds

11:35 Herbal silver nanocomposite based burn wound dressing

11:55 Break

12:10 Posters and Interactions

13:10 End of Day 2

Thursday 1 June

Session 5 - Food Formulations

BST

08:30 Oil bodies from plant seeds: Extraction, characterization, and potential application

08:50 Preparation of pH-responsive intelligent release fresh-keeping agent for fruit and vegetable preservation

09:10 The design and fabrication of high-performance co-encapsulated microcapsules and their application in food products

09:30 Break

Session 6 - Nanoparticles

09:45 Andrographolide nanoparticles protect against lipopolysaccharide-induced neuroimmune toxicity

10:05 Structural Reconstruction of Nanoparticles During Digestion Enhances Their Mucosal Permeability and Absorption Efficiency in Small Intestine

10:20 Evaluating wound healing potential of sesamol loaded solid lipid nanoparticles: In- vitro, ex-vivo, and in-vivo investigation

10:40 Designing Zein and Trimethyl Chitosan-based Core-shell Nanoparticles for Quercetin Oral Delivery to Enhance Absorption by Paracellular Pathway in Obesity Mice

11:00 Formulation development and characterization of Quercetin loaded nano lipoidal system for the management of psoriasis in IMQ induced Plaque type psoriatic model

11:20 Glutaraldehyde/ Sodium tripolyphosphate Crosslinked Polysaccharide Nanoparticles for Colonic Delivery of Inositol hexaphosphate

11:40 Break
12:00 Posters and Interactions
13:00 End of Day 3 and the Conference

Poster Presentations
Tuesday 30 May 12:00-13:00 BST

Evaluation of anti arthritic activity of bombax ceiba plant	Chittra Gangwar* M.J.P. Rohilkhand University, India
Phytochemical, Pharmacognostic Properties and Antimicrobial Activity of the Ethanolic Crude Extract and Fractions of the Leaves of Picralima nitida Against Multidrug Resistant Bacteria	Stella Omokhefe Bruce* Queen's University Belfast, United Kingdom
Braiding Traditional Medicine and Scientific Validation	Alino Sumi* Indian Institute of Technology, Gandhinagar, India
Utilization of high-value natural colorant extracted from Butea monosperma (Lam.) flower biowaste-Physiochemical stability and in-vitro toxicity assessment	Shivraj Nile* National Agri-food Biotechnology Institute, India
Marine Drugs as Cosmeceuticals for various Dermatological Disorders	Abhishek Singh* Amity Institute Of Pharmacy, India
Fabrication of robust protein-based foams with multifunctionality by manipulating intermolecular interactions	Xu Xiyu* China Agricultural University, China

Tuesday 30 May 12:00-13:00 BST

Improving the survival of probiotics via in situ re-culture in calcium alginate gel beads	Yongkai Yuan* Jiangnan University, China
Reprogramming M1 to M2 Phenotype to Alleviate Inflammation: A Novel Approach Using Liposomal Formulations to Control Macrophage Functionality	Ashutosh Kumar* Ahmedabad University, India
Impact of macronutrient composition in nutrition shakes on postprandial glycemic response, appetite, and food intake in healthy young adults	Keying Yang* China Agricultural University, China
A Review On Microspheres: As Carrieres Used For Novel Drug Delivery System	Sanjay Krishna* M.J.P. Rohilkhand University, Bareilly, India
Formulation of aerolysin-specific immunoglobulin by immune magnetic binding for accurate PCR detection of diarrheagenic Aeromonas	Kannan Subbaram* The Maldives National University, Maldives

Poster Presentations
Wednesday 31 May 12:10-13:10 BST

Simultaneous co-delivery of Donepezil and Memantine via mannosylated PLGA for nanoparticles Intranasal delivery: Characterization, Pharmacokinetics and Pharmacodynamics studies

Mayank Handa*
National Institute of Pharmaceutical Education and Research, India

Design and evaluation of naproxen-loaded nanoformulations based on trifoliate starch and its carboxymethylated starch nanoparticles

Omobolanle Omoteso*
University Of The Western Cape, South Africa

Biotin-zein conjugated nanoparticles encumbered with Decitabine: Fabrication, Central composite design optimisation, characterisation and cytotoxic activity against C6 glioma cell line

Akshada Mhaske*
National Institute of Pharmaceutical Education and Research, India

Formulation and characterization of vanillic acid-loaded copper nanoparticles by chemical reduction method

Mohini Yadav*
Babu Banarasi Das Northern India Institute Of Technology, India

Formulation and Evaluation of TLDDS Lip patch

Vinit Gaikwad*
National Institute of Pharmaceutical Education and Research, India

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Poster Presentations

Wednesday 31 May 12:10-13:10 BST

Transdermal lip patches	Vishakha Gangwal* SSDJ College Of Pharmacy, India
A research on selection of natural polymer (flaxseed mucilage) for the development of benzydamine HCl buccal film using solvent casting method for aphthous ulcer	Akash Sharma* SRMS CET,India India
Development of Sublingual Tablets of Verapamil Hydrochloride with Enhanced Permeation through Mucosa	Rajasekhar Reddy Poonuru* St. Peter's Institute Of Pharmaceutical Sciences, India
Design and Evaluation of Diclofenac Potassium Pulsatile Drug Delivery System for the Treatment of Osteoarthritis	Neelam Datt* Babu Banarasi Das Northern India Institute of Technology, India

Poster Presentations

Thursday 1 June 12:00-13:00 BST

Comparative assessment of the physicochemical attributes of Moringa oleifera seed oil obtained by microwave-assisted and soxhlet extraction techniques	Chukwuebuka Umeyor* Institute Of Chemical Technology, India
Effect of gum extracts on the textural and bread-making properties of a composite flour based on sour cassava starch, Peanut and cowpea flour	Marie Madeleine Ndjang Nanga* University Of Dschang, Cameroon
Preparation of cookies with the addition of chañar brea gum flour	Maria Fernanda Torres* Universidad Nacional De San Luis Infap - Conicet, Argentina
Fish Feed Formulation By Using Spirulina And Vegetables Waste	Vikranti Patel* Veer Narmad South Gujarat University, India
Production, characterization and antioxidant property of exopolysaccharide from probiotic lactic acid bacteria strain: its application in the formulation of probiotic coconut yoghurt.	Bukola Adebayo-Tayo* University Of Ibadan, Nigeria

Poster Presentations

Thursday 1 June 12:00-13:00 BST

Arabinoxylans potential in modulating dough structure and enabling fiber-enriched bread	Saqib Arif* Pakistan Agricultural Research Council, Pakistan
Integrating Edible Flowers in Formulations of Health promoting infusions	Archna Karel* IIS University, India
Genetically Modified Foods: A Boon or Bane for Human Health	Adeeba Farheen* KMCL University, India
Techno-functional properties and applications of whey proteins in formulations	Samipta Singh* Babasaheb Bhimrao Ambedkar University, India

Abstracts for Oral Presentations

Intermolecular interactions regulate in–vitro digestion of whey protein emulsion gels: towards controlled lipid release

Qing Guo, Xiyu Xu*

College of Food Science and Nutritional Engineering, China Agricultural University, Beijing 100083, China

Precise control of lipid digestion in the gastrointestinal tract (GIT) is difficult. In this study, differently structured heat-set whey protein emulsion gels were fabricated by manipulating intermolecular interactions between protein molecules, i.e., disulfide bonds or noncovalent interactions were blocked, or none of them were blocked. The aim was to decipher the intermolecular force–gel structure–lipid digestion relationship, with a focus on determining mechanical/structural properties of the gels and their breakdown behavior in a simulated GIT. We found that noncovalent interactions dominated the mechanical properties of the "control" and "noncovalent" gels whereas blocking noncovalent interactions promoted the formation of intermolecular disulfide bonds and imparted high fracture resistance to the "disulfide" gel. Although the disulfide-crosslinked protein network precipitated at the surface of the oil droplets, the "disulfide" gel had the fastest lipolysis rate, indicating that it could not inhibit the access of lipases to the oil-water interface with most intact proteins hydrolyzed after 60 min of gastric digestion. In contrast, the noncovalent gel network was more susceptible to in vitro digestion, resulting in a significantly faster lipolysis rate for the "noncovalent" gel than for the "control" gel. This demonstrates that intermolecular disulfide bonds and noncovalent interactions played a synergistic effect on the digestion of the gels. The current study provides a potential strategy for the development of protein-based hydrogels with controlled lipid release.

Development of an anthocyanin-hydrocolloid hydrogel for smart wound dressing applications

Mr Glen Redpath, Ms Chandana Lakshminarasimhaiah, Ms Tara Adams, Mr Thomas Holt, Professor Eddie Pelan

University Of Birmingham, Birmingham, United Kingdom

Anthocyanins are a class of water-soluble pigment which exhibit pH-dependant colouring, making them ideal for applications where a pH change occurs such as in the treatment of chronic wounds. Such wounds undergo an increase in pH from 6 to around 8 [1], due to bacterial infection in wound exudate. This work focuses on the development of proof-of-concept, anthocyanin-dosed, hydrocolloid-based hydrogels to determine their efficacy as a passive indicator of alkaline conditions, and thus potential use in a 'smart' wound dressing.

Extraction of anthocyanin pigment from fruits (strawberries, blackberries) using acidified methanol and subsequent freeze drying was found to be effective, if variable in pigment yield. Anthocyanin was embedded into a range of food-grade hydrogels, including kappa-carrageenan, calcium (sodium form) alginate, agar and (low acyl) gellan gelatine.

All hydrogels, except calcium alginate, exhibited a clear and obvious colour change under an induced change in pH, making calcium alginate potentially unsuitable for this application - possibly due to interference effects of the acidic calcium chloride solution used to induce gelation.

It was found that, depending on the gel, the anthocyanin extract affected both the rheological and textural properties. Differential scanning calorimetry revealed that gel melting temperatures were affected by anthocyanin addition, and whilst statistically significant, were practically insignificant (¡ ±5oC) for typical gel processing.

The findings from this work indicate that anthocyanin and food-grade hydrogels are a promising area of research for smart wound applications.

Further purification and extraction work would be prudent to identify the effect of anthocyanin on gel strength independent of contamination from the extraction process. In addition, opportunities to expand this research to include 3D printed gel structures, which have been explored for similar hydrocolloids previously [2], controlled release and/or response-time tuning could be highly beneficial to the intended healthcare application of anthocyanin-dosed hydrogels.

References

[1] E. M. Jones, C. A. Cochrane, and S. L. Percival, "The Effect of pH on the Extracellular Matrix and Biofilms," Adv. Wound Care, vol. 4, no. 7, pp. 431–439, 2015, doi: 10.1089/wound.2014.0538.

[2] M. A. Kamlow, S. Vadodaria, A. Gholamipour-Shirazi, F. Spyropoulos, and T. Mills, "3D printing of edible hydrogels containing thiamine and their comparison to cast gels," Food Hydrocoll., vol. 116, no. December 2020, p. 106550, 2021, doi: 10.1016/j.foodhyd.2020.106550

Assessment of the 3D printability of salt-induced -carrageenan hydrogels

Panchami Patel[1], Kratika Mujmer[2], V.K. Aswal[3], Sharad Gupta[2], Prachi Thareja[4]

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[4]Department of Chemical engineering, Dr. Kiran C. Patel Centre for Sustainable Development, Indian Institute of Technology Gandhinagar, 382355, India.

In this work, we have explored the capability of -carrageenan hydrogels to form functional scaffolds using 3D printing. -carrageenan is a seaweed-derived polysaccharide used as a gelling agent in food and pharmaceutical products. The strength of -carrageenan can be enhanced with the addition of salt cations, polymers, and nanoparticles. The addition of potassium chloride (KCl), calcium chloride (CaCl2), and a mixed salt of KCl + CaCl2 to 0.25–2 percent w/v -carrageenan was systematically studied using rheology, SANS, and zeta potential measurements, and SEM and AFM imaging. From rheological measurements, we observe a synergistic increase in -carrageenan modulus by adding KCl + CaCl2. The printing limitation of -carrageenan due to its poor fidelity and mechanical strength is overcome by optimizing the formulation of these salt-induced -carrageenan hydrogels. It is observed that the KCl-induced -carrageenan hydrogels can be successfully utilized for the 3D printing of polygons, cylinders, and multilayer structures. The structural integrity of printed structures is maintained by keeping the extruder at 45 °C and the printing bed plate at 25 °C. Rheological measurements indicate the superior shear thinning, strain and temperature recovery of the KCl-induced -carrageenan gels over the CaCl2-induced gels, which also explains their superior 3D printing capability. Live/dead assay imaging of A549 cells seeded on the printed structures indicate the good biocompatibility of the gels which can be studied further for tissue engineering, food additive, and drug delivery applications.

Improving the survival of probiotics via in situ re-culture in calcium alginate gel beads

Yongkai Yuan[1,2,3,4], Ming Yin[1,2,3,4], Fei Liu[1,2,3,4], Maoshen Chen[1,2,3,4], and Fang Zhong[1,2,3,4]

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Cell-mediated chemistry is an emerging strategy that leverages the metabolic process of living cells to build advanced materials. Here, a simple yet versatile microbe-mediated in situ re-culture approach using calcium alginate gel beads to improve the survival of probiotics was reported. After re-culture, Lactobacillus rhamnosus GG (LGG) in both liquid and solid core gel beads (LCGB and SCGB) exhibited 100 percent gastric acid resistance, while the bile salt resistance varied from 59.38 to 92.39 percent. LGG in LCGB generally showed higher bile salt resistance than SCGB, and the resistance would be further improved with high initial bacterial concentration due to more extracellular polymer secretion. Besides, the re-cultured LGG in beads exhibited survival of 95.02-96.05 percent in calcium-supplemented MRS broth within 6 weeks at 4 °C. And the survival of the re-cultured LGG in LCGB was more than 90 percent in yogurt, milk, milk tea, and juice respectively within 6 weeks at 4 °C, followed by semi-solid jelly (85.81 percent). The addition of inulin had no adverse effect on the above storage survival of re-cultured LGG in LCGB, indicating the possibility of the construction of synbiotic. Combined transcriptome and metabolome analysis of LCGB implied that the mechanism of LGG damage by gastric acid included 8 pathways, among which, 2 pathways including propanoate metabolism, phenylalanine, tyrosine and tryptophan biosynthesis were responsible for the improved gastric acid resistance of re-cultured LGG. The unique re-culture strategy provides a powerful platform for microbial agents to smoothly enter the gut to serve host health.

Feruloylated arabinoxylans and arabinoxylan gels: chemistry, nutritional functions and potential biomedical applications

Xin Jia, Minghao Zhang, Wenjia Yan, Lijun Yin

College of Food Science Nutritional Engineering, Beijing Key Laboratory of Functional Food from Plant Resources, China Agricultural University, Beijing, 100083 China

Making full use of grain processing by-product resources has become the key to improving the comprehensive utilization value of grain. As a non-starch polysaccharide with high production and processing value, arabinoxylans (AXs) is mainly extracted from the bran of cereals such as wheat, corn and sorghum, and has a flexible molecular structure and rich side chain composition, which makes it possible for the controlled structural modulation and functional enhancement. Implementing enzyme-based cross-linking for fabrication of biomaterials displays various advantages, such as high cross-linking efficiency and less toxicity. The role of phenolic acids in laccase-mediated cross-linking particularly ferulic acid, which is a component of lignocellulose serving cell rigidity via cross-linkage. AX-based delivery systems with various structural characteristics was synthesized, and the structure-function relationship was demonstrated. The steady-state delivery of functional factors with different solubility profiles was successfully achieved to enhance the targeted delivery and efficient release of functional factors, which provided theoretical foundation for the development of highly bioavailable fortified foods. The development and application of AX and AX gels will further promote the industrialization of non-starch polysaccharide-based functional foods.

Dynamic Artificial Cells by Swarm Nanorobotics and Synthetic Life Chemistry

Xiaofei Wang

College of Food Science and Nutritional Engineering, China Agricultural University, Beijing 100083, China

Artificial cell mimicry is extremely valuable in basic and applied biotechnological research. However, the existing construction of artificial cell compartments is typically static, creating a distinction between them and the dynamic natural cells. Herein, we describe a programmable dynamic artificial cell model using swarm nanorobotics and cell-free synthetic transcription-translation solution chemistry. Under the physical control of two- or three-dimensional magnetic fields by varying the direction, strength, and frequency, diverse compartmentation configurations in clusters, chains, and sheets were produced with DNAs and magnetic particles of different morphologies. These diverse dynamic artificial cell architectures exhibit distinct transcription and translation activities. Using swarm robotics and synthetic life chemistry could provide a new paradigm to construct imaginative artificial cells and provide significant insights into the fundamental life processes and biological applications.

In silico Studies of Angiotensin II Receptor Blocker (ARBs) as Therapeutic Moiety in Tissue Regeneration by Modulating Pro-inflammatory Stimuli

Alka Shubhini A. Saraf

Babasaheb Bhimrao Ambedkar University, India

Tissue regeneration following surgery, injury, or tissue damage is determined by the cells that first repopulate the root surface. The primary aim of tissue regeneration is to re-establish the morphological and functional aspects of tissue, such as activation, differentiation, and proliferation of keratinocytes, endothelial cells, leukocytes, and fibroblasts, through the release of multiple cytokines. Interleukin (IL)-6 plays an essential role in the modulation of the inflammatory and reparative process. The binding of IL-6 to the IL-6 receptor (IL-6R) further regulates JAK associated, activation of signal transducer and activator of transcription 3 (STAT3) participating in the processes of proliferation of cell survival genes. IL-6 dysregulation change leads to the tension of the dermis during tissue regeneration, prolongs inflammation, as well as IL-6 induces Bcl2 expression forming hypertrophic scars. However, studies are required to explore novel molecular targets to improve tissue regeneration. Antibiotics are available but resistance remains major drawback. Agents targeting IL-6, or JAKs are available for treatment of inflammatory conditions. Novel inhibitors of the IL-6/STAT3 pathway, are currently in development therefore the objective of this study was to virtually screen novel IL-6/STAT3 inhibitors of angiotensin II receptor blocker (ARBs) using PyRx and Autodock Vina. Further drug likeliness and ADMET property was carried out by SwissADME and pkCSM online server. In conclusion, Telmisartan, Tasosartan (-8.3); Azilsartan, Candesartan (-8)) emerged as promising candidates with good drug likeliness and ADMET. Future in vitro and in vivo studies will be needed to confirm our findings.

Influence of self-assembly on the reactive sulfhydryl and antioxidant activity of aggregation-prone ovalbumin-derived peptides

Ms. Amanda Clairoux [1], *Dr. Chibuike C. Udenigwe* [1,2]

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[2] School of Nutrition Sciences, University of Ottawa, Ottawa, Canada

Ovalbumin-derived peptides IFYCPIAIM, NIFYCPIAIM and YCPIAIMSA, containing a common region YCPIAIM, were previously identified as aggregation-prone peptides with variable fibril formation. In this study, the self-assembly mechanisms of the peptides were elucidated by determining the influence of self-assembly on sulfhydryl group accessibility. The free sulfhydryl group content and antioxidant capacity results demonstrate that the peptides assemble into -sheets, possibly involving hydrogen bonding with the sulfhydryl groups. NIFYCPIAIM, IFYCPIAIM and YCPIAIMSA, in decreasing order, had the largest particle size, thioflavin T fluorescence, reactive sulfhydryl group content, and antioxidant activities. This demonstrates that the reactive sulfhydryl group content, which is influenced by the cysteine residue position relative to the N-terminal of the peptide, is dependent on fibrillation. Rheological studies further demonstrated the non-Newtonian shear-thinning behavior of the peptides. The results provide valuable insight on peptide self-assembly, which is imperative for future design of bioactive hydrogels with promising biomechanical properties for biomaterial applications.

"Next Generation Prebiotics: Selective targeted delivery of protein to gut probiotics"

Stav Peleda [a], Shay Freilich [b], Hila Hanani [b], Yechezkel Kashi [b], Yoav D. Livney[a]

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Consumption of prebiotics is important to promote gut-probiotics, for improving human health. Current prebiotics are predominantly carbohydrates. However, great competition exists among gut-microbes for the scarce protein in the colon, as most consumed protein is absorbed in the small-intestine. Still, no protein-containing-prebiotics are commercially-available. Here, we developed and evaluated in-vivo the next-generation prebiotics: protein-containing-prebiotics, for selectively-targeted delivery of protein to colonic-probiotics, to boost their growth. This system is based on micellar-particles, composed of Maillard-glycoconjugates of 2'-Fucosyllactose (2'-FL, human-milk-oligosaccahride) and lactoferrin hydrolysate (LFH). This core-shell structure lowers protein-core digestibility, while the prebiotic-glycans are hypothesized to serve as molecular-recognition ligands for targeting probiotics. Consumption of 2'-FL-LFH by mice significantly increased the levels of short-chain-fatty-acids (SCFAs)-producing probiotics and SCFAs gut-concentration, compared to the unconjugated-components or saline. 2'-FL-LFH can serve as novel protein-containing-prebiotics, beneficially modulating gut microbial composition and its metabolic activity, thereby may contribute to host health more effectively than the carbohydrate-only prebiotics.

"Construction of high efficiency carrier systems for protecting probiotics in spray drying and gastrointestinal tract"

Ming Yin[1,2,3,4], *Yongkai Yuan* [1,2,3,4], *Fei Liu* [1,2,3,4], *Maoshen Chen* [1,2,3,4], *Fang Zhong*[1,2,3,4]

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Probiotics are live microorganisms when consumed in adequate quantity could confer health benefits to the host. However, some environmental stresses including heat, pH, oxygen, and bile salts could significantly reduce the viability of probiotics, which limited its application in food industry. Hence, the protection of living probiotic cells became an important issue. In this context, the microcapsule delivery system was constructed by combining different types of wall materials and different pretreatment methods to improve the survival rate of probiotics in spray drying, and preserve them via the gastrointestinal tract and ultimately release in the colon. In this research, to improve the shelf life of bacteria powder as the starting point, using hydrophobic material as the wall material to reduce the moisture absorption of probiotics powder and this method significantly improved the shelf life. Meanwhile, high melting point oil addition and TGase crosslinking pretreatment were used to reduce the thermal stress and the contact area with hot air during spray drying, and the spray drying survival rate was improved from 20.63 to 65.32 percent, and the in vitro digestion retention rate was up to 87.59 percent. In conclusion, the current research has provided valuable information for the selection of wall materials and pretreatment methods for spray drying of probiotics, making the formulation of probiotic-based nutraceuticals more cost-effective, stable and effective.

Effect of Electric Fields on Probiotic Cells: Modulation of the Encapsulation, Drying, and Viability

Panagiota Dima, Peter Reimer Stubbe , Ana C. Mendes, Maoshen Chen,Ioannis S. Chronakis

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Probiotic cells are microorganisms that have health-promoting properties, which could be exerted providing that the cells are viable. Therefore, this work aims to show different approaches to enhance the viability of probiotic cells by the utilization of electric fields. Electric fields can be utilized not only to encapsulate probiotics by electrospray, but also to manipulate the organization of the encapsulated cells within electrosprayed microcapsules. Encapsulating the negatively surface-charged Bifidobacterium animalis subsp. lactis (BB12) by applying negative polarity at the needle, led to the organization of the cells in the core of maltodextrin microcapsules due to Coulombic forces. The organization of the cells affected the evaporation of the solvent (water), and subsequently the glass transition temperature (Tg) of the electrosprayed microcapsules, as well as the viability of probiotic cells[1]. Since drying and moisture content are crucial for the long-term storage stability of probiotics, the effect of the ionic wind on the electrohydrodynamic drying (EHD) of probiotics was explored. Several parameters, such as the polarity and voltage of the electric field, were found to affect the EHD drying process. The EHD drying was compared with the freeze-drying process, revealing that the survival of probiotics and the water evaporation rates were similar, thus confirming the potential of EHD drying as an alternative drying technology for probiotic cells[2]. Probiotic cells' long-term stability can also be induced through cell aggregation. Probiotic cell aggregation was stimulated by the application of DC electric fields and combined electric field with standing acoustic waves (SAW). The synergistic effect of DC electric field and SAW not only facilitated the high aggregation of the cells, but also considerably enhanced the hydrophobicity of BB12 cells, without compromising their viability or altering their surface charges. In summary, the utilization of electric fields significantly modulated the encapsulation, drying, and aggregation of the probiotic cells, subsequently enhancing their viability.

References

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Structural factors determining the stability and bioavailability of liposomal forms of biologically active substances encapsulated with food biopolymers

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It is now generally accepted that a deficiency in the human body of a number of biologically active substances, the so-called nutraceuticals, can lead to the development of various chronic non-communicable diseases (type 2 diabetes, cardiovascular diseases, oncology and neurodegenerative diseases). Enrichment of foods with essential nutraceuticals (antioxidants (essential oils, -carotene); vitamin D; phospholipids; essential PUFAs (n-3 and n-6)) is an effective strategy to counteract nutritional deficiencies. Co-encapsulation of various combinations of the above nutraceuticals was carried out using phospholipid liposomes with a unique structure. To obtain a more stable liposomal form of nutraceuticals, additional sequential encapsulation of liposomes with protein (WPI) was carried out, followed by coating of protein-lipid particles with oppositely charged chitosan. At the same time, the efficiency of encapsulation of liposomes by biopolymers exceeded 80 percent. The size and charge of both loaded liposomes and their complexes with biopolymers were characterized using laser light scattering in dynamic and electrophoretic modes, as well as by transmission electron microscopy. The EPR spectra characterized the effect of both nutraceuticals and biopolymers on liposome bilayers. In addition, laser light scattering in static modes characterized weight averaged molar mass, radius of gyration, architecture, density, and the osmotic second virial coefficient for the studied supramolecular complex particles of the biopolymers with liposomes. In turn, the functional properties of the supramolecular complex included water solubility, protective ability, mucoadhesiveness, and the ability to control the release of liposomes in the gastrointestinal tract. Structure-functionality relationships are revealed and will be discussed.

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Physicochemical characterisation of liposomes using light scattering techniques

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The study of liposomes has gained popularity in recent years as they are extensively used for drug delivery and serve as models for studying cell membranes and organelles. Their unique structure allows them to encapsulate aqueous moieties within their internal compartments. The size of liposomes influences characteristics such as encapsulation efficiency, circulation half-life, and drug loading capacity as well as their targeting capability. Equally important is their charge as it determines their stability and extend of interaction with biological systems. Both nanoparticle tracking analysis and dynamic light scattering are widely used non-invasive techniques to characterise the size and concentration of nanoparticles easily, quickly and accurately. Similarly, zeta potential is utilised in the study of the stability of formulations in terms of electrostatic interactions. In this talk, the characterisation of size, concentration and zeta potential of liposomes will be discussed to study different formulations and help deduce their stability

Ionic liquids and deep eutectic solvents for drug delivery applications

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The field of Ionic liquids (ILs) and deep eutectic solvents (DESs) is continuously expanding due to their exceptional unique properties and highly tunable nature, which finds applications in broad areas of modern science. Considering numerous possible IL and DES combinations prepared with active pharmaceutical ingredients (APIs), they find applications in pharmaceutical sciences. They can also serve as potential components of drug formulations and hence they have drawn the attention of formulation scientists. Herein, the concept of pharmaceutical ILs and DESs are discussed briefly. The possible applications of these solvent systems for slow drug delivery including nanoscale drug delivery are discussed citing various examples from the published literature. Although the ILs and DESs are found to be suitable for various drug delivery applications but still none of the slow drug delivery vehicles based on these solvents is in practical use. The data relating to long-term toxicity upon administration in the human body followed by various safety evaluations, clinical trials, etc. are pending for such new drug delivery systems. However, proof of concept studies done on the retention of biological activities in the ionic form is quite encouraging and such studies indicate the possibility of application of such new systems in the development of biomedical research and related industries in near future.

An overview of protein-based edible film and coating as a carrier of active compounds

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Edible film and coating are nutritious and beneficial for the host as those are consumed with food. The protein-based film and coating have been the focus of this review among the various edible film and coating types because of their advantages to health and potential application as a bioactive component carrier. Probiotics, prebiotics, and phenolic compounds may help to maintain intestinal health by enhancing immune response, lowering inflammation in gastrointestinal illnesses, and preventing colon cancer. These bioactive compounds require encapsulation to survive the environment, such as heat, temperature, pH etc. and deliver in the host body with proper functional properties. Current trends focused on incorporating phenolic compounds in films or encapsulating probiotics and prebiotics by different methods after that added in the food directly. Therefore, this review discussed the possible methods of encapsulating the active compounds in different types of protein film and enhanced the functionality and health benefits of these bioactive compounds. In conclusion, active compounds incorporated in protein-based edible films and coating should be considered a carrier for application in the food industry.

Herbal silver nanocomposite based burn wound dressing

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Superficial and partial-thickness burns are managed conservatively with wound dressings, whereas Full-thickness burns require early excision and skin grafting. The burn wound surfaces are prone to bacterial colonization especially Staphylococcus aureus present in the skin. Pseudomonas aeruginosa and Acinetobacter baumannii are also known to infect burn wound. The gold standard for burn wound is silver sulphadiazine. But recent studies have found that it retards wound healing. Hence there is an urgent need for broad spectrum anti-microbial agent. Silver nanoparticles synthesized by bio reduction of silver nitrate using an immunomodulatory herbal extract is an innovative approach. The phytosynthesized silver nanoparticles by virtue of their high specific surface adsorb various phytoconstituents like flavonoids, polyphenols and possess additional therapeutic properties. The phytosynthesized silver nanoparticles were compared with chemically synthesized silver nanoparticles for mean particle size, crystallinity, elemental composition and antimicrobial activity. The prepared silver nanoparticles were dispersed in suitable polymer matrix resulting in formation of silver nanocomposite. The nanocomposite can be formulated as gel, cream or ointment. The developed silver nanocomposite will be evaluated in suitable animal model for its burn wound healing efficacy. Although many silver dressings are available in the market but their long term use on chronic wound causes argyria (bluish grey discoloration) of the adjoining skin. One possible reason could be the dose of chemically synthesized silver nanoparticles incorporated in these products. The toxicity of proposed phytosynthesized silver nanoparticles can be controlled and minimized

Oil bodies from plant seeds: Extraction, characterization, and potential application

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Oil bodies (oleosomes) are oil-storage organelles in plant seeds, which are composed by a core of neutral lipids and a surrounding phospholipid monolayer embedded with various proteins. Aqueous extraction of oil bodies from various plant seeds, such as soybeans, flaxseeds, etc., were performed. Effects of different parameters on their extraction efficiency were determined, as well as that on their composition, physio-chemical properties and stabilities under different pH or ionic concentrations. Potential applications in foods, such as salad dressing, chocolates, and emulsified sausages, were explored, which indicated that oil bodies, as sustainable natural emulsion, possess great potential to substitute artificial emulsion or animal fat in various foods.

Preparation of pH-responsive intelligent release fresh-keeping agent for fruit and vegetable preservation

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Fruits and vegetables are good sources of nutrients, which are indispensable in people's daily diet, but their quality is easily damaged after picking. How to effectively improve the preservation of fruits and vegetables and reduce the loss has become a major problem to be solved. Essential oils have good antiseptic and fresh-keeping effect on fruits and vegetables, but their shortcomings such as poor stability and volatility have become the main bottleneck restricting the efficient application of essential oils. In view of this, this report based on the law that the pH value gradually decreases due to the acidic changes in the headspace microenvironment of fruits and vegetables after harvest. Cinnamaldehyde-chitosan schiff base compouds (CS-Cin) were designed by using acid sensitive imine bond through mild schiff base reaction, which could sense pH signal changes and achieve dynamic regulation of antibacterial essential oils. The stability of the material, pH responsive controlled release performance and antibacterial performance will be introduced. And after verifying the fresh-keeping effect on postharved fruits and vegetables, the pH responsive release performance was further optimized according to the practical application requirements.

The design and fabrication of high-performance co-encapsulated microcapsules and their application in food products

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The rational design and fabrication of edible co-encapsulated microcapsules are important to develop functional foods fortified with a plurality of bioactive agents, which may produce synergistic effects in increasing bioactivity and functionality to target specific health benefits. Spray-drying is a convenient and cost-effective approach for the conversion of liquid O/W emulsions to solid powders, facilitating the co-encapsulation of multiple bioactives with diverse properties and their application in food products. However, the chemical instability and low loading capacity of biopolymer-based microcapsules limited their application in food products. In our studies, the interfacial engineering strategy was used to fabricate spray-dried microcapsules through the combination of whey proteins and polysaccharides, showing low interface oil content (0.62 1.75 percent) and enhanced oxidative stability. These microcapsules exhibited high performance in the co-encapsulation and protection of polyphenols (e.g., curcumin, resveratrol) and bioactive lipids (e.g., fish oil, Vitamin E), which could be incorporated into yogurt for the development of nutritionally fortified products. The co-microencapsulation is beneficial for masking the inherent fishy taste of fish oil, enhancing the quality of yogurt, and effectively improving the oxidation stability of fish oil and the retention rates of eicosapentaenoic acid and docosahexaenoic acid. The co-encapsulated microcapsules exhibited no significant effect on the production of lactic acid bacteria and acidic substances in yogurt. In addition, the co-encapsulation of fish oil and polyphenols can further inhibit fish oil oxidation and improve the nutritional value of yogurt. These results expand the potential use of spray-dried microcapsules as co-encapsulation carriers and their application in food products.

Andrographolide nanoparticles protect against lipopolysaccharide-induced neuroimmune toxicity

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Andrographolide (AG) possesses good anti-inflammatory and anti-oxidant properties. Despite its great therapeutic interest, the low oral bioavailability of AG becomes a major challenge in developing formulations for clinical efficacy. In current study we evaluated andrographolide-loaded PLGA nanoparticles (AG@PLGA NPs) and their bulk counterpart against lipopolysaccharide (LPS) induced neuroinflammation in rats which enhances the endogenous anti-oxidants viz., catalase, GSH levels and protecting from oxidative stress and anti-inflammatory activity. Male Swiss Albino mice (25-30g) were randomized into six groups (n=5 for each group) as follows. Group I: Control; Group II: LPS only 0.25mg/kg i.p.; Group III: AG only 2.5 mg/kg i.p.; Group IV: LPS+AG (0.25+2.5 mg/kg i.p); Group V: LPS+ nano AG (0.25+2.5 mg/kg i.p), and Group VI: Void nanoparticles (2.5 mg/kg i.p). The alteration of the neuroinflammatory response in the brain and spleen was investigated by neurobehavioral test, oxidative stress parameters, caspase-3, and cytokine levels. LPS-exposed mice showed depression-like symptoms evaluated by a forced swim test, tail suspension test, and anxiety-like behavior by an elevated plus-maze. On the other hand, AG@PLGA NPs ameliorated LPS-induced inflammation where they depreciated the level of pro-inflammatory cytokines (TNF-, IL-6, IL-1) and enhanced antioxidant status as compared to their bulk counterpart. Our results conclude that AG@PLGA NPs can be a potential neuroprotective agent.

Structural Reconstruction of Nanoparticles During Digestion Enhances Their Mucosal Permeability and Absorption Efficiency in Small Intestine

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Enhancing the bioavailability of lipophilic bioactive compounds has long been a focal point in the fields of food nutrition and carrier delivery. While researchers commonly assess the carrier's transport efficiency through in vitro digestion processes, limited studies focus on the dual absorption barriers of mucus layer and intestinal epithelial cells. This study investigates the post-digestion carrier morphology, nutrient permeability through the mucus layer, and intestinal epithelial cell transport behavior using -carotene as a model molecule and various protein carriers. The findings reveal that although non-lipid-based protein nanoparticles exhibit lower bioaccessibility in in vitro digestion models compared to traditional lipid-based micelles, they demonstrate excellent transport efficiency in cell transport models and mouse plasma. The biocompatible protein nanoparticles interact with bile salts during gastrointestinal digestion, forming bile salt-hydrolyzed protein restructured particles. These restructured particles not only possess excellent properties of exogenous bile salt formulations, enhancing mucus layer permeability and facilitating transmembrane transport but also avoid toxicity issues associated with exogenous bile salt intake.

Evaluating wound healing potential of sesamol loaded solid lipid nanoparticles: In-vitro, ex-vivo, and in-vivo investigation

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Objectives: Sesamol, a lignan, obtained from sesame seeds (Sesamum indicum Linn., Pedaliaciae) has a promising antioxidant, and anti-inflammatory profile. In the present study it is encapsulated into solid lipid nanoparticles (SLNs) to impart local targeting (as free drug faces high flux). The benefit of encapsulation was investigated to comprehend the mechanistic pathways underlying the wound healing potential of sesamol SLNs.

Methods: Ex-vivo skin penetration study was performed to investigate the penetration of SLNs in various skin layers. In-vitro antibacterial and antibiofilm activity of free and encapsulated sesamol was evaluated in some common wound pathogens. In-vivo wound healing potential of free and encapsulated sesamol was evaluated in diabetic open excision wound model in wistar rats. Animals were evaluated for various biophysical, biochemical, and histological parameters.

Results: Encapsulated sesamol was found to have better skin retention and superior antimicrobial profile (200% more effective) vs free sesmaol. In vivo evaluation in diabetic open excision wound model showed promising results with significant (p¡0.05) improvement in percentage wound healing in Sesamol SLNs treatment group vs free sesamol.

Conclusions: The results suggested that encapsulation of sesamol in SLNs substantially enhanced its wound healing potential. This was achieved via inhibiting bacterial growth and clearing the bacterial biofilm at the wound site, and by regulating oxidative stress in skin tissue.

Designing Zein and Trimethyl Chitosan-based Core-shell Nanoparticles for Quercetin Oral Delivery to Enhance Absorption by Paracellular Pathway in Obesity Mice

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Quercetin as a flavonoid polyphenol in nature has shown great anti-obesity effects. Due to its poor stability in chemical structure and low intestinal absorption, the in vivo bioavailability of quercetin is considered to be the main challenge for applications. To achieve the oral quercetin administration, chitosan was successfully trimethylated (TMC) to coat the quercetin-loaded zein nanoparticles (Zein-Q), which were designed as the core-shell structure for enhancing the intestinal absorption in this study. TMC-Zein-Q was demonstrated to protect quercetin from degradation and showed the sustained-release effect in an in vitro drug release experiment. The nanoparticles were found to reversibly open tight junctions between intestinal epithelial cells and help to increase quercetin uptake via the paracellular pathway in Caco-2 cells. In addition, the delivery system also showed stronger intestinal permeability and muco-adhesion in vivo, which improved the bioavailability of quercetin in cellular and animal experiments. After ten weeks of intervention, TMC-Zein-Q could effectively suppress weight gain, improve serum lipid levels, and ameliorate hepatic steatosis and glucose tolerance in high-fat diet (HFD) mice by mediating the AMPK pathway. Consequently, this work successfully constructed TMC-Zein-Q for oral quercetin delivery, providing a novel and feasible strategy for the treatment of obesity via the oral route.

Formulation development and characterization of Quercetin loaded nano lipoidal system for the management of psoriasis in IMQ induced Plaque type psoriatic model

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Herbal novel drug delivery system for dermatological disorders results in manifold increase in activity as compared with conventional formulations. The topical route is especially appropriate for skin diseases, although some dermatologic diseases respond well or better to drugs administered systemically or when drug reaches to systemic circulation through transdermal application. Method Nanolipoidal gel of Quercetin was developed for dermatological disorders like psoriasis, skin irritation and inflammation. Carbopol 934P 0.5 percent gel was prepared. Imiquimod (immune modifier) (Glenmark pharmaceuticals) was applied topically on the shaven back of mice for the induction of psoriasis like inflammation. Histopathological examination of inflamed tissue was also done to observe change in epidermal thickness and elongation of rete ridges. Result Prepared nano carrier gels were characterized. Comparison with conventional formulation (Tacrolimus ointment) was done for their efficacy against inflammation, imiquimod-induced psoriasis and skin sensitivity. Percent inhibition of edema was determined by Carrageenan-induced paw edema method. PASI score was also calculated. Primary irritation index was found to be ¡ 0.4 inferring its safe use for topical formulation. Conclusion Histopathological report revealed that, in psoriasis induced animal treated with topical application of drug loaded nanolipoidal gel showed a marked reduction in thickness of epidermis, length of rete ridges as compared to conventional marketed formulation The present research work focuses on use of herbal drugs in novel drug delivery system for dermatological disorders and it proves the potential of nanocarriers for incorporating the phytoconstituents and improving the effectiveness in the management of psoriasis and inflammation.

Glutaraldehyde/ Sodium tripolyphosphate Crosslinked Polysaccharide Nanoparticles for Colonic Delivery of Inositol hexaphosphate

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Polysaccharide-based biopolymer (pectin/chitosan) nanocarriers for oral drug delivery have been of particular fascination owing to their outstanding, biocompatibility, and solubility. The study employed a new approach of the Polymer blended double crosslinked Emulsification Solvent Evaporation method to develop two sets of PEGylated nanoparticles (NPs). Glutaraldehyde was used to crosslink the first set while for the second set, sodium tripolyphosphate was employed as a crosslinking agent. The drug-loaded NPs were optimized for in-vitro characteristics via a three-factor three-level central composite design and compared to identify factors influencing NP development. It was found that the second set had smaller sizes (108.6±6.27nm to 376.4±3.67nm) than the first set NPs (347.8±1.57nm to 877.7±8.639nm). Also, the second set showed better stability and drug release than the first set NPs at simulated gastro-intestinal pH that confirmed desired release rates at colonic pH (7.4). Further, the optimized NPs of the second set were investigated for in-vitro cell line cytotoxicity and internalization studies in J77.4A, HT29, and DLD-1 cell lines. The NPs were non-toxic in J77.4A cell lines while showing significant cytotoxicity in HT29 and DLD-1 cell lines through MTT assay. The PEGylated NPs showed good cellular uptake in HT29 and DLD-1 cell lines while a time-dependent uptake was observed in the macrophages (J77.4A cells) indicating their stealth nature. Conclusively, developed NPs were successfully prepared using a new approach for colon drug delivery. This method may also pave the way for the colonic delivery of alternative drugs via oral administration

Abstracts for Poster Presentations

Evaluation of anti arthritic activity of bombax ceiba plant

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Arthritis is the most common disorder of articular joints which affects knees,spines,hips,hand and feet. Rheumatoid arthritis(RA) is an autoimmune and inflammatory disease which means that our immune system attacks healthy cells in our body by mistake, causing inflammation (painful swelling) in the affected parts of the body. In a joint with RA, the lining of a joint becomes inflamed, causing damage to joint tissue. The tissue damage can cause long lasting and chronic pain. Arthritis is regarded as a disease that has affected the huge proportion of world's population, that results in interfered them from good performance at work and in social relationship and causing disorder in millions of families. Therefore the research for new therapeutic agent considered a priority for the discovery of more effective form of treatment. The purpose of this study is to evaluate the anti arthritic activity of the methanol extract of aerial part of Bombax ceiba plant. In the review, studies of various plants having anti arthritic activity are discussed. The plants which are selected having the probable anti arthritic activity are Nagarmotha (Cyperus scariosus), Tridax (Tridax procumbens),Semar (Bombax ceiba). The mechanism of action of phytoconstituents drive from these plants are discussed. This review centralizes the phytoconstituents,and their mechanism of action,physiological activities as well as their extraction. This article basically emphasizes on the utilization of these traditional herbal plants in the treatment of arthritis.

Phytochemical, Pharmacognostic Properties and Antimicrobial Activity of the Ethanolic Crude Extract and Fractions of the Leaves of Picralima nitida Against Multidrug Resistant Bacteria

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Background: Medicinal plants have been used as traditional treatments for numerous human diseases including antimicrobial therapy for thousands of years and in many parts of the world. The emergence of multi-drug resistance pathogen which resulted from our mismanagement of antibiotics has spurred the need to look for substances from other sources with proven antimicrobial activity. P. nitida leaf has also been shown to possess good antimicrobial properties.

Aim: To determine the pharmacognostic properties and antimicrobial activity of the methanol crude extract and fractions of the leaves of Picralima nitida against multidrug resistant bacteria.

Method: Fresh leaves of P. nitida were collected from the pharmacognosy garden and washed, then kept in a clean room to air-dry for two weeks. Macroscopic, microscopic and chemomicroscopic examinations were carried out. Quantitative and qualitative phytochemical as well as proximate analysis were done using standard methods. The leaves were extracted using methanol. The crude ethanol extract was then fractionated using solvents of increasing polarity (n-Hexane, ethyl acetate, butanol and water) fraction. The antimicrobial activities were determined using agar well diffusion assay.The test organisms used include Staphylococcus aureus, Streptococcus spp., Salmonella spp., Escherichia coli, and Candida albicans.

Results: Picralima nitida leaf crude extract revealed the presence of saponins, tannins, carbohydrates, flavonoids, alkaloids, glycosides, reducing sugar, proteins, lipids, and oils. Hydrogen cyanide was not detected. Picralima nitida leaf also shows the presence of starch grains, lignified tissues, cellulose, proteins, and oil globules. The chemomicroscopy of the powder revealed parenchyma cells and fibers aligned with reticulate-type vascular components. The crude extract and ethylacetate fractions showed the best activity against the organisms. The test for their combined activity showed that they have good Antimicrobial activities at three dose combinations.

Conclusion: Phytochemical analysis and pharmacognostic characteristics serve as a trustworthy tools for the standardization and quality assessment of the plant component, assisting in identification and verification.

Combining the crude extract and ethylacetate fraction of the leaves of P. nitida has promising antimicrobial activity against S. aureus.

Braiding Traditional Medicine and Scientific Validation

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Pharmacognosy encompassing both biological and social sciences, is an alternative and complementary to allopathy, particularly for indigenous communities. This cultural interpretation of health vis-à-vis food and medicine is gaining momentum in research. One such healthcare regime is practiced by the Nagas in Nagaland, northeast India. These are facilitated predominantly by individuals, referred to as traditional healers and practitioners, who may not be formally certified. While most plants treat common health concerns like fever, diarrhea, dysentery, insect bite, cough, headache, reduce labour pain etc.; few cater to prophylaxis like cancer. The formulations vary for usage (oral and topical), and are mostly decoction from heating or boiling- fresh, raw, sun-dried, air-dried, smoked and powdered, while some are cooked with herbs and spices. A series of activities- cultivation (besides wild species), collection, formulation, and therapeutic use are involved in the process; however, phytochemical, phytopharmalogical evaluation and clinical trials are essential to develop new and effective drugs.

Utilization of high-value natural colorant extracted from Butea monosperma (Lam.) flower biowaste- Physiochemical stability and in-vitro toxicity assessment

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Butea monosperma (Lam.) has gained significant importance due to its multipurpose applications in food and pharmaceutical industry. In this study we explored the natural colorant and bioactive properties of B. monosperma flower. Initially the flower powder was extracted using different combination of solvents for the quantification of total anthocyanin, flavonoid and phenolic contents. The crude extract was further purified using HP-20 resin, C-18 and MCX cartridge and the purified isolates were further used to study natural colorant extraction, pH and temperature stability and biological activity. Out of four selected isolates (including crude extract), MCX showed effective and potential colorant intensity at alkaline pH and long-term stability under dark condition at 4°C. HPLC and LC-MS analysis showed butein, isobutrin and butin as a major biochemical constituent in these isolates. Genotoxicity study using onion (Allium cepa) root tip culture method showed that the MCX and C-18 did not reveal any genotoxic effect compared crude extract with very low toxicity at higher concentration. Thus, this study provides new insights on utilization of B. monosperma flower as an excellent source of natural colorant without any cyto-genotoxicity.

Marine Drugs as Cosmeceuticals for various Dermatological Disorders

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Marine drugs are obtained from marine sources, as zooplanktons and phytoplanktons from sea or oceans which correspond to diverse marine ecosystem. These drugs have been used as active agents in cosmeceutical formulations for treating various dermatological disorders. Cosmeceuticals are defined as the hybrids of cosmetics and pharmaceuticals which are referred as cosmetic products with an active pharmaceutical ingredient present in it, that imparts therapeutic efficacy or have medicine like benefits to the health of the skin. Medicinal components obtained from algae, fungi, sea cucumbers, seaweeds, corals, shrimps etc. are efficacious in curing wrinkles, blemishes, ageing, hyperpigmentation, oxidation. Being natural in origin these drugs and sources, provide least or no side effects onto skin. The topical delivery of marine drugs and its site of action is the skin, which is treated by cosmeceuticals. This review focuses on marine drugs, their chemical constituents, applications in cosmeceuticals and pathophysiology of various dermatological - disorders. Marine organisms also serve as sources of raw materials used as excipients in cosmeceutical formulations. Due to huge industrialization, unsustainability finds major issue in research, which is contraindicated by marine compounds, as they are highly sustainable and eco-friendly. An exhaustive literature review in this regard, focuses on how various marine compounds affect the skin, their physicochemical parameters and evaluation performed post formulation. Pertaining to present research and future-prospects, marine drugs find better area in the field of cosmetics and cosmeceuticals for treating skin disorders.

Fabrication of robust protein-based foams with multifunctionality by manipulating intermolecular interactions

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Biopolymer aerogels/foams exhibit wide applications, such as liquid separation and purification, gas separation, catalysis, and thermal insulation. However, their insufficient mechanical stability or complicated fabrication process often limits their practical application. In this work, we describe a facile and sustainable method to prepare robust foams; they are produced from the gelation of whey protein emulsions by manipulating intermolecular interactions. We demonstrate that hydrophobic interactions dominate the sol–gel transition by controlling protein aggregation and determine the linear viscoelasticity of the hydrogel. Blocking the hydrophobic interactions by adding guanidinium hydrochloride (GuHCl) led to a much lower degree of protein aggregation and promoted the formation of intermolecular disulfide bonds, enhancing protein adsorption on to oil droplets and imparting high elasticity to the hydrogel network.When the hydrogel was turned into a foam by freeze drying, the GuHCl foam exhibited outstanding mechanical properties (yield stress: 1.4 MPa; Young's modulus: 16.9 MPa), benefiting from the cellular structure and the synergistic effect of enhanced intermolecular disulfide bonds and oil droplets working as crosslinkers. Also, the foam possessed strong hydrophilicity and underwater oleophobicity (147.8° at pH 10 and 146.7° at pH 0), with resistance to oil fouling, and was successfully used as a filter medium to efficiently separate oil–water mixtures for repeated usage and to rapidly remove cationic dyes from their aqueous solutions. This study provides a universal strategy to design mechanically robust protein-based foams with multifunctionality.

Improving the survival of probiotics via in situ re-culture in calcium alginate gel beads

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Cell-mediated chemistry is an emerging strategy that leverages the metabolic process of living cells to build advanced materials. Here, a simple yet versatile microbe-mediated in situ re-culture approach using calcium alginate gel beads to improve the survival of probiotics was reported. After re-culture, Lactobacillus rhamnosus GG (LGG) in both liquid and solid core gel beads (LCGB and SCGB) exhibited 100% gastric acid resistance, while the bile salt resistance varied from 59.38% to 92.39%. LGG in LCGB generally showed higher bile salt resistance than SCGB, and the resistance would be further improved with high initial bacterial concentration due to more extracellular polymer secretion. Besides, the re-cultured LGG in beads exhibited survival of 95.02%-96.05% in calcium-supplemented MRS broth within 6 weeks at 4 °C. And the survival of the re-cultured LGG in LCGB was more than 90% in yogurt, milk, milk tea, and juice respectively within 6 weeks at 4 °C, followed by semi-solid jelly (85.81%). The addition of inulin had no adverse effect on the above storage survival of re-cultured LGG in LCGB, indicating the possibility of the construction of synbiotic. Combined transcriptome and metabolome analysis of LCGB implied that the mechanism of LGG damage by gastric acid included 8 pathways, among which, 2 pathways including propanoate metabolism, phenylalanine, tyrosine and tryptophan biosynthesis were responsible for the improved gastric acid resistance of re-cultured LGG. The unique re-culture strategy provides a powerful platform for microbial agents to smoothly enter the gut to serve host health.

Reprogramming M1 to M2 Phenotype to Alleviate Inflammation: A Novel Approach Using Liposomal Formulations to Control Macrophage Functionality

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Rheumatoid arthritis (RA) is a complex and heterogeneous autoimmune disease that causes inflammation and affects the joints, connective tissues, muscles and fibrous tissues. The disease accounts for disability, impaired quality of life and premature mortality, two times higher than the general population. Despite recent advances in therapeutic modalities, largely it leads to adverse systemic side effects due to short half-life and insufficient bioavailability of therapeutic agents at the site of action, due to which a high number of dosing is required. Drug delivery vehicles like liposomes are proven to be successful in addressing these delivery-related limitations and carrying drugs to the desired sites of therapeutic action while reducing adverse side effects.

In RA, lymphocytes and activated macrophages infiltrate the synovial tissue, destroy the cartilage, and activate the inflammatory signalling pathways. This process results in progressive destruction of bone and cartilage and causes chronic pain and disability. The macrophage (M1) that enters the joints secretes a significant amount of inflammatory cytokines including TNF- and IL-1 and contributes to the progression of RA. Hence, in this study, we hypothesize that converting the M1 to M2 (anti-inflammatory) in the joints would be a promising approach for the treatment of RA. Amongst diverse pro-inflammatory cytokines participating in the pathogenesis of rheumatoid arthritis, tumour necrosis factor TNF- plays a crucial role in recruiting additional cytokines and stimulating chronic inflammation. siRNA targeting TNF- could potentially downregulate the REL-A and thereby M1 macrophages re-polarize into M2 macrophages which are involved in tissue repair. As it is implausible that siRNA alone could not block the complex inflammatory signal process, we hypothesize that combining the siRNA with the anti-rheumatoid drug methotrexate (MTX) in a folate receptor targeting liposome can synergistically reduce the RA mediated inflammation.

Impact of macronutrient composition in nutrition shakes on postprandial glycemic response, appetite, and food intake in healthy young adults

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Achieving proper postprandial glycemic control through dietary intervention is essential for preventing and controlling diabetes. However, limited data on the precise effect of macronutrient composition and their interactions on postprandial glycemia are available due to the influence of food structure. Herein, 7 emulsion-based nutrition shakes were formulated with balanced and complete macronutrients and were designed to achieve identical structural characteristics and matched macronutrient levels with varying sources of protein, oil, available carbohydrate or fiber. Using a randomized crossover trial (n = 15), participants were assigned one of 8 treatments (7 nutrition shakes and water) 2 h after a standardized breakfast. Blood glucose, insulin levels and subjective appetite were monitored over the following 2-h. Ad libitum food intake was measured after each treatment. Besides, in vitro digestion method was utilized to determine in vitro glucose release. The results showed that soybean protein decreased the peak blood glucose level compared with sodium caseinate (P = .0003). Medium-chain triglycerides (MCT) decreased the blood glucose level at 30 or 45 min (P ¡ .0001 or = .0008) compared with long-chain triglycerides (LCT). Maltodextrin decreased the peak blood glucose level compared with corn syrup (P = .0058). Maltodextrin + whey protein decreased the blood glucose level at 45 min compared with corn syrup + sodium caseinate (P ¡ .0001). MCT + whey protein + syrup + fructo-oligosaccharide (FOS) (P ¡ .0001), LCT + whey protein + maltodextrin + FOS (P ¡ .0001), and LCT + whey protein + syrup + oat fiber (P = .0027) suppressed food intake compared with LCT + sodium caseinate + syrup + FOS. These data indicated that postprandial glycemia and food intake after consumption of nutrition shakes could be controlled by manipulating patterns of macronutrient intake (i.e., changing the source of one or two macronutrients).

A Review On Microspheres: As Carrieres Used For Novel Drug Delivery System

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In pharmaceutical research, a new age of science and technology has emerged that is focused on the development of several novel drug delivery systems. A current drugs performance in terms of efficacy, safety, and patient compliance may be significantly improved, if it transforms from its conventional to a novel drug delivery system. Any drug delivery systems main objective is to deliver a therapeutic dose of drug to the right location in the body and then maintain the desired drug concentration. Although the microsphere is usually administered via injection, oral dosage forms are being developed to enhance the treatment of gastrointestinal problems. Microsphere will play a key role in novel drug delivery in the future, especially in the sorting of sick cells, diagnostics, and a targeted drug delivery system. Microspheres are multi particulate drug delivery system prepared to achieve prolonged or controlled drug delivery in order to increase the drug bioavailability, stability, and capacity to target the drug to a specific region at a predetermined rate. These administration methods have many benefits over traditional dosage forms, including increased efficacy, decreased toxicity, and better patient compliance. These systems frequently use macromolecules as the drug carriers. In this study, we give a brief introduction of microspheres, types, preparation methods, and pharmaceutical applications, which may be used as a useful reference for interested readers.

Formulation of aerolysin-specific immunoglobulin by immune magnetic binding for accurate PCR detection of diarrheagenic Aeromonas

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Aeromonas are motile Gram-negative bacteria that occur ubiquitously in the environment. It is known to cause mild to severe diarrhea, meningitis, pneumonia, and wound infections. Causative agents of Aeromonas diarrhea are A. hydrophila, A. veronii, A. schuberti, A. caviae, A. jandei, and A. trota. Diarrheagenic Aeromonas produce an enterotoxin called aerolysin. Conventional identification of Aeromonas present in feces might take 2 - 3 days. A reliable technique is necessary for the diagnosis of diarrhea-causing Aeromonas. In this research, we have developed a formulation of aerolysin toxin-specific immunoglobulins for accurate PCR detection of Aeromonas. In the laboratory, rabbits were immunized with aerolysin toxin in increasing doses over a period of six months. It was followed by immune magnetic attachment of aerolysin immunoglobulins. This allowed aerolysin immunoglobulins to react with anti-immunoglobulin coated on magnetic chromium oxide. Subsequently, feces samples were permitted to bind with aerolysin-specific immunoglobulins coated on magnetic particles. It was followed by the removal of magnetic particles by centrifugation. The clear supernatant containing aerolysin-producing Aeromonas was used for PCR. Compared to culture, formulated aerolysin-specific immunoglobulin by immune magnetic binding revealed more accuracy. The percentage of diarrheagenic aeromonads detected with formulated preparation of aerolysin-specific immunoglobulins after PCR was 12.4% compared to 5.1% in cultivation. In addition, the culture method identified false-positive organisms like nonpathogenic E. coli present in the feces. PCR using formulated aerolysin immunoglobulins exhibited 100% accuracy in detecting all six species. But the classical method identified only five species leaving A. trota. Specificity studies on PCR with formulated aerolysin toxin immunoglobulin expressed 99%. We conclude that PCR using formulated aerolysin immunoglobulin was rapid, accurate, and reliable for the detection of diarrheagenic Aeromonas. The same technique can be applied to detect diarrheagenic Aeromonas present in other samples like food items.

Simultaneous co-delivery of Donepezil and Memantine via mannosylated PLGA nanoparticles for Intranasal delivery: Characterization, Pharmacokinetics and Pharmacodynamics studies

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Current therapeutics for Alzheimer's disease (AD) encountered limited blood-brain barrier (BBB) permeability and peripheral side effects. The intranasal route is an alternative to direct brain delivery. However, the Intranasal route impairs the delivery of drugs due to the clearance mechanism. In the present research Intranasal route was explored as an alternative route for the direct nose-to-brain delivery of drugs via the olfactory bulb. To optimize intranasal delivery Donepezil and Memantine coloaded mannose decorated PLGA were formulated as management therapy for AD. To study the In vivo pharmacokinetic and pharmacodynamic studies in Balb C male mice to determine and compare the drug distribution and efficacy of prepared drug loaded mannose coated PLGA with PLGA encumbered nanoparticles when administered via peroral and Intranasal route. The final coated NPs exhibited 179.4 nm size, and -33.1 mV zeta potential and its spherical shape. The brain concentration IN administered coated NPs for DPZ and MEM was 207 and 573 ng/mL. This concentration is more than 3 times higher in amount when compared with uncoated NPs administered via intranasal and peroral route both. The plasma concentration of coated NPs administered via intranasal route was found to be manifold times less when compared with other groups. In pharmacodynamic studies, the efficacy of coated NPs administered via IN route was higher when compared with other groups in neurobehavioral, biochemical estimation and gene expression studies. The results suggest that IN route can be explored in the future for the delivery of actives via nano particles in the brain for neurological disorders and can serve as promising alternatives for conventional dosage forms and route. Apart from this gene expression studies done using RTPCR depicted AIF1, BDNF, IL6, and NFB promising results.

Design and evaluation of naproxen-loaded nanoformulations based on trifoliate starch and its carboxymethylated starch nanoparticles

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Background: Modifying starch nanoparticles (SNP) broadens the range of polymeric nanoparticle applications or functionalities. These SNP derivatives are becoming popular as drug-delivery vehicles due to their improved mechanical strengths, dispersibility, bio-adhesiveness, pH-sensitivity, interfacial adsorption, enzymatic-thermal stability, and lower recrystallization of nanoparticle-based systems [1, 2]. The production of trifoliate starch nanoparticles (TSNP) involved the acid hydrolysis of trifoliate native starch (TNS) with sulfuric acid, and the production of carboxymethylated trifoliate starch nanoparticles (CTSNP) involved the reaction of TSNP with sodium hydroxide and monochloroacetic acid.

Results: SEM analysis revealed that TSNP was formed due to acid hydrolysis. Chemical modification of the TSNP resulted in particle size reduction and changes in the morphology of the CTSNP compared to its precursor and trifoliate native starch (TNS). FTIR confirmed the presence of carboxymethyl functional groups on the spectrum of CTSNP via three absorption bands at 1652 cm-1, 1444 cm-1, and 1352 cm-1, which were not found in TSNP or TNS. TSNP and CTSNP demonstrated a biphasic release profile for naproxen (immediate and sustained release), whereas TNS demonstrated delayed drug release. The primary naproxen release kinetics in most formulations are non-Fickian diffusion.

Conclusion: The nanoparticle-based systems developed can improve, control, and extend the release of hydrophobic drugs, ensuring their optimal bioavailability in the systemic circulation.

Biotin-zein conjugated nanoparticles encumbered with Decitabine: Fabrication, Central composite design optimisation, characterisation and cytotoxic activity against C6 glioma cell line

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Decitabine (DEC) is a cytidine analogue with a tumor selective T cell sensitization ability accompanied with silenced anticancer gene rejuvenation property have emphasized its application as chemotherapeutics. Biotin is a water-soluble vitamin with higher affinity for sodium dependent multivitamin transporter in brain, biotinylation is smart delivery approach as tumor cells demands higher vitamin source for sustaining continuous proliferation. Zein is another biocompatible and biodegradable natural polymer for targeted anticancer cargo delivery. Conjugation of biotin and zein was assessed with NMR, FTIR, DSC and quantification assays. The DSC analysis showed single amorphous peak in DEC loaded nanoformulation, ensures successful encapsulation within nanoparticular matrix. For the optimization of prepared nanoformulation central composite design with three factor and five level were opted. The optimized formulation is composed of 15 mg biotin-zein conjugation and 100 mg of poloxamer-188 with 96.31potential. The morphological analysis of biotin-zein conjugated nanoparticles was recorded with transmission electron microscopy and scanning electron microscopy (SEM) revealed spherical shape particle below 200 nm size with smooth surface. The Circular dichroism based secondary structure estimation suggest the extent of -helix, -sheets and other secondary structural composition of conjugate compared to pure zein.

This study reports the DEC loaded conjugated nanoparticles are encompassed with physicochemical stability and successfully showed cytotoxic effect DC in C6 cell line. The prepared nanoparticles improve the cellular uptake efficiency in C6 glioma cells compared to free decitabine. Fluorescence microscopy study revealed the apoptosis induction capacity in C6 cell line.

Formulation and characterization of vanillic acid-loaded copper nanoparticles by chemical reduction method

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Vanillic acid is a phenolic acid derivative obtained from Vanilla planifolia and possesses various medicinal properties such as antimicrobial, antioxidant, wound healing, antidepressant effects, etc. However, it poses problems such as low solubility, and bioavailability. This study intended to develop vanillic acid loaded copper nanoparticles for the synergistic effect in antimicrobial activity, as Copper itself is an antimicrobial. The drug-loaded copper nanoparticles were formulated by chemical reduction, method using PEG 6000 as a stabilizing agent and sodium borohydride as a reducing agent. The optimization of prepared nanoparticles was done using Box-Behnken design. Fifteen batches were prepared and characterized for various parameters, such as particle size, zeta potential, polydispersity index, entrapment efficiency, and in-vitro drug release studies. The optimized batch showed a particle size of 97.9nm, zeta potential of -31mV, polydispersity index of 0.316, and entrapment efficiency of 90.9%, with in-vitro drug release of 89.6%. Vanillic acid loaded copper nanoparticles were successfully formulated using chemical reduction method and this could be an effective approach for the treatment of various diseases such as wound, acne, ringworms etc.

Formulation and Evaluation of TLDDS Lip patch

Vinit Gaikwad

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Lippatch as novel dosage form for translabial drug delivery have not been extensively studied. This research addresses the lip anatomy, its formulations, and treatment possibilities as a novel drug delivery platform while highlighting novel drug administration through lips. The lip anatomy allows for localised, and site-specific pharmacological activity on the lips. It is a safe way to provide drugs to very ill and who are unable to swallow anything. This route allows for systemic distribution of medications that would otherwise experience high first pass metabolism, resulting in higher bioavailability, increased therapeutic efficacy, more uniform plasma levels, and a longer half-life for the medication. It allows for both local and systemic effects. Using the right dosage form while applying the medication to the lips allows both locally and systemically effects.

Transdermal lip patches

Vishakha Gangwal

Ssdj College Of Pharmacy, Chandwad, India

Lippatch as novel dosage form for translabial drug delivery have not been extensively studied. This research addresses the lip anatomy, its formulations, and treatment possibilities as a novel drug delivery platform while highlighting novel drug administration through lips: The lip anatomy allows for localised, and site-specific pharmacological activity on the lips. It is a safe way to provide drugs to very ill and who are unable to swallow anything. This route allows for systemic distribution of medications that would otherwise experience high first pass metabolism, resulting in higher bioavailability, increased therapeutic efficacy more uniform plasma levels, and a longer half-life for the medication It allows for both local and systemic effects Using the right dosage form while applying the medication to the lips allows both locally and systemically effects

A research on selection of natural polymer (flaxseed mucilage) for the development of benzydamine HCl buccal film using solvent casting method for aphthous ulcer

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Buccal drug delivery is the finest mucosal drug delivery system, it prolongs the residence time of dosage form at the site and thus contributes to improving and better therapeutic performance of the drug. There are various buccal dosage forms used in the treatment of aphthous ulcer. Aphthous ulcer (minor ulcer) is an oral painful inflammatory disorder of unclear cause, recurrent aphthous ulceration (RAU) manifests as repeated, single or multiple ulcerations of the oral mucosa. Approximately 5-25% of the population suffers from severe and often recurring inflammation of the intraoral cavity. However, the development of benzydamine HCL with natural flaxseed mucilage polymers is a promising solution. This innovative treatment provides a slow and continuous release of Benzydamine HCL, a anti-inflammatory, analgesic, and anesthetic drug, and reduces the pain caused by aphthous ulcers. This research article will give a brief description of how Benzydamine HCL buccal film works significantly and how it is made with natural flaxseed mucilage polymers to provide a safe and effective treatment for those suffering from aphthous ulcers. So, the aim of study is to use flaxseed mucilage as a polysaccharide that has high water retention capacity, films from flaxseed hydrogel, lesion healing, and an anti-inflammatory effect. Flaxseed mucilage film is replaced in place of synthetic polymer. Future prospective plant-based or herbal material is used in a buccal film for reduction in the severity and reduction in lesion diameter (mm) inthe ulcer.

Development of Sublingual Tablets of Verapamil Hydrochloride with Enhanced Permeation through Mucosa

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Verapamil hydrochloride, an L-type calcium channel blocker used in angina, cardiac arrhythmia, and hypertension therapy, shows poor oral bioavailability due to an extensive first-pass effect. Hence, sublingual tablets were designed through two approaches: individually or as a hybrid of lipid matrix systems and the pH Max technique. Lipids like Compritol 888 ATO, Compritol HD5 and Precirol ATO were used in lipid matrix systems, and dibasic sodium phosphate was used as a buffering agent in pH Max technique. In vitro drug release profiles of lipid matrix containing Compritol 888ATO as a solid lipid carrier (F2) showed a good release of 97% within 30 minutes. Buffered tablets without carbopol (F8) showed 76% drug release in 15 minutes and 93% at the end of 1 hour. Hybrid tablets showed an intermediate drug release of 80% in 15 minutes. Ex vivo sublingual mucosa permeation studies on pure verapamil hydrochloride and an optimized formulation (F6) showed fluxes of 2.19 ± 0.91 mg hr-1 cm-2 and 4.35 ± 0.94 mg hr-1 cm-2 respectively, indicating a two-fold increase in the flux compared to the pure drug.

Design and Evaluation of Diclofenac Potassium Pulsatile Drug Delivery System for the Treatment of Osteoarthritis

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Verapamil hydrochloride, an L-type calcium channel blocker used in angina, cardiac arrhythmia, and hypertension therapy, shows poor oral bioavailability due to an extensive first-pass effect. Hence, sublingual tablets were designed through two approaches: individually or as a hybrid of lipid matrix systems and the pH Max technique. Lipids like Compritol 888 ATO, Compritol HD5 and Precirol ATO were used in lipid matrix systems, and dibasic sodium phosphate was used as a buffering agent in pH Max technique. In vitro drug release profiles of lipid matrix containing Compritol 888ATO as a solid lipid carrier (F2) showed a good release of 97% within 30 minutes. Buffered tablets without carbopol (F8) showed 76% drug release in 15 minutes and 93% at the end of 1 hour. Hybrid tablets showed an intermediate drug release of 80% in 15 minutes. Ex vivo sublingual mucosa permeation studies on pure verapamil hydrochloride and an optimized formulation (F6) showed fluxes of 2.19 ± 0.91 mg hr-1 cm-2 and 4.35 ± 0.94 mg hr-1 cm-2 respectively, indicating a two-fold increase in the flux compared to the pure drug.

Comparative assessment of the physicochemical attributes of Moringa oleifera seed oil obtained by microwave-assisted and soxhlet extraction techniques

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Background: There is a growing interest in the search and application of biomaterials from plants for food, pharmaceutical, and industrial applications. Comprehensive data of the functional properties of some of these phytomaterials are lacking in extant literature. This work presents a comparative assessment of the physicochemical quality attributes of Moringa oleifera seed oil obtained by microwave-assisted and soxhlet extraction (MAE and SE) techniques.

Methods: M. oleifera seeds were pulverized to fine powders and oil was extracted by microwave-assisted and soxhlet extraction techniques using petroleum ether. Quality characteristics including percentage yield, moisture content, iodine, saponification, specific gravity, viscosity, pH, thiobarbituric acid, acid and peroxide values were measured. Mineral and vitamin contents, chemical/functional groups present, fatty acid (FA) composition, and reducing power of the oil were evaluated.

Results: M. oleifera oil from MAE and SE methods had good yield (34.25 ± 0.0 - 28.75 ± 0.0 %), low moisture content (0.008 ± 0.0 - 0.011 ± 0.0 %), non-drying and unsaturated, moderately saponified, less dense (0.91 ± 0.01 - 0.92 ± 0.02 gml-1), had Newtonian flow, were weakly acidic, showed good content of FAs, recorded strong potential for long shelf-life, showed stability against oxidative rancidity and enzymatic hydrolysis, had very rich deposits of micro- and macro- nutrients as well as water-soluble and lipid-soluble vitamins, and functional groups in the oil were reflective of its content of long- and medium- chain triglycerides (LCT and MCT). Monounsaturated and saturated fatty acids (MUFA and SFA) i were detected and the oil has excellent ferric ion reducing power. Conclusions MAE technique is a feasible and acceptable alternative for high throughput extraction of M. oleifera oil with high yield and excellent quality attributes. The study did not reveal any remarkable comparative differences in the physicochemical properties of M. oleifera seed oil obtained by MAE and SE techniques.

Effect of gum extracts on the textural and bread-making properties of a composite flour based on sour cassava starch, Peanut and cowpea flour

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Gluten intolerance and the unavailability of wheat flour in some parts of the world have led to the development of gluten-free bread. However, gluten-free bread generally results in a low specific volume and to remedy this, the use of hydrocolloids and bases has proved to be very successful. Thus, the present study aims to determine the optimal proportions of gum extract of Triumffeta pentendra and sodium bicarbonate in breadmaking of a composite flour based on sour cassava starch, peanut and cowpea flour. Method:To achieve this a Box Benkhen design was used the variable being the amount of extract gums, the amount of bicarbonate and the amount of water. The responses evaluated were the specific volume and texture properties (Hardness, Cohesiveness, Consistency, Elasticity and Masticability). The specific volume was done according to standard methods of AACC and the textural properties by a texture analyzer. Result: It appears from this analysis that the specific volume is positively influenced by the incorporation of extract gums, bicarbonate and water. The hardness, consistency and plasticity increased with the incorporation rate of extract gums but reduced with the incorporation rate of bicarbonate and water. On the other hand, Cohesion and elasticity increased with the incorporation rate of bicarbonate and water but reduced with the incorporation of extract gum. The optimate proportions of extract gum, bicarbonate and water are 0.28;1.99 and 112.5 respectively. This results in a specific volume of 1.51±0,16; a hardness of 38.51±1,5; a cohesiveness of 0.88±0,3; a consistency of 32.86±1,8; an elasticity of 5.57±0,46 and a masticability of 162.35±2,4. Conclusion: This analysis suggests that gum extracts and sodium bicarbonate can be used to improve the quality of gluten-free bread based on sour cassava starch, peanut and cowpea flour. Box Benkhen design, Bread-making, Gums, Textures properties, Specific volume

Preparation of cookies with the addition of chañar brea gum flour

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In the present work, cookies were formulated based on corn starch (145g), rice flour (75g), cassava starch (25g), baking powder (5g), egg (one), sugar (75g) and margarine (50g), with the addition of chañar brea gum (CBG) flour in increasing concentrations. The objective of this study was to evaluate the effect of the addition of CBG flour as a binder in the cookie. Five formulations were made with different concentrations of CBG on dry basis, the concentrations used were 3, 5, 7 and 10% wt. Cookies without CBG, prepared in an analogous manner, were used as a control sample. Color, texture and a sensory evaluation of the hedonic test type, where visual characteristics, presentation, olfactory characteristics and taste were evaluated. Cookies baked with CBG flour addition showed a Young's modulus of 0.56MPa and 0.68MPa for 7% and 0%, respectively. For all the cookies the color is similar, light brown. The Cookie Factor was determined, resulting in 8.35 and 7.89 for the 0% and 10% cookies, respectively. The nutritional profile of the cookies was determined. The carbohydrate content was higher in the cookies with 3% CBG, while the control sample of cookies with 0% CBG showed a lower amount. It was observed that cookies with 10% CBG yielded a higher amount of fiber than cookies formulated with 0% CGB. In terms of protein content, all samples presented a similar percentage. As for the sensory evaluation, the result showed that the cookies with CBG have good odor and flavor, are not rigid when biting, do not stick to the palate and have a good flavor compared to the control cookie, highlighting the 7% CGB cookies with good binding properties. In conclusion, the use of CBG as additive in regional cookies is very attractive and has a very promising future in the bakery industry.

Fish Feed Formulation By Using Spirulina And Vegetables Waste

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Fish is a cheap but highly nutritious food for human and in aquaculture an aquafeed is generally take big (approximately 70 %) part of an input cost in food fish and an ornamental fish culture. In which, fish meal is generally used as an important ingredient as a protein source in food fish culture while in ornamental fish culture, pigments are another major ingredient which can make the feed more costly. On the other hand, the vegetable waste which is generated from the vegetable markets or from the different processing plants caused environmental hazard as they are discarded in landfills or sometimes in the rivers. Spirulina is the micro blue green algae, which is known to have various nutrients like proteins, carbohydrates, vitamins, pigments and many more. So, these two ingredients (Spirulina and vegetable waste) were used with other traditional feed ingredients to prepare cost effective and pigment enhancing feed for an ornamental fish and one ingredient (vegetable waste) was used to prepare the cost-effective feed for Indian Major Carps. Application of feed was done on the IMC for 6 months and on the ornamental fish for the 3 months. The growth of fishes was compared with fish fed on commercial feed and found high growth (Weight Gain) of fish fed on experimental feed (16.75 gm) in the comparison of fish fed on commercial feed (11.25 gm) in case of IMC. Pigments were found high in an ornamental fish fed on experimental feed (0.156 µg/g) with compare to fish fed on commercial feed (0.057 µg/g).

Production, characterization, and antioxidant and property of exopolysaccharide from probiotic lactic acid bacteria strain: its application in the formulation of probiotic coconut yoghurt

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Production and characterization of EPS from LAB strain isolated from yoghurt, its probiotic and antioxidant potential and its application in the production of probiotic coconut yoghurt was investigated. The EPS produced by the isolate was characterized and the antioxidant potential of the EPS was determined. The probiotic potential such tolerance to low pH, bile salts, gastric pH, auto-aggregation, co-aggregation, antimicrobial potential and antibacterial activity of the isolate was evaluated and the isolate was identified using 16S rRNA. The LAB strain and the EPS were used for the formulation of probiotic coconut yoghurt and the proximate mineral composition of the enriched formulated yoghurt was determined. The Exopolysaccharide produced by the LAB was spherical, Hydroxyl, carboxyl, and -pyranose and eight monosaccharide's were present in which glucose has the highest molar ratio. The EDX spectra ascertain the presence of carbon, oxygen (carbohydrate) and other element. DPPH, FRAP, TAC and TPC of the EPS ranged from 42.36 - 75.88 %, 2.48 - 5.31 µg/mL, 1.66 - 3.57 µg/mL and 1.42 - 2.03 µg/mL respectively. The LAB strain has 100.0% Pairwise Identity to Pediococcus acidilactici strain NST-Sarhadi. The formulated samples has pH, lactic acid, specific gravity, total soluble solid and vitamin C content ranged from 5.81- 6.8, 10.8- 55.8 mg/L, 0.910 - 1.394 kg/m3, 0.136 - 0.196 BRIX, 0.26 - 0.66 %. The formulated coconut yoghurt fortified with EPS showed the highest protein content (4.6 %) and samples with the highest concentration of EPS had the highest calcium content (162.31±0.01a). In conclusion, EPS produced by Pediococcus acidilactici was a heteropolymeric exopolysaccharide with good antioxidant activity and the LAB strain exhibited a good starter for the production of formulated coconut yoghurt enriched with EPS. The formulated yoghurt has good nutritional characteristics which could serve as a functional and natural nutraceutical food for lactose intolerance populace.

Arabinoxylans potential in modulating dough structure and enabling fiber-enriched bread

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Arabinoxylans (AX) are recognized for their nutritional and health benefits and can significantly influence flour functionality in product formulation. This study investigated the effects of water extractable (WE) and water unextractable (WU) arabinoxylans on dough rheology and the resulting bread attributes. The AX content varied significantly among wheat samples, with distinct ratios of WE to WU observed in both meal and flour. Incorporating WE led to reduce setback, hot paste, and cold paste viscosities, as well as enhanced breakdown viscosity across all flour cultivars. On the other hand, WU influenced dough development and had notable effects on bread attributes. Interestingly, WE and WU demonstrated contrasting impacts on physical and sensory characteristics of bread, with WE contributing to improvements while WU showed negative outcomes. These findings provide valuable insights into the intricate role of AX in shaping bread microstructure and emphasize the importance of understanding the distinct effects of WE and WU arabinoxylans. The knowledge gained from this study has implications for the development of high-fiber foods with optimized microstructure and enhanced quality, highlighting the significance of AX in flour functionality for targeted product formulations.

Integrating Edible Flowers in Formulations of Health promoting infusions

Archna Karel,Qurrat ul Ain Akbar,Salman Khurshid,Mehwish Iqbal,Saba Iqbal

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ABSTRACT NOT AVAILABLE

Genetically Modified Foods: A Boon or Bane for Human Health

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Khwaja Moinuddin Chishti Language University, India

Genetic modification is a special set of gene that alters the genetic machinery of such living organisms as animals, plants, or microorganisms. Combining genes from different organisms is known as recombinant DNA technology and the resulting organism is said to be genetically modified organisms (GMOs), genetically engineered or transgenic. GMOs have widespread applications as they are used in biological and medical research, production of pharmaceutical drugs and agriculture. It has enhanced food production by making plant less vulnerable to drought, frost, insects and viruses and by enabling plants to uptake soil nutrients effectively. It has also improved the quality and nutritive value of food crops like golden rice and flavour-saver tomato. As revealed by some studies, GM foods also have harmful effects on the human body. Antibiotic resistance marker genes (ARMGs), like kanamycin, are commonly used for creation of GM foods amp; for distinguishing it with non-GM foods. Theoretical studies put forward that consumption of these foods may cause the development of human diseases which are immune to antibiotics. Animal studies with certain GM foods like potatoes have shown that they may toxically affect several organs like hepatic, pancreatic, renal, immune amp; reproductive system, digestive system besides responsible for accelerated aging and insulin regulation. It may also alter the hematological, biochemical and immunological parameters. Another risk associated with consumption of GM food is of allergenicity. Many childrens in US and Europe have developed life-threatening allergies to GM foods like peanuts. It increases levels of insulin like growth factor (IGF-1). IGF-1 is known to promote cancers like that of breast, prostrate amp; colorectal by inhibiting apoptosis. As many argumental theories favouring amp; opposing GM foods are available during our literature search, we conclude that further studies on a large sample of human population are required in order to approve the beneficial impact versus the risk posed by GM foods on human health.

Techno-functional properties and applications of whey proteins in formulations

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Whey protein, a byproduct of cheese manufacturing, is a high-value ingredient and exhibits several techno-functional properties, such as emulsifying, fat and oil binding capacity, foaming capacity, gelling properties and water holding capacity. It is reported to exhibit anti-oxidant, anti- inflammatory, anti-cancer, hepato-protective, immunomodulatory and cardioprotective properties. Pharmaceutically, it has been utilized to encapsulate doxorubicin hydrochloride, atorvastatin, lycopene and curcumin and deliver the drug to the respective site of action. Some of the whey protein-based drug delivery systems that have been reported include nanosuspensions, nanoemulsions (as an emulsifier), microparticles, hydrogels, aerogels, nanocrystals (as a stabilizer), solid dispersion and nanofibers. Whey protein micelles in cosmetics formulations have also been patented, for their use as an abrasive agent and for the use of colostrum whey protein as an active agent for skin regeneration. The use of whey protein micelles for the delivery of active nutritional/cosmeceutical agents is also patented. In conclusion, whey protein and its peptides exhibit multiple applications and have become the most promising excipient in drug delivery systems. The current review highlights all such properties and applications of whey proteins.

Bedaquiline Fumarate Microemulsions for Therapeutic Intervention of Interventions Pulmonary MDR-Tuberculosis: Formulation, Optimization and in vitro Characterization

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Bedaquiline fumarate (BQF), an USFDA approved drug for therapeutic intervention of pulmonary multi drug-resistant tuberculosis (MDR-TB), shows low oral bioavailability due to solubility-limited intestinal absorption. The objective of this study was to develop BQF- loaded microemulsions (ME) to enhance the oral bioavailability of BQF. The BQF-loaded ME formulation was developed by spontaneous emulsification method using lemongrass oil as the oil phase, Cremophor EL and Transcutol P as the surfactant and cosurfactant, respectively. Lemongrass oil was used as a carrier for BQF, which was reported to possess antibacterial activity against MDR-TB, and it may result in a synergistic activity against TB. The ME showed an average globule size of 26.50 ± 6.29 nm with spherical geometry. BQF was released from the ME in a controlled manner as compared to pure BQF. The smaller globule size of ME with controlled release pattern and increased circulation time might be beneficial in the long-term treatment of MDR-TB by reducing the frequency of administration and thus, increasing the patient compliance. Microrheological investigations indicated gel-sol-gel behaviour of ME and rheological studies revealed low viscosity of 0.23 Pa.s. In vitro cytotoxicity and cellular uptake studies on Caco-2 cells showed cytocompatibility of the BQF-ME at the highest concentration of 500 g/mL with enhanced cellular internalization. These insights indicate that BQF-loaded ME could be an effective strategy to improve the therapeutic outcomes in patients with MDR-TB.

Impact of binary/ternary solid dispersion using poloxamer 188 and TPGS to enhance biopharmaceutical attributes of multidrug resistant tuberculosis drug bedaquiline fumarate

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In 2012, the FDA granted rapid clearance to bedaquiline fumarate (BDQN) for the treatment of multidrug-resistant tuberculosis (MDR-TB). It falls under the biopharmaceutical classification system39;s class II and has a low rate of aqueous solubility, which ultimately compromises its bioavailability. In the current work, tocopheryl polyethylene glycol 1000 succinate and poloxamer 188 were employed as the dispersing matrix to create binary solid dispersion (BSD) and ternary solid dispersion (TSD). The saturation solubility for BSD and TSD were 5.68-fold and 7.46-fold higher than the BDQN alone, respectively. Additionally, the in vitro dissolution data showed significantly higher BDQN release from BSD and TSD at rates that were significantly higher than those of the pure drug and their respective physical mixtures at the indicated time points, 99.98±1.48respectively. TSD maintained the same concentrations throughout the dissolution period, but BSD was unable to maintain the parachute effect in the dissolving medium and showed reduced concentrations. In comparison to BDQN plain drug, BDQN from BSD and TSD was provided 1.86-fold and 3.53-fold more permeability, respectively. In conclusion, we have found that solid dispersions of BDQN is able to enhance biopharmaceutical performance of BDQN in terms of solubility, dissolution rate and permeability.

Formulation Optimization and Evaluation of Hesperidin Microemulsion for Brain Delivery

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Hesperidin, a dihydroflavone derivative found in citrus fruits shows poor solubility and dissolution rate, which momentously limits its clinical utility. This study presents the formulation and characterization of hesperidin loaded microemulsion containing sesame oil and orange oil as carrier, Tween ® 80 and Solutol ® HS15 as surfactant and cosurfactant, respectively. The phase boundary region corresponding to the formation of isotropic microemulsion was determined using pseudoternary phase diagrams. The microemulsion was extensively characterized for size, morphology, microstructure, pH, transmittance, stability, in vitro release, nasal ciliotoxicity, cytotoxicity and cellular internalization studies. DSC and UV transmittance studies confirmed the formation of a clear, transparent, and thermodynamically stable o/w microemulsion. The microemulsion showed an average size of 14 nm with a PDI of 0.049 in DLS measurements. The rheological investigations demonstrated a viscosity of 0.3097 ± 0.0333 Pa.s with a non-Newtonian shear-thinning flow. The formulation remained stable up to 70 °C as observed by thermal stability studies. The in vitro drug release studies displayed a faster release rate of hesperidin from the microemulsion in comparison to naïve hesperidin. Further, nasal ciliotoxicity studies performed on goat nasal mucosa demonstrated safety of the formulation for nose-to-brain delivery applications. In vitro cell viability studies in SH-SY5Y cells showed good biocompatibility and cell update studies showed abundant green cytoplasmic fluorescence confirming effective internalization of the microemulsion formulation. These insights can be explored to develop a stable hesperidin loaded microemulsion for effective drug delivery applications in the treatment of various neurodegenerative diseases.

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