prolonged PTX plasma circulation time and no apparent side effects.

Conclusion: This work provides new insights into the design of targeted nanomedicines for NSCLC and suggests that CLA-coated PTX-SPIONs@HRH could provide a potentially effective treatment modality for NSCLC for enhanced therapeutic outcomes and minimal side effects.

Artificial intelligence in precision drug delivery for the treatment of neurological disorders

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Introduction: Neurological disorders are defined as diseases affecting the brain, spinal cord, and other nerves in the human body (neurons). Brain disease difficulties involving the central nervous system (CNS) and peripheral nervous system (PNS), along with brain cancer, represent some of the most prevalent, lethal, and inadequately treated conditions. Over 1 million of the 6.8 million deaths attributed to CNS-related issues each year are caused by neurodegenerative disorders, including glioblastoma (GBM), Parkinson's disease (PD), and Alzheimer's disease (AD). Several drugs have been developed to address issues related to toxicity, specificity, and delivery while treating diseases of the CNS. However, it is challenging for therapeutic drugs to get across barriers like the blood-brain barrier (BBB), which reduces the efficacy of the therapy. Also, the poor aqueous solubility of some therapeutic agents, their short half-lives, low bioavailability, which requires frequent high dose administrations, and their poor aqueous solubility, which can lead to several severe side effects like dyskinesia, stomatitis, sleep disturbance, anxiety, and depression, limit their use in the treatment of CNS diseases. These problems highlight the need for precision drug delivery, like the use of polydopamine nanoparticles (PN) as a model to alter or manipulate various processes at the cellular level due to the presence of the polydopamine receptors in the CNS to achieve the desired attributes. These nanoparticles are an efficient substitute for delivering drugs and other approaches since they may cross the blood-brain barrier due to their nano size. Given their biocompatibility, high stability, surface modification, and adjustable targeting efficacy, they are useful for transporting bioactive compounds, particularly across the BBB. They have the potential to be an appealing approach for the delivery of drugs to the CNS. Artificial intelligence (AI) has become a crucial technology in the advancement of precision medicine. This is because AI can analyse and interpret biological data and automate intelligent activity. Although AI has been used in drug delivery, there is little to no evidence that computational techniques have been leveraged to study and predict the delivery of polydopamine particles to the CNS.

Objective: The focus of this work and the presentation is on the preparation, physicochemical characterisation of PN and application of AI in the prediction of the delivery and efficacy of polydopamine particles to CNS for the treatment of AD, PD, and GBM diseases.

Method: The synthesis of PN is examined using the self-polymerisation approach. Using the Zetasizer dynamic light scattering technique, the particle size and surface charge will be assessed. Differential scanning calorimetry, thermogravimetric analysis, scanning electron microscopy, transmission electron microscopy, and Fourier infrared spectroscopy techniques will be used to investigate the physicochemical characterisation of the synthesised PN analysis. For the study and prediction analysis of PN particles to CNS, an artificial intelligence neural network (Neurosolution 4.2) software will be employed.

Results: The AI neural network, the Neuro-solution software model, is being developed for the prediction analysis of PN delivery to the CNS disease treatment. The size and morphology analyses confirmed the formation of PN with the intrinsic size and morphological features attributed to PN.

Nanotechnology for cardiovascular diseases

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Introduction: Nanotechnology is being applied to the advancement of drug delivery systems and theragnostic devices in various conditions, including cardiovascular speciality.

Objective: To appraise evidence on the application of nanotechnology cardiovascular disease (CVD) management.

Method: Literature was retrieved from PubMed using the search terms “nanotechnology” AND “cardiovascular”. Inclusion criteria were peer-reviewed articles, available as free full-text, in English and published between 2013 and 2023. Opportunities, types of nanoparticles used, benefits and challenges of nanotechnology in CVD were analysed.

Results: A total of 3,124 records were identified. All records were screened, and after the inclusion criteria had been applied, 46 articles were included in the appraisal. Most articles (n = 39) were reviews, and most originated from Asia

(n = 16), followed by North America (n = 13) and Europe (n = 11). The articles reported on the application of nanotechnology in the treatment (n = 42) and diagnosis (n = 13) of CVD, mostly for atherosclerosis (n=36). Most articles reported on the use of nanotechnology for targeted drug delivery (n = 26). Fourteen articles discussed how nanotechnology can be applied to medical devices, mostly in magnetic resonance imaging (n = 10). The classes of nanoparticles mostly studied are inorganic nanoparticles, such as gold and iron oxide nanoparticles (n = 16), followed by lipid-based nanoparticles (n = 10). Benefits of using nanoparticles include a good safety profile (n = 12), adequate biocompatibility (n = 11), enhanced drug delivery (n = 10), biodegradability (n = 7), and improved bioavailability (n=4). Challenges mostly reported include lack of clinical translation (n = 12), cost issues (n = 8), need for scale-up production (n = 7) and regulatory issues (n = 3).

Conclusion: CVDs persist as the leading cause of morbidity and mortality globally, and nanotechnology represents novel viable approaches for diagnosis and treatment, particularly in atherosclerosis. Nanotechnology still has a long way to go from translational medicine to clinical application, and further evaluation of biocompatibility, pharmacokinetics, and safety of nanomaterials in vivo is required.

Design, evaluation, and optimisation of taste-masked azithromycin by ion-exchange resins

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Introduction: Azithromycin (AZI) is an intensely bitter macrolide antibiotic used to treat both paediatric and adult infections. The bitter taste affects patient adherence to therapy, which may further worsen the condition. Bitter taste is a serious issue in the formulation of most active pharmaceutical ingredients (API); hence, masking the taste of APIs is a useful method for improving patient adherence to therapy. Several taste-masking formulation techniques have been used to develop palatable dosage forms. A taste-masking technique using ion-exchange resins has been used to mask the taste of AZI. Ion exchange resins are pharmacologically inert polymers that bind to substances and exchange mobile ions to produce a tasteless drug-resin complex or resinate.

Objective: This study aimed to develop a taste masked AZI resinate utilising Indion® 234, a weak acidic cation exchange resin.

Method: The parameters influencing the formation of the AZI-resin complex were evaluated. A central composite design was used to generate experiments to optimise response through the evaluation of input variables such as stirring time, temperature, and drug-resin ratio. AZI loading efficiency was assessed using a previously validated HPLC-UV method. Differential scanning calorimetry (DSC), scanning electron microscopy (SEM), and Fourier transform infrared (FT-IR) spectroscopy were used to confirm complex formation. In-vitro taste evaluation of the resinate was performed using simulated salivary fluid.

Results: The optimal AZI-resin ratio, temperature, and stirring time were 1:0.10, 70°C, and 4 hours, respectively, at pH 8. The drug loading efficiency of AZI resinate was 81%. In-vitro taste evaluation revealed 1.72% drug release from the resinate in 5 minutes, implying adequate taste masking.

Conclusion: Using ion exchange resin to mask the bitter taste of drugs in oral dosage forms is a cost-effective and reliable method for improving the taste of medicine. To achieve optimal drug loading, it is important to consider the drug-to-resin ratio, solvent temperature, and contact time between the resin and drug. These studies show Indion® 234 can effectively reduce the bitter taste of AZI.

Protein-coated satin nano delivery system

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Introduction: Atorvastatin is used to treat hypercholesterolemia. However, its low bioavailability (12%) and extensive hepatic first-pass metabolism affect its pharmacokinetics and pharmacodynamics. Bovine serum albumin (BSA) is an endogenous protein characterised by its biocompatibility, water solubility, and potential for active targeting. This research aims to utilise a novel, non-toxicity, and nanoprecipitation-based method to develop an atorvastatin nano-delivery system with protein corona.

Method: The nanoprecipitation approach was used to produce the nano-delivery system. The organic phase, containing a specific proportion of 3-mercaptopropyl and 3-aminopropyltrimethoxysilane, was allowed to stand for 24 hours before the addition of atorvastatin. The mixture was then injected into the aqueous phase and incubated in a 60°C circulating water bath for two hours. Subsequently, nanoparticles were extracted and mixed with BSA. Leveraging the positively charged characteristics of the nanoparticle surface, self-assembly occurred with BSA, resulting in the formation of an atorvastatin nano-delivery system with a protein corona.