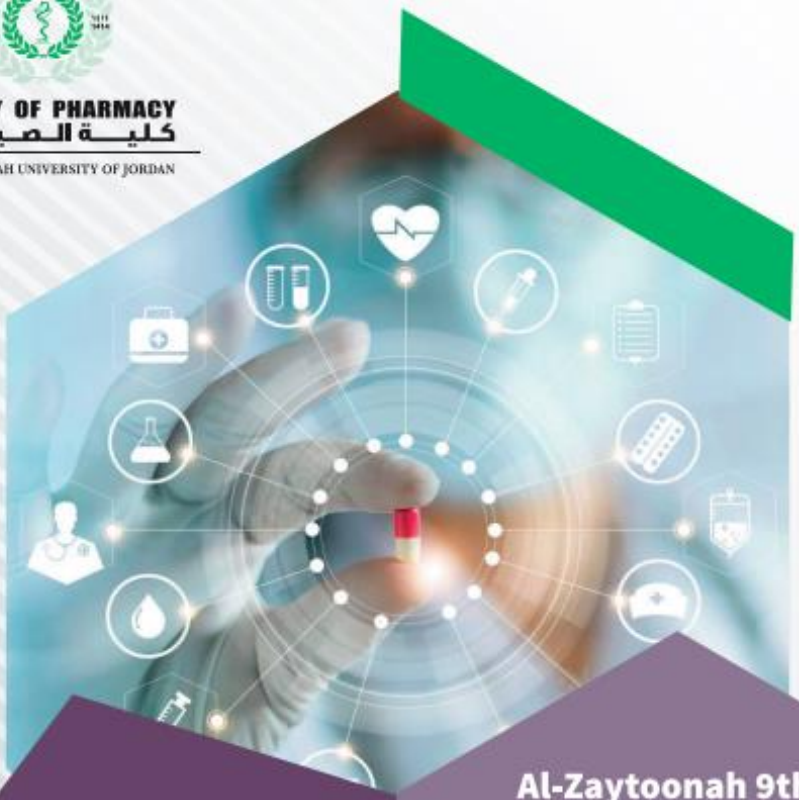
FACULTY OF PHARMACY
كلية الصيدلة
AL-ZAYTOONAH UNIVERSITY OF JORDAN



ZIPC 2024

Al-Zaytoonah 9th International Pharmaceutical Conference 2024 (ZIPC 2024)

Amman, Jordan

Innovations in Pharmaceutical Research and Practice

October 16th and 17th 2024

Al-Zaytoonah 9th International Pharmaceutical Conference (ZIPC 2024)

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Message from the Conference Chair

Dear Esteemed Speakers and Participants,

On behalf of the organizing committee, it is my profound honor to welcome you to Al-Zaytoonah 9th International Pharmaceutical Conference (ZIPC 2024). This semi-annual conference has been organized on a regular basis by the Faculty of Pharmacy with generous support from Al-Zaytoonah University of Jordan, which aligns with the University's commitment to promoting scientific research at the national and international levels.

This conference serves as a platform for researchers from around the globe to share their insights and experiences. This year's theme, "Innovations in Pharmaceutical Research and Practice," reflects our commitment to advancing the frontiers of knowledge in pharmaceutical research. Each of you, through your research and expertise, contributes to the collective effort of finding solutions to pressing healthcare challenges. We have an exceptional lineup of four keynote speakers, 54 oral presentations, and 49 poster presentations, presented by leading scientists and early career researchers from Jordan and globally in the different fields of Pharmacy: Pharmaceutical Chemistry, Pharmacology and Toxicology, Pharmaceutics, and Clinical Pharmacy. We hope that by the end of our conference, all of you will be able to build lasting relationships that can extend beyond these walls.

As we gather here today, we are reminded of the difficult challenges that our region is currently facing, yet we stand together in a spirit of resilience and hope. Together, we can create a future where these challenges can become the steppingstones for tomorrow's breakthroughs.

Thank you for your participation, and I wish you a fruitful and inspiring conference experience.

Sincerely,

Prof. Abdel Qader Al Bawab
***Chair*, ZIPC 2024**

Al-Zaytoonah 9th International Pharmaceutical Conference (ZIPC 2024)

About ZIPC 2024

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  - Dr. Ahmad Bahlool

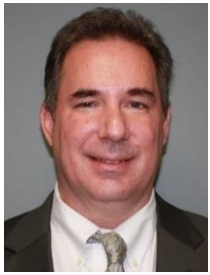
Al-Zaytoonah 9th International Pharmaceutical Conference (ZIPC 2024)

Keynote Speakers' Biographies

Prof. Yvonne Perrie MBE FRSC FRPharmS FAPS FSB PhD
University of Strathclyde, Glasgow, UK

Professor Yvonne Perrie is the Chair in Drug Delivery within Strathclyde Institute for Pharmacy and Biomedical Sciences, University of Strathclyde, Glasgow, Scotland. Prior to this appointment, she was Professor in Drug Delivery, within Aston University, Birmingham, England (2007-2016). Yvonne has a BSc (First-Class Hons) in Pharmacy from Strathclyde University and she attained her PhD from the University of London under the supervision of Prof Gregoriadis. Yvonne's research is multi-disciplinary and is focused on the development of drug carrier systems to facilitate the delivery of drugs and vaccines, providing practical solutions for current healthcare problems. Yvonne has published approximately 150 peer-reviewed papers, 5 patents and 4 text books. She is a Fellow of the Society of Biology, a Fellow of the Royal Society of Chemistry, the Royal Pharmaceutical Society, a member of the College of Fellows for the Controlled Release Society, and an Eminent Fellow of the Academy of Pharmaceutical Sciences. Yvonne was appointed a Member of the Order of the British Empire (MBE) in His Majesty the King's New Year Honours List 2024 for services to pharmaceutical innovation and regulation.

Prof. Frank Scott Hall, PhD
University of Toledo, OH, USA



Dr. F. Scott Hall is a Professor of Pharmacology and Experimental Therapeutics in the College of Pharmacy and Pharmaceutical Sciences at the University of Toledo. His research has focused primarily upon the genetic basis of addiction and the role that early social experience plays in shaping adult behavior and behavioral pathology. After a B.A. from Harvard University (1987) and a Ph.D. from the University of Cambridge (1994), Dr. Hall completed a National Research Council Research Associateship at the National Institute on Alcoholism and Alcohol Abuse. His research at NIAAA focused on animal models of schizophrenia and alcohol use disorder. Dr. Hall joined the Molecular Neurobiology Branch at the National Institute on Drug Abuse in 1999 where he led a behavioral genetics group in the Molecular Neurobiology Branch until 2014, when he moved to the University of Toledo. Dr. Hall's laboratory at the University of Toledo investigates the genetic and environmental determinants of susceptibility to addiction and related psychiatric disorders. His long-standing interest in the underlying mechanisms leading to the development of psychopathology has contributed to advancements in models used to identify novel potential targets for the treatment of psychiatric disorders. His most current research focuses on the lethal toxicity of amphetamines and synthetic cathinones (e.g. "bath salts"). Dr. Hall has authored over 175 scientific publications. He is the Past-President of the International Behavioral Neuroscience Society.

Prof. Talal Aburjai
University of Jordan, Jordan

Professor Aburjai completed his PhD in Natural Product Chemistry and Analysis, QC of Natural products and nutraceuticals from Milan University and he received his post doctorate from University of Kentucky. He published more than 100 papers in reputed journals, symposium abstract and patent applications. He has been serving as an editorial board member of reputable pharmaceutical journals. Also, he has ample experience in drug development, registration and GMP implementation. He is official consultant of many regional and international pharmaceutical industries. Moreover, he was ex. Vice president and Dean of different faculties of pharmacy and has excellent administrative experience. His research focuses on development of innovative formulations of drugs based on medicinal plants and evaluation of their activity *in vivo* and *in vitro*. His interests also include development of new dosage forms and analytical methods based on natural products and nutraceuticals.

Prof. Thaqif El Khassawna
University of Giessen, Germany

Prof. Thaqif El Khassawna is the Chair of the Experimental Trauma Surgery and Regenerative Medicine at the Faculty of Medicine, Justus Liebig University Giessen, Germany. An acclaimed expert in bone regeneration technologies, his groundbreaking work involves the extracellular matrix, osteoimmunological interactions, and the development of personalized biomaterial solutions. Prof. El Khassawna directs several international, extramurally funded research projects spanning basic and clinical domains, with his team currently leading over 12 clinical trials for innovative products. His contributions have recently been recognized with the prestigious 2024 GO-Bio award in the field of Bone Substitute Materials.

K-01

From Lipid Selection to Preclinical Production: Designing Effective Lipid Nanoparticles

Yvonne Perrie

Within our laboratories, we have been working on the intricate journey from lipid design to production strategies in the realm of Lipid Nanoparticles (LNPs) at preclinical volumes. We explore the foundational principles of lipid selection and formulation optimisation crucial for successful LNP development and consider the challenges in bridging the gap from bench to clinic cost-effectively and sustainably. By navigating through the interplay of formulation design (from the choice of lipid to the buffer selection) and production strategies, through to effective pre-clinical potency screening, our work aims to provide valuable insights into overcoming barriers and unlocking the full potential of LNPs for preclinical applications. Our findings reveal that despite consistent preparation of LNPs with diverse lipid compositions, characterised by typical critical quality attributes (CQAs) such as size, polydispersity index (PDI), zeta potential, and mRNA encapsulation, there existed discrepancies in the potency observed between in vitro and in vivo studies. Specifically, the choice of pegylated lipid in conjunction with the ionisable lipid significantly impacted the potency outcomes. These findings contribute significant insights to the ongoing landscape of mRNA research, highlighting that while CQAs serve as indicators of production process quality, they do not necessarily reflect treatment potency. Furthermore, conventional in vitro assessments alone do not adequately predict in vivo potency.

K-02

Insights into the Lethal Toxicity of Synthetic Psychoactive Cathinones from Studies in Larval Zebrafish

F. Scott Hall

Use of synthetic psychoactive cathinones (SPCs) has been increasing worldwide over the past two decades, although the true extent of SPC use and abuse is probably underestimated. SPCs have similar structures to amphetamines and mimic the stimulant and other effects of amphetamines depending on structural motifs that give them properties that are similar to methamphetamine (METH), methylenedioxymethamphetamine (MDMA), or cocaine. As hundreds of SPCs with unknown properties are used illicitly, high throughput behavioral and toxicological approaches are being developed to study this diverse class of drugs. In a series of studies at the University of Toledo, we have studied a closely related series of MDMA-like synthetic cathinones in our first efforts to develop structure-activity relationships for lethal toxicity. A series of studies has shown amphetamine-like behavioral outcomes and lethal toxicity, including neural, hepatic, and cardiac toxicity, as well as potentiation of lethal toxicity by high ambient temperatures. The mechanisms underlying toxicity to these organs has been confirmed, and the molecular mechanisms explored in more detail, using *in vitro* models for toxicity in each of those organs, as well as comparisons to lethal toxicity in mouse models. These additional approaches have helped to establish the validity of the zebrafish model for human drug overdose, as well as contributing to understanding of the underlying mechanisms (which are surprisingly poorly understood even for classical stimulant drugs). Overall, there is substantial evidence for abuse potential of these drugs, and lethal toxicity that is similar to amphetamines. This lethal toxicity clearly varies with structural motifs, and it is likely that, in a manner similar to fentanyl and heroin, some SPCs may have much greater potential for overdose than the drugs that they are replacing. The validity of the zebrafish model for predicting the effects of SPCs is shown by its ability to replicate many findings from rodent studies, including the effects of high ambient temperature on amphetamine/SPC lethal toxicity. It must be remembered however that the goal of these studies is to model human drug overdose. A number of factors complicate interpretations of human drug overdose, including concomitant use of other drugs,

particularly ethanol and nicotine. In our zebrafish model we have shown that ethanol, not surprisingly, exacerbates the lethal toxicity of MDMA and methylone (the β-ketone SPC analogue of MDMA). However, nicotine was found to be highly protective against the lethal toxicity of both drugs. Once understood, this surprising effect may provide an approach to treating stimulant drug overdose, which may affect not just acute lethality, but perhaps also long-term consequences of drug overdose in survivors and chronic drug users. This series of studies clearly shows that this model can now be used to examine the wide range of SPC drugs in use (>400), to determine structure activity relationships underlying SPC abuse liability and lethal toxicity, and to develop treatments for acute lethality as well as to prevent longer-term consequences of SPC overdose.

K-03

Revolutionizing Phytochemical Delivery: The Potential of Phytosomes as Advanced Delivery Systems

Talal Aburjai

To increase their bioavailability and absorption and get around the drawbacks and negative effects of traditional herbal extracts, Phytosomes are one of the growing nanotechnologies that can be used to improve the miscibility of bioactive phytoconstituents in lipid-rich barriers and overcome their poor bioavailability. Many novel drug delivery carriers are employed for targeted delivery of phytoconstituent at the site of action. Phytosomes are well-known biocompatible nanocarriers that can increase the solubility and permeability of phytopharmaceuticals among various novel drug delivery systems (NDDS). There is a strong need to develop a new drug delivery method to address the issue of low water solubility i.e., less in vivo absorption. Nanotechnology-based medication delivery methods are developing to solve the problem of low-solubility compounds' bioavailability [8]. Among all effective methods, Phytophospholipid complexes, also known as phytosomes, have become a successful method for enhancing the active ingredients' bioavailability.

K-04

Regenerative Medicine in Trauma Surgery and Osteology – from Pathophysiology to Personalized Therapy

Thaqif El Khassawna

Regenerative medicine is transforming the landscape of trauma surgery by harnessing the body's inherent healing potential and leveraging innovative biomaterials to accelerate and optimize recovery. Our research centers on the integration of regenerative medicine and functionalized biomaterials in the treatment of complex bone disorders, with a particular emphasis on pseudarthrosis, including atrophic and hypertrophic variants. Through clinical data, patient biopsies, and high-throughput gene expression analyses, we identified critical molecular pathways such as the NF1, ERK, CD68, and IL3, which delineate the distinct pathophysiological mechanisms underlying atrophic and hypertrophic pseudarthrosis. To translate these findings, mouse models were developed: an NF1 knockout model for atrophic pseudarthrosis and a macrophage depletion model for the hypertrophic variant. Our longitudinal studies confirmed the role of these genetic and molecular drivers in fracture healing. Furthermore, in vitro studies employing Nano-ESI-LC-MS proteomics revealed novel biomarkers, CALM1 and GARS, which exhibit significant differential expression in pseudarthrosis. Building on these insights, we engineered functionalized biomaterials targeting CALM1 and interleukins IL3 and IL4 to reverse atrophic and hypertrophic pseudarthrosis in respective rodent models. Personalized bioinks, derived from the patient’s bone marrow and adipose tissue, were developed for 3D bioprinting of scaffolds, enhancing the precision and efficacy of the therapeutic approach. This comprehensive investigation of regenerative medicine and functionalized biomaterials not only advances our understanding of bone pathology but also paves the way for innovative, personalized treatments that hold the promise of revolutionizing bone disorder therapy. Our work exemplifies how the convergence of molecular biology, biomaterials science, and clinical practice can forge new pathways for the treatment of complex skeletal diseases.

01-O-01
Synthesis, Characterization, Antiglycation Evaluation and Molecular Docking for Nicotinic Acid Derivatives

Soha Taher Mansour Telfah

Twenty compounds with different chain length, ester or amid functionality had been synthesized from nicotinic acid and its mono- and dichlorinated analogue at position number 5 or position number 5 and 6, respectively. The compound synthesized has been characterized using NMR, MS and IR spectroscopy, and their structures were confirmed. Lead identification and optimization are crucial steps in drug discovery especially to modulate lead potency, biological activity and toxicity profile. Advanced glycation end products (AGEs) are formed after prolonged period of hyperglycemia after irreversible binding between macromolecules like protein or lipid. The accumulation of AGEs had deteriorating effect in diabetes mellitus (DM) and exaggerated its complication. Antiglycation, antioxidant activity had been evaluated for nicotinic acid and its analogue and investigated using spectroscopic method for HSA-glucose binding, DPPH assay method, respectively. It has been found that the percentage of inhibition was duplicated from 8.32% for nicotinic acid to 17.50% for both 6-cyclohexyloxy-5-chloro and 5,6-Dichloroethyl nicotinate derivative in a concentration dependent manner. Binding affinity was confirmed using molecular docking and infrared microscopy. Protein fragmentation pattern by reactive oxygen species was investigated using polyacrylamide gel electrophoresis (SDS-PAGE), A protective effect for nicotinic acid and optimized compound were confirmed by single band rather than two band for glycated albumin.

01-O-02
Oxaliplatin-based Platinum (IV) Complexes with Biologically Active Sulfur and Selenium Ligands

Wolfgang Weigand, Marie-Christin Barth, Xiao Liu

Cancer treatment with platinum(II) complexes is accompanied by severe side-effects and mechanisms of intrinsic or acquired resistance.1 To overcome these drawbacks, researchers have traced the path of platinum(IV) complexes. Inside the cell, the less toxic platinum(IV) complexes are reduced by intracellular biomolecules and

release the cytotoxic platinum(II) complex and its free axial moieties. We report on the formation of new oxaliplatin-based platinum(IV) complexes by reaction with DSC- activated (DSC: N,N′-Disuccinimidyl carbonate) thiols via thiocarbonate linkage. Three model complexes based on aliphatic and aromatic thiols, as well as one complex with N-acetylcysteine as biologically active thiol were synthesized. Their biological behavior was evaluated against two ovarian carcinoma cell lines and their cisplatin-resistant analogues.2Moreover, we reports on synthetic and cytotoxicity studies of platinum(IV) complexes containing α-lipoate (ALA) and its isologous 1,2-diselenolane (SeA) and cyclopentyl (CpA) analogues.3 Three representative complexes were assessed for their redox potentials, reduction studies with ascorbic acid (AsA), lipophilicity, cellular accumulation and ROS production. Although platinum(IV) complexes containing a single 1,2-diselenolane were more effective than 1,2-dithiolane analogues throughout all tested cell lines, cyclopentyl containing species possessed higher lipophilicity, demonstrated the most potent cytotoxicity, part of them even superior to the parent drug oxaliplatin. The difference in cytotoxicity might be ascribed to the different capacities of increasing cellular ROS levels (especially for SeA containing complexes) and the ease of reduction from platinum(IV) prodrugs to active platinum(II) species.

01-O-03

Optimization of 4-Hydroxy-2-Quinolone-3-Carboxamide Scaffold as Potential Anticancer Agents

Dima A. Sabbah

Cancer is a multifactorial disease associated with a vast incidence and death rates. Genetic mutations and aberrant signaling pathways are considered as one of numerous factors predisposing cancer development. Derivatives of 4-hydroxy-1,6-naphthyridin-2-one-3-carboxamide and 4-hydroxy-1,8-naphthyridin-2-one-3-carboxamide were designed and synthesized in order to optimize the scaffold of 4-hydroxy-2-quinolone-3-carboxamide. The identity of the synthesized analogues was characterized using FT-IR, 1H NMR, 13C NMR, and elemental analysis. Biological investigations against human colon carcinoma cell (HCT-116) and breast cancer cell (MCF-7) lines showed that analogues exhibit potent and selective inhibitory activity. The 4-hydroxy-1,6-naphthyridin-2-one-3-carboxamides displayed cytotoxicity

with IC50 HCT-116 = 43.3-360.0 μM, IC50 MCF-7 = 20.0-400.0 μM. However, analogues of 4-hydroxy-1,8-naphthyridin-2-one-3-carboxamide exerted cytotoxicity with IC50 HCT-116 = 22.9-208.0 μM, IC50 MCF-7 = 58.2-300.0 μM. The induced-fit docking (IFD) studies against potential receptors such as phosphoinositide-3-kinase (PI3Kα), histone deacetylase (HDAC-II), estrogen receptor (ER), and caspase-3 receptor revealed distinguishable binding scores against HDAC-II encouraging us to dip deeply into the molecular level to better retrieve potential receptor (s).

01-O-04
Selective Carbonic Anhydrase Modulators as New Antibacterial Agents or Probiotics Stimulators

Simone Carradori

With the advent of the antibiotic era, the overuse and inappropriate consumption and application of antibiotics have driven the rapid emergence of multidrug-resistant pathogens. It is therefore important to develop anti-bacterial drugs with novel mechanisms of action. The carbonic anhydrase (CA) superfamily represents an attractive novel target for the treatment of infectious diseases. Until recently, only α- and β-CAs were considered to be present in *Helicobacter pylori* working in a complex interplay with urease. Thus, CA inhibition can be an innovative approach to tackle antibiotic resistance. The synthesis of several inhibitors was accomplished via classical and microwave-assisted procedures keeping into consideration the presence of specific functıonal groups. We then used four strains of *H. pylori*, the commercial strain NCTC 11637 and three clinical isolates, which were characterized using metronidazole, clarithromycin, and amoxicillin as benchmarks. Different chemical scaffolds (phenols, sulfonamides, coumarins) were designed and investigated in order to assess inhibitory potency and isoform selectivity. Further microbiological (MIC/MBC, anti-biofilm effect, checkerboard test) investigations in vitro, in silico and in vivo were performed on the best-in-class derivatives.Interestingly, there are convincing literature data, which prove that interference with the CA activity from various bacteria leads to an impairment of the bacterial growth and virulence, which in turn gives a significant anti-infective effect. Conversely, the probiotic CA activation could be an

innovative strategy to stimulate the performance of our gut microflora in the prevention and treatment of infectious diseases.

01-O-05
Susceptibility of Gramine Chain-Cyclized Analogues to Polymerization in Trifluoroacetic Acid

Muhammed Alzweiri

Gramine exhibits a range of therapeutic properties, including antiviral and antibacterial effects, but its significant toxicity limits its clinical application. To exploit its therapeutic potential while reducing toxicity, modifications involving chain cyclization of the dimethylamine terminus have been explored, resulting in compounds that are more rigid, selective, and biologically effective. This study synthesized a series of 3-indolyl methanamines, including morpholine, piperidine, and piperazine derivatives, which demonstrated limited solubility in standard NMR solvents. To enhance solubility and resolution in NMR analysis, trifluoroacetic acid (TFA) was utilized. The morpholine derivative provided well-resolved NMR spectra, attributed to reduced nitrogen interconversion and effective hyperconjugation. In contrast, the N-methyl piperazine derivative rapidly dissolved and precipitated, indicating decomposition. TFA selectively catalyzed the decomposition of N-methyl piperazine while having minimal effect on morpholine derivatives, leading to polymerization of the former. The kinetics of decomposition revealed that TFA accelerated the process significantly compared to HCl, underscoring TFA's dual role as a solvent and catalyst. This research offers valuable insights into the structural stability and reactivity of modified gramine derivatives, highlighting the potential for further therapeutic applications

01-O-06
Synthesis And Characterization Of Novel Polymer Based On Amino Acids That Support Metal Nanoparticles

Faten Al.Regeb

Novel biodegradable and biocompatible poly(ester amide)s and poly (amide)s nanoparticle polymers based on non-toxic building monomers such as aromatic amino acid tyrosine and α-amino acid lysine were synthesized for use in environmental and drug delivery applications. Interfacial polymerization was used to synthesize poly(ester amide)s

and poly (amide)s nanoparticle polymers. The polymers that have been prepared are poly(tyrosine terephthalate ester amide) (TT), poly(tyrosine- 2,6-pyridine carbox ester amide) (TP), poly(tyrosine fumaryl ester amide) (TF), poly(tyrosine-1,3- cyclohexane ester amide) (TC), poly(lysine terphthalamide) (LT), poly(lysine-2,6- pyridineamide) (LP), poly(lysine fumaramide) (LF) and poly(lysine- 1,3-cyclohexamide) (LC). The polymers were linked to copper ions and then copper ions were reduced with sodium borohydride to obtain Cu-NP polymers. Solubility tests, Fourier Transform Infrared Spectroscopy (FTIR), solution viscosity, x- ray diffraction (XRD), Transmission electron microscopy (TEM), Particle size and zeta potential measurements, Thermo Gravimetric Analysis (TGA), Differential Scanning Calorimetry (DSC) and nuclear magnetic resonance spectroscopy (NMR) techniques were used to characterize the polymers obtained. The metal ions uptake and kinetics of adsorption and desorption of metal on the polymer's surface have been studied. Batch equilibrium and column approaches were used to investigate the uptake characteristics of the polymer towards Cu(II) ions in aqueous solutions as a metal concentration, contact duration, function of pH, and temperature. Atomic Absorption Spectroscopy (AAS) was used to evaluate the amount of copper ion uptake by the polymers. The isothermal properties and kinetics of metal ions adhering to polymers had been studied. The experimental data were analyzed using Langmuir, Freundlich and DubininRadushkevich adsorption models. In concentration variation isotherm studies, the polymers were observed to selectively absorb Cu(II). 0.10 M HNO3 was used to regenerate the metal-loaded polymers. Polyamide NPs were found to have higher metalion uptake capacity for Cu(II) than polyester amide NPs. High sorption rates for Cu(II) to polyester amides and polyamide NPs have observed during the first 4 and 15 hours, respectively. A high percentage of uptakes toward Cu(II) to poly(tyrosine-fumaryl esteramide) and poly(lysine-terphthalamide) NPs but a low percentage of uptakes toward Cu(II) to poly(tyrosine-1,3-cyclohexane esteramide) and poly(lysine-1,3- cyclohexamide) NPs.The adsorption capacity (qm) to Cu(II) ions was high for TP and LF NP polymers.The cumulative percent recovery is higher for TT and LT polymer NPs.

02-O-01
Selected Statins as dual Antiproliferative-Antiinflammatory Compounds

Violet Kasabri, Buchra Haj Hussein, Yusuf Al-Hiari, Shereen Arabiyat et al.

We hypothesized that superlative dual cytotoxicity-antiinflammtion bioefficacies of 9 selected lipophilic statins correlate to their chelation effect of 3,5-dihydroxyheptanoic acid. Lipophilic-acid chelating statins have been screened for in vitro duality of proliferation inhibition and NO-radical scavenging capacities. Their spectrum of selectivity indices for safety in PDL fibroblasts -based 72h incubations was reported. Surprisingly despite its lack on macrophages LPS-triggered inflammation over 5-200 μM and unlike the 8 statins; cerivastatin had growth inhibition IC_{50} values of 40nM (SW620), 110nM (HT29), 2.9 μM (HCT116), 6μM (SW480), and most notably 38μM (<50 μM, in Caco2). Exclusively cerivastatin exerted antitumorigenesis IC_{50} values <50 μM in all T47D, MCF7 and PANC1 72h cultures. In statins with greater antiinflammation affinity than indomethacin's; lovastatin had cytotoxicity IC_{50} values <20 μM in SW620<HT29<ACT116<SW480 and >100 μM in Caco2. Atorvastatin was found of viability reduction IC_{50} value <20 μM in HCT116<SW620. Simvastatin exerted growth inhibition IC_{50} values <20 μM in HT29< SW620<SW480 and MCF7. Rosuvastatin, pitavastatin and fluvastatin proved equipotency to indomethacin but cytotoxicity IC_{50} values >50μM in T47D, MCF7 and PANC1. Rosuvastatin had antineoplastic IC_{50} values (<50 μM) in SW620<SW480<MCF7. Pitavastatin was ascribed cytotoxicity IC_{50} values (<50μM) in HT29<SW620<HCT116<SW480. Fluvastatin had antiproliferation IC_{50} values (<50μM) in SW620< HT29<SW480<HCT116, and the rest were >50 μM in remaining colorectal, breast and pancreatic cancer cell lines. In statins with appreciable antiinflammation but reasonably lower affinity than indomethacin's and cytotoxicity IC_{50} values >50μM in T47D, MCF7 and PANC1; pravastatin had viability reduction IC_{50} values <50μM in HT29<HCT116. Mevastatin was reported for growth inhibition IC_{50} values <50μM in HT29<SW620<HCT112<SW480. Antitumorigenesis IC_{50} values>50 μM were for statins in remaining colorectal cancer cell lines, breast cancer and pancreatic cancer cell lines. Among the rest, cerivastatin warrants further novel scaffold development to maximize

efficacy and optimal molecular action mechanisms of chemotherapy/prevention.

02-O-02
The Dissemination of Multiple Drug Resistance in Some Coliforms Isolated from Environmental and Clinical Samples in Jordan

Randa Nayef Haddadin

The emergence and dissemination of multiple drug-resistant (MDR) coliform bacteria pose a significant challenge to public health. Furthermore, numerous reports have indicated an increase in the spread of Extended-Spectrum Beta-Lactamase (ESBL)-producing strains. This has exacerbated the clinical challenge, as ESBL-producing bacteria often exhibit resistance to multiple classes of drugs, necessitating the use of more potent and frequently more toxic medications. In this talk, the findings of our research team will be presented regarding the prevalence of MDR in clinical specimens of *Klebsiella* and in environmental samples of *Escherichia coli* collected from homes and hospitals in Amman, Jordan. Also, the prevalence of ESBL-producing strains and the distribution of certain ESBL genes within these isolates will be evaluated.Clinical isolates were obtained from microbiology laboratories in several hospitals in Amman, while environmental isolates were collected from various locations in homes and hospitals. The isolates underwent antibiotic susceptibility testing. The release of ESBLs was assessed using combined disc diffusion, and ESBL genes were screened via PCR.Among the environmental *E. coli* isolates, 50% were MDR, and the distribution of these isolates was comparable between hospital and household environments ($p > 0.05$). The proportion of ESBL producers was 60% in household settings, while in hospital settings, it ranged from 50 to 71%. For clinical isolates, the prevalence of ESBL-producing *K. pneumoniae* was 68%. The distribution of ESBL genes SHV, TEM, and CTX-M in K. pneumoniae was 92%, 62%, and 40%, respectively. The widespread dissemination of MDR, particularly ESBL genes among coliforms in community and hospital settings, is alarming and necessitates the implementation of comprehensive antimicrobial stewardship and stringent infection control programs.

02-O-03

Oxidant-Activated Protein Kinase G Facilitates Pulmonary Vasodilation Mediated by Endothelial TRPV4-Channels

H. Alhabashneh, A. Greenstein, A. Gurney

Smooth muscle protein kinase G (PKG) mediates vasodilation whether activated by the NO/cGMP signalling pathway or by oxidation of cysteine residues in the PKGIα subunit1. PKG is also present in endothelial cells, but its physiological role in the endothelium is less well understood. This study investigated the function of oxidant-activated PKG in the endothelium of pulmonary arteries, by comparing endothelium-dependent relaxation in vessels from wild type (WT) mice with vessels from PKG[C42S]KI mice, which lack the cysteine-based oxidant sensor1.Pulmonary arteries were isolated from the lungs of WT and PKG[C42S]KI mice, contracted with 30nM U46619 and tension measured using wire myography. Carbachol (100 nM–1 mM), or theTRPV4 agonist GSK1016709A (3-100 nM), was then applied to evoke endothelium-dependent relaxation, measured as the % loss of U46619-induced tone. The endothelial surface of fluo-4loaded arteries was imaged using spinning-disc confocal microscopy to monitor Ca2+ signals in the absence (pulsars) and presence (sparklets) of 1μM cyclopiazonic acid2, applied to deplete endoplasmic reticulum (ER) Ca2+ stores. Measurements are given as mean ± S.E.M. and compared using two-tailed unpaired t-tests.Carbachol caused similar relaxation of pulmonary arteries from WT and PKG[C42S]KI mice. WT vessels reached a maximum relaxation of 38 ± 9% with pEC50 = 5.9 ± 0.1 (n=9), while PKG[C42S]KI vessels achieved 40 ± 9% relaxation with pEC50 = 5.8 ± 0.1 (n=7). Arteries of both genotypes failed to relax significantly to carbachol when the endothelium was removed. GSK1016790A was less potent in arteries from PKG[C42S]KI mice (pEC50=7.48 ± 0.08, n=10) compared with WT mice (pEC50=8.0 ± 0.1, n=8; P=0.0005), but evoked a similar maximum relaxation in each case (WT= 91 ± 2%; PKG[C42S]KI= 86 ± 3%). Removing the endothelium inhibited relaxation to GSK1016790A in WT arteries, but not in arteries from PKG[C42S]KI mice. The frequency of endothelial Ca2+ pulsars increased from 0.6 ± 0.2Hz to 1.5 ± 0.3Hz (n=11, P=0.016) in WT arteries after applying 10μM carbachol and reached a similar level (1.3±0.4 Hz, n=7) in PKG[C42S]KI arteries exposed to carbachol. Therefore, muscarinic receptor activation evoked Ca2+ release from

the ER in arteries of both genotypes. In contrast, GSK1016790A (10nM) was less effective at evoking endothelial sparklets in PKG[C42S]KI arteries compared to WT. Sparklets were detected at 15 ± 2 sites/5µm2, firing at 0.24 ± 0.02 Hz (n=5) in PKG[C42S]KI arteries compared with 92 ± 27 sites/5µm2 and 1.5 ± 0.4 Hz (n=5, P=0.02) in WT arteries.The loss of endothelium-dependent relaxation to GSK1016790A in PKG[C42S]KI arteries, along with its reduced ability to generate Ca2+ sparklets, indicates that vasodilation mediated by endothelial TRPV4 channels requires oxidant activation of PKG. In contrast, carbachol stimulated endothelial ER Ca2+ release to evoke relaxation independently of oxidant activated PKG, suggesting it did not employ TRPV4 channels.

02-O-04
Investigation of the Nephroprotective Activity of *Moringa* peregrina Leaves Aqueous Extract in Mice

Abdulhakeem Hasan, Reem Issa, Lidia Al-Halaseh, Manal Abbas, Nariman Al-Jawabri, Rawan Al-Suhaimat

Traditional remedies for Moringa peregrina leaves have a variety of uses with confirmed biological and therapeutic effects, as per published reports. The current study aims to evaluate the ability of the leaves aqueous extract to protect from nephrotoxicity in gentamicin-treated mice. Phytochemical analysis for the aqueous extract was performed using DPPH (2, 2-Diphenyl-1- picrylhydrazyl) assay for antioxidants, Folin-Ciocalteu, AlCl3 and HPLC-MS/MS analysis, focusing on phenol and flavonoid content. The nephroprotective activity of the prepared extract was evaluated by means of variable biochemical parameters including Creatinine (Cr), Uric Acid (UA), and Urea (Ur). In addition, histological examination of renal tissues was performed in all mice groups (control, gentamicin-induced (150 mg/Kg ip) and aqueous extract-orally treated groups (500 and 1000 mg/Kg)). Findings reveal that the prepared extract has total phenols (555.57±0.92 mg/g, equivalent to gallic acid), flavonoids (40.08±1.56 mg/g, equivalent to quercetin), and DPPH IC50 (3.10 µg/ml). HPLC-MS/MS analysis revealed the presence of 10 phenols and flavonoids compounds. In vivo studies showed a significant ($P < 0.05$) reducing effect for the high-dose treatment, on serum and urine concentrations for UA, Cr, and U, among the nephrotoxicity induced mice. Low-dose treated group showed

significant reduction on serum concentration of UA, Cr and U, but only for Cr concentration in urine. The histological examination showed an improvement in the image of the renal tissue among the inducednephrotoxicity mice, which was treated with high-dose extract. In conclusion, leaves aqueous extract of M. peregrina have shown potential protective effect to counteract some of the gentamicin consequences on kidney functions.

02-O-05
An in vitro Anticoagulant Effect of Aqueous Extract of Sumac *Rhus coriaria* L.

Shoroq Shawar, Rezq Basheer-Salimia, and Hatem A Hejaz

In the context of global health, where cardiovascular diseases, particularly thromboembolic disorders, pose significant burdens in terms of morbidity and mortality, there's a growing interest in natural anticoagulant compounds as potential therapeutic alternatives. Sumac (Rhus coriaria L.), a well-known spice with a history of medicinal applications, holds promise in this regard. This study investigated the impact of Palestinian and Turkish-cultivated aqueous Sumac extracts on blood coagulation, specifically through prothrombin time (PT) and activated partial thromboplastin time (aPTT) assays.Sumac (Rhus coriaria L.) fruits were sourced from two distinct locations (Turkey and Hebron). The fruits were initially cleaned to remove any impurities, fruits were evenly spread out and shade-dried at room temperature for one week and were carefully stored in dark, sealed bags at room temperature until the extraction process. The 5% Sumac aqueous extracts, were utilized for in vitro testing to assess their potential anticoagulant activity in blood samples obtained from healthy individuals.The findings reveal a significant ($P < 0.05$), concentration-dependent prolongation of aPTT by both Sumac extracts, indicating a specific influence on the intrinsic coagulation pathway, while the extrinsic pathway remains unaffected. These results suggest the potential of Sumac extract as a natural anticoagulant agent, offering prospects for innovative therapeutic approaches or complementary strategies in thromboembolic disorder management. Our study sheds light on the potential hemostatic properties of aqueous sumac extracts, both Turkish and Palestinian varieties. Through meticulous evaluation of their impact on coagulation using PT and aPTT assays, we

uncovered that these extracts significantly prolonged aPTT in a concentration-dependent manner. These comprehensive analyses will contribute to a more thorough understanding of the therapeutic potential of sumac and its constituents, bringing us closer to the development of effective and safe hemostatic remedies.

02-O-06

A Tripartite Investigation into the Bioactivity of *Artemisia judaica*, *Portulaca oleracea*, and *Terminalia chebula* across Antimicrobial, Antioxidant, and Neuropharmacological Realms

Belal Rahhal, Mohammad Qneibi, Nidal Jaradat, Mohammed Hawash, Mohammad Qadi, Linda Issa, Sally Rajab, Yasmeen Feras, Nataly Bairat, Sosana Bdir, Mohammad Bdair, Samia Ammar Aldwaik , Samer Mudalal

Harnessing the potential of traditional medicinal plants is crucial for discovering novel therapeutics. This study aims to explore the phytochemical richness and bioactivities of aqueous extracts from three medicinal plants: *Artemisia judaica*, *Portulaca oleracea*, and *Terminalia chebula*, focusing on their antimicrobial, antioxidant, and neuropharmacological properties.Qualitative and quantitative phytochemical tests were conducted to identify active compounds in each plant extract. In-vitro models measured their ability to inhibit lipase, DPPH (free radical), α-amylase, and microbial strains. Electrophysiological recordings were also conducted to investigate the interaction between herbal extracts and AMPA receptor subunits.Phytochemical screening revealed the presence of alkaloids, cardiac glycosides, phenols, tannins, and terpenoids in all extracts. *T. chebula* exhibited high levels of phenols and flavonoids, demonstrating prominent antioxidant activity comparable to Trolox, and significant antidiabetic and anti-obesity effects. All extracts exhibited varying degrees of antimicrobial activity. Electrophysiological recordings highlighted that the herbal extracts modulated AMPA receptor dynamics, with *T. chebula* showing the strongest inhibitory effect. This study underscores the diverse therapeutic potential of these plant extracts. Integrating traditional knowledge with modern pharmacological approaches provides insights into their bioactive profiles and neuropharmacological effects. These findings advocate for further exploration of these medicinal plants as sources of novel

therapeutics, emphasizing the importance of botanicals in drug discovery and development.

02-O-07
Cosmetic and Therapeutic Uses of Plant Extracts and Preparations

Mohammad Isam Hasan Agha

A study prepared in the Faculty of Pharmacy at Damascus University Under the supervision of Prof. Dr. Mhd Isam Hasan AghaThe spread of common skin problems (acne, acne, skin pigmentation and skin aging) and the continuous environmental changes, the negative impact of which increases day by day, necessitate interest and expansion in the study of appropriate industrial and plant preparations and treatments to reduce the spread of various skin lesions and to prevent skin diseases.To investigate the spread of the use of plant extracts and preparations in the prevention and treatment of skin diseases.A theoretical study through global search engines and a questionnaire to determine the prevalence of the phenomenon of self-treatment using pharmaceutical preparations containing plant or natural products (tea tree oil in the treatment of common acne, willow in the treatment of comedones, licorice in the treatment of pigmentation and frankincense essential oil in the treatment of skin aging and sunscreens and their role in reducing skin deterioration and pathology).The spread of many plant extracts and herbal preparations used in the prevention and treatment of skin diseases, which have proven their actual role in solving some skin problems and preventing their occurrence and treating them, which the questionnaire conducted on 200 participants of both sexes and different ages showed their use of these preparations and their confidence in them, but in most cases without resorting to medical advice.In the use of tea tree oil in the treatment of common acne, it was found that the compound Tribinin-4-ol, at an appropriate concentration, shows positive properties and a role in the treatment of acne.In the use of willow bark extract in the treatment of comedones, itwas found that willow extracts, at an appropriate concentration, show properties that regulate sebum secretion and exfoliate the skin and havea positive role in the treatment of blackheads and whiteheads.In the use of licorice extract to treat skin pigmentation, it was found that the compound Galbiridin and antioxidants, at appropriate concentrations, show

properties that scavenge free radicals and have a positive role in the treatment of skin pigmentation.In the use of frankincense essential oil in the treatment of skin aging,it was found that its active components, alpha-Pinen, Ocimen and linalool, at an appropriate concentration, show properties that inhibit collagenase and elastase enzymes.

02-O-08

Updating Trends and Profiles of Poisoning Cases: A 17-Year Evaluation of Exposure Calls Managed by the Poison Control and Drug Information Center in Palestine

Sa'ed H. Zyoud

The Palestinian Poison Control and Drug Information Center (PCDIC) was founded in 2006 to offer current information on medications and assist in the prompt diagnosis and management of poisoning cases. Both accidental and intentional poisoning represent a serious public health issue that requires intervention. This study seeks to assess the types of poisoning exposure calls received by the PCDIC in Palestine over a 17-year timeframe.The analysis utilized the poisoning enquiries database from the Palestinian PCDIC, covering the years 2006 to 2022. We extracted demographic data and the nature of poisoning exposure calls for descriptive analysis. primary objective is to assess trends in poisoning exposure calls to the PCDIC based on type and mode of poisoning over 17 years. The secondary objective is to analyze the characteristics of human exposure cases reported. Over the 17 years since the Center was established, it received a total of 12,039 inquiries, with 74% coming from physicians. There was a significant rise in the number of poisoning exposure calls during this period ($r=0.932$; $P < 0.001$). Unintentional poisoning accounted for the largest portion of calls at 55.3%, followed by suicidal poisoning at 12.5%, with children making up the majority of cases. Most exposures occurred at home (96%) and were predominantly due to ingestion (97.2%). The primary substances involved in intentional exposures included pharmaceuticals (51.33%), pesticides (11.77%), and household products (15.51%). In general, the majority of poisoning calls were linked to pharmaceutical agents, particularly non-opioid analgesics (20.2%), antihistamines (14.7%), and antibiotics (13.9%).Poison exposures and poisonings have risen significantly in Palestine, leading to increased morbidity. The PCDIC has played a crucial role in preventing unnecessary emergency

department visits. Its database serves as an important national resource for tracking and monitoring cases of poisoning exposure, functioning as a real-time surveillance tool that benefits public health. It is advisable to make reporting to the PCDIC mandatory and to ensure its activities receive adequate national support. Improving poisoning safety education and implementing targeted interventions are vital for decreasing the occurrence of poisoning incidents.

02-O-09
Novel Synthetic Glutamate Transporter Enhancer for the Treatment of Opioids Overdose

Youssef Sari

Chronic use of opioids has been a major health problem. Studies from ours and other groups revealed that chronic exposure to opioids downregulated astrocytic glutamate transporter 1 (GLT-1), which regulates the majority of glutamate uptake. In addition, our lab demonstrated that beta-lactam antibiotic, ceftriaxone, attenuated hydrocodone-induced downregulation of the expression of GLT-1 and cystine/glutamate antiporter (xCT) in central reward brain regions. Recent studies from our lab investigated the effects of overdose of several opioids such as hydrocodone, morphine and fentanyl, and the efficacy of novel synthetic non-antibiotic beta-lactam drug, MC-100093, in the expression of GLT-1, xCT, and neuroinflammatory factors, and locomotor activities. The results showed that GLT-1 enhancer, MC-100093, attenuated fentanyl overdose-induced downregulation of GLT-1 and upregulation of IL-6 in the nucleus accumbens (NAc) as well as attenuated fentanyl-induced increase in locomotor activity. In addition, MC-100093 attenuated morphine overdose-induced downregulation of GLT-1 and upregulation of IL-6 in the NAc. Furthermore, GLT-1 enhancer attenuated hydrocodone overdose-induced alteration in respiratory exchange and downregulation of GLT-1, xCT and BDNF in target reward brains regions such as the NAc, amygdala, and dorsomedial prefrontal cortex. Finally, our study showed that MC-100093 attenuated hydrocodone overdose-induced increase in inflammatory mediators such as TNF-α and HMGB1 in these brain regions. These findings revealed the beneficial therapeutic effects of novel synthetic GLT-1 enhancer, MC-100093, in mouse models of opioids overdose.

02-O-10
Design and Data Analysis of Biosimilar Clinical Studies

Nasir Mohammad Yasir Idkaidek

Biosimilar drug product is a biological product that is highly similar to a licensed reference biological product with no clinically meaningful differences in terms of safety, purity, and potency. Examples include antibodies, vaccines, recombinant/fusion proteins and gene therapy. Studies include quality, non-clinical and clinical comparisons. The presentation will focus, with examples, on clinical studies in terms of design, sample size and statistical calculations.

02-O-11
Effect of Fasting-Induced Headache on Calcitonin Gene Related Peptide (CGRP) and Other Clinical Biomarkers on the First Day of Ramadan

Abdulrahman Alwhaibi et al

Fasting-induced headache has been shown to occur in the first day of Ramadan and clearly declined thereafter. Despite the wealth of knowledge about different types of headache such as migraine-, cluster-, and tension-type headache, research on the mechanism underlying fasting-induced headache as well as its treatment is still scarce. Our study aimed to investigate any association between potential headache-related plasma biomarkers, including C-reactive protein (CRP), Magnesium, Folic acid (vit B-9), Cobalamin (vit B-12), homocysteine and Calcitonin Gene Related Peptide (CGRP) and fasting-induced headache during the first day of Ramadan. This was a follow-up study of a randomized, open-label trial that evaluated the effect of paracetamol as a prophylactic therapy for Fasting-induced headache (Saudi Clinical Trials Registry No. 22122102). Blood samples from a sub-matched-population of treatment and control groups were withdrawn after the 1st dose of paracetamol. Plasma was separated for 61 participants, 31 and 30 were in the treatment group and control groups, respectively. Eleven participants in the treatment and 10 of the control group have suffered from fasting-induced headache. No significant differences were found in the levels CRP, Magnesium, vit B-9, and vit B-12 between headache and non-headache arms whether in the treatment or control groups.

Interestingly, homocysteine was significantly reduced in all participants who had headache compared to those without headache (median 6.98 [1.88] vs. 7.66 umol/L [2.68]; $p < 0.05$). Surprisingly, when CGRP was measured using immunoassay, it was significantly elevated in headache-suffering participants despite being in the treatment (121.52 [18.46] vs. 105.75 pg/mL [11.92]; $p < 0.01$) or control group (128.44 [30.77] vs. 104.60 pg/mL [25.38]; $p < 0.001$). Additionally, elevated level of CGRP was found to increase the risk of developing fasting headache [OR: 1.316, 95% CI 1.063 – 1.215, $p < 0.001$]. Our findings revealed for the first time the role of CGRP in fasting-induced headache and suggest further investigation in signaling pathways downstream CGRP receptors. Furthermore, modulation CGRP or CGRP receptors could have a clinical application in the treatment or prevention of fasting-induced headache.

02-O-12

In Vivo Assessment of Black Seed Oil Single Dose on Prednisolone Pharmacokinetics

Rana Abutaima

Black seed oil is widely used in the Middle East to treat different illnesses suchas inflammatory conditions. This might result in herb-drug interactions if black seed oil was administered with other medications such as prednisolone. To assess the pharmacokinetic herb-drug interaction among black seed oil and prednisolone in Wistar rats suggesting p-gp inhibition as a potential mechanism.A high performance liquid chromatography method was developed and validated to quantify prednisolone in rats' plasma. Three groups of Wistar rats (n= 5) per groupwere administered single dose of one of the following compounds: vehicle, verapamil (p-gp inhibitor, 50 mg/kg) or black seed oil (5 mL/kg) 15 minutes before administering prednisolone (5 mg/kg). Plasma samples were collected at 0, 0.16, 0.25, 0.5, 1, 2, 4, 8, and 24 hrs and quantified. Non-compartmental analysis was employed to calculate primary pharmacokinetic parameters; C_{max}, $AUC_{0\text{-last}}$, t_{max}, Cl/F. Statistical significance was considered at $p \leq 0.05$. Both C_{max} and $AUC_{0\text{-last}}$ of prednisolone were significantly lower in the black seed treatment group compared to the negative control (65%, $p<0.0001$ and 25%, $p= 0.0029$, respectively). In the positive control group who received verapamil and prednisolone, C_{max}

and $AUC_{0\text{-last}}$ increased by 1.75-folds and 8-folds ($p<0.0001$), respectively. T_{max} was achieved at 0.16, 0.5, and 0.25 h in the negative control, verapamil, and BSO-treated groups, respectively.However, it remained statistically comparable. Co-administration of black seed oil with prednisolone resulted in herb-drug interaction, however, this interaction does not presumably occur at the level of p-gp inhibition. Another pharmacokinetic process might be involved. In conclusion, patients who are receiving prednisolone need to avoid co-administration of their medication with black seedoil.

02-O-13

Epigenetics aiding Precision Medicine and Pharmacogenetics: Determining Optimum Treatment Strategy and Outcome in Pancreatic Cancer

Aamir Ahmad

Pancreatic cancer is an aggressive cancer with disproportionately high mortality rates. More than half a million new cases of pancreatic cancer are diagnosed worldwide annually and the 5-year survival rate of patients with advanced disease is only about 1%. Drugs approved for pancreatic cancer include 5-FU/capecitabine, Gemcitabine, Abraxane, Irinotecan etc. as well as some drug combinations such as Gemcitabine + Cisplatin/Oxaliplatin, OFF and FOLFIRINOX. Drug combinations offer better outcome, as compared to monotherapy, but often associate with increased toxicity. With the advancements in the field of pharmacogenetics, it is being realized that patients respond differentially to different therapies, based on their genetic make-up and our research indicates an epigenetic signature for the same as well. In pancreatic cancer, time is of the essence and patients' prognosis can be improved by administering them the most optimum therapy, based on their epigenetic signature. This represents a major advancement in the precision medicine and treatment of pancreatic cancer patients with novel role of select epigenetic signatures in identification of therapies that the patients are most likely to respond to.

02-O-14
Proteomic Analysis of Paracetamol Usage for Fasting-Induced Headaches During Ramadan

Mohammed A. Assiri et al.

Fasting-induced headaches is common during the first few days of Ramadan, and paracetamol is the primary therapeutic agent used to manage this condition. In this study, we investigated the proteomic changes associated with paracetamol usage among fasting participants using an untargeted proteomics approach. The results revealed significant differences in the expression levels of proteins linked to inflammation, immune responses, acute phase response, and hormone and enzyme binding. Specifically, the levels of transthyretin, fibrinogens (alpha, beta, and gamma chains), haptoglobin, alpha-1-acid glycoprotein 1, and metalloproteinase inhibitor 1 were differentially expressed between the studied groups. This work sets the foundation for further studies to comprehensively understand the pathophysiology of fasting-induced headaches and to design well-targeted therapeutic strategies. Future research should focus on validating these proteomic findings and exploring the specific mechanisms by which paracetamol modulates the observed protein expression changes.

02-O-15
Personalized Medicine Approaches to Interventions in Asthma–COPD Overlap: Alterations in the Respiratory Microbiome During and After Exacerbation

Ahmad Alsayed

Asthma, chronic obstructive pulmonary disease (COPD), and respiratory tract infections often interact in complex ways, providing challenges for clinical management that necessitate creative approaches. Utilizing next-generation sequencing in our recent study, alterations in the respiratory microbiome during asthma-COPD overlap (ACO) exacerbations reveal decreased taxonomic richness, suggesting microbial shifts contribute to exacerbation pathogenesis. These insights advocate for microbiome-targeted therapies to improve clinical outcomes. This study explored the respiratory microbiome's role in patients with ACO during both stable and exacerbations states. The study found that during exacerbations, there is a notable decrease in

taxonomic richness and an increase in evenness within the respiratory microbiome, indicating a shift in microbial composition. These changes suggest that specific bacterial genera, such as Prevotella, may play a role in exacerbating the symptoms of ACO. The findings highlight the importance of understanding microbial dynamics in respiratory diseases, suggesting that targeted antibiotic therapies during exacerbations could improve clinical outcomes for patients with ACO. In a case study of a 27-year-old male with recurrent viral URTIs, bovine colostrum (BC) administration resulted in the cessation of infections over one year, highlighting its potential as a preventive therapy that enhances respiratory microbiome diversity. Collectively, these studies emphasize the necessity of integrating microbiome analysis and personalized treatment strategies in managing complex respiratory conditions, offering a paradigm shift towards precision medicine in respiratory care. Future research should aim to stabilize phenotype definitions and further explore the therapeutic potential of BC, fostering advancements in the prevention and management of respiratory diseases.

02-O-16

The Prevalence and Implications of Factor V rs6687813 Mutation among COVID-19 Patients on D-dimer Levels

Walid Aburayyan, Ola Ahmad Al-Fawares, Mohammad Mansour Albalbaki, Nesrin Seder

COVID-19 has invaded human community worldwide threatening public health and the world economy. The confounder data about the pathogenesis of the disease progression has aroused prognostic theories concerning the implications of demographic data and the genetic variability of the disease prognosis. A total of 120 participants; 68 males and 52 females, aged from 15 to 82 years, among them 90 COVID-19-infected patients, and 30 COVID-19-free participants were enrolled in the current study. Blood samples were drawn from 120 participants and then analyzed for D-dimer levels using fluorescence immunoassay. The 120 DNA extracted samples were amplified by PCR using Factor V-specific primers. The PCR products were sequenced and examined for putative mutations in the Factor V gene. A significantly high mutation rate in Factor V **(**rs6687813) 82%, $p< 0.001$ was demonstrated in the study population. The mutations were

significantly correlated with extremely high D-dimer levels of 2975 ng/ml versus 986 ng/ml in the wild type (r=0.228, p<0.012). Hospitalized COVID-19 patients expressed significantly higher levels of D-dimer compared to non-hospitalized patients 3353 ng/ml vs 513 ng/ml p<0.001, respectively. The age had an odds rate of 1.12 on the acquisition of COVID-19 infection as the ages above 35 were more vulnerable to acquiring the infection than younger ages (r=0.21, p<0.022). In conclusion, the study provides robust evidence about the direct association between the FVL mutation and elevated levels of D-dimer in COVID-19 patients and the implementation of the FVL mutation test as a prognostic marker is recommended for COVID-19 patients.

02-O-17

Prevalence of CYP2C19 *2 & *3 Loss-of-Function Alleles and Major Adverse Cardiac Events among Ischemic Heart Disease Patients Undergoing PCI and Treated with Dual Antiplatelet Therapy in a Tertiary Care Hospital, Palestine

Suhaib Hattab, Adham Abu Taha, Yahya Ismail, Ahmed Jamal Dawod, Ibraheem Saadeh, Kais Abu Zaitoun.

loss-of-function (LOF) genetic mutations in cytochrome P2C19 (CYP2C19) alleles can lead to impairment of clopidogrel metabolism. This can decrease the efficacy of clopidogrel in treating acute coronary syndrome, leading to increased risk of major adverse cardiac events (MACE) due to insufficient antiplatelet effect. In this study, we measured the prevalence of CYP2C19 gene LOF mutation named *allele*2 and *3* among patients presenting with ischemic heart disease in a tertiary care setting. We also studied the effect of these *alleles* on the incidence of MACE in ischemic heart disease patients treated with clopidogrel. This is a prospective study that was held at the cardiology division at An-Najah National University Hospital, Nablus. Data collection started in September/2022 and ended in April/2023. The blood samples were collected and molecularly tested at the same hospital. Data collection was completed using a combination of patient-reported responses and electronic medical records. The chi-square test of independence was used to measure the correlation between CYP2C19 genotypes and incidence of MACE in patients treated for myocardial infarction at one, three, and six months post percutaneous

coronary intervention. A *p*-value of less than 0.05 was considered statistically significant. One hundred and forty patients were included in the study. Mean (standard deviation) age of the study sample age was 61.3 (10.1) years, 104 (74.3%) were males, 44 participants (31.4%) were taking clopidogrel at enrollment. The majority of patients (117/140, 83.6%) had the normal-no-*allele*2*- genotype, 20/140 (14.3%) were heterozygous for *allele*2* and (2.1%) were homozygous for *allele*2*. In addition, the majority of patients (136/140, 97.1%) had the normal-no-*allele*3*- genotype, 4/140 (2.9%) were heterozygous for *allele*3* and none were homozygous for *allele*3*. At the first follow-up (one month), MACE was reported in 7/117 (6%) of patients with the normal -no *allele*2*-, 1/20 (5%) of the heterozygous, and none (0/3) of the homozygous genotypes. The chi-square test of independence found no significant difference between the three genotypes (p=0.89) in incidence of MACE at the one-month follow up. Similar results were found when evaluating data from the three months (p=0.95), and six months (p=0.76) follow ups. At the first follow-up (one month), MACE was reported in 8/136 (5.9%) of patients with the normal -no *allele*3*-, and none 0/4 (0%) of the heterozygous genotypes. The chi-square test of independence found no significant difference between the two genotypes (p=1.00) in incidence MACE at the one-month follow up. Similar results were found when evaluating data from the three months (p=0.95), and six months (p=0.76) follow ups.Alleles*2 and *3 exhibit a prevalence that is similar to what was reported previously, Alleles *2 and *3 genotypes did not have a statistically significant effect on incidence of MACE up to 6 months of follow-up.

02-O-18

Acetylsalicylic Acid Reduces Cigarette Smoke Withdrawal-Induced Anxiety in Rats via Modulating the Expression of NFκB, GLT-1, and xCT

Alaa M. Hammad

Chronic exposure to cigarette smoke produces neuroinflammation and long-term changes in neurotransmitter systems, especially glutamatergic systems. Objective: We examined the effects of cigarette smoke on astroglial glutamate transporters as well as NF-κB expression in mesocorticolimbic brain regions, prefrontal cortex (PFC) and nucleus accumbens (NAc). The behavioral consequences of

cigarette smoke exposure were assessed using open field (OF) and light/dark (LD) tests to assess withdrawal-induced anxiety-like behavior. Methods: Sprague-Dawley rats were randomly assigned to five experimental groups: a control group exposed only to standard room air, a cigarette smoke exposed group treated with saline vehicle, two cigarette smoke exposed groups treated with acetylsalicylic acid (ASA) (15 mg/kg and 30 mg/kg, respectively), and a group treated only with ASA (30 mg/kg). Cigarette smoke exposure was performed for 2 hr/day, 5 days/week, for 31days. Behavioral tests were conducted weekly, 24 hr after cigarette smoke exposure, during acute withdrawal. At the end of week 4, rats were given either saline or ASA 45 min before cigarette exposure for 11 days. Results: Cigarette smoke increased withdrawal-induced anxiety, and 30 mg/kg ASA attenuated this effect. Cigarette smoke exposure increased the relative mRNA and protein expression of nuclear factor κB (NFκB) in PFC and NAc, and ASA treatment reversed this effect. Also, cigarette smoke decreased the relative mRNA and protein expression of glutamate transporter1 (GLT-1) and the cystine-glutamate transporter (xCT) in the PFC and the NAc, while ASA treatment normalized their expression. Conclusion: Cigarette smoke caused neuroinflammation, alterations in glutamate transporter expression, and increased anxiety-like behavior, and these effects were attenuated by acetylsalicylic acid treatment.

03-O-01
Nanotechnology Based Antimicrobial Drug Delivery System for Orthopaedic Application

Yazan Al Thaher

Antibiotic loaded bone cements are widely used in total joint replacement (TJR); despite many limitations such as a burst release which leads to antibiotic concentration below inhibitory levels and possibly contributing to the selection of antibiotic resistant strains. In order to address such limitations and to simultaneously address antibiotic resistance and short-term antimicrobial activity, we developed a nanocomposite bone cement capable of idgproviding a controlled release of antimicrobial agents from bone cement to act as prophylaxis or treatment against prosthetic joint infections (PJIs).Gentamicin and chlorhexidine were loaded in combination on silica nanoparticles surface using layer-by-layer coating technique (LbL) combining hydrolysable and non-hydrolysable polymers.The drug release from the nanocomposite continued for >50 days at concentrations higher than the commercial formulation containing the same amount of antimicrobial drugs, where burst release for few days were observed. Moreover, the nanocomposite bone cement showed superior antimicrobial inhibition without adversely affecting the mechanical properties or the ability of osteoblasts to grow. In vivo experiments with an infected bone lesion model along with mass-spectrometric analysis also provided further evidence of efficacy and safety of the implanted nanocomposite material as well as its prolonged drug eluting profile.The developed nanocomposite bone cement has the potential to reduce PJIs and enable treatment of resistant established infections; moreover, the newly developed LbL based nano-delivery system may also have wider applications in reducing the threat posed by antimicrobial resistance

03-O-02
Aptamer-Functionalized Nanomedicines for Targeted Gene Silencing in Cancer

Walhan Alshaer

Targeted cancer therapy has got a helping hand from nanomedicine, which uses molecular ligands for improved drug delivery. Aptamers are

known for having high affinity and specificity to tumor biomarkers and have therefore been used as targeting moieties on nanocarriers to achieve selective delivery of therapy agents including small interfering RNA (siRNA). Despite its potentiality in silencing genes in diverse diseases, siRNA's therapeutic use is hampered by low cellular uptake and susceptibility to degradation hence necessitating protective carriers. Recent successes in the functionalization of aptamers on nanomedicines show great prospects towards overcoming the aforementioned challenges and bring us closer to the "magic bullet" ideal for treating cancer.

03-O-03
Nail Penetration Enhancer Vesicles Loaded with Tioconazole for the Treatment of Onychomycosis

Sara A. Abdel Gaber, Eman A. Helmy, and Maha Nasr

Onychomycosis is a chronic nail fungal infection caused principally by the dermatophyte Trichophyton rubrum. Since nails are impermeable, onychomycosis can persist up to 18 years. In this study, the thin film hydration technique was applied to synthesize nail penetration enhancer vesicles (nPEVs) loaded with Tioconazole (TIO). The nPEVs were characterized by measuring their particle size, zeta potential, elasticity, viscosity, and TIO loading. The nail hydration potential and transungual TIO uptake were assessed. The antimicrobial activity of the TIO-nPEV compared to its free form was tested using disk diffusion assay. Screened onychomycosis causative agents were Trichophyton mentagrophytes, Trichophyton rubrum, Trichophyton violaceum and Cryptococcus neoformans, Candida parapsilosis, Candida glabrata, Candida tropicalis, Candida krusei, Candida auris, Candida lipolytica, Staphylococcus aureus, Staphylococcus epidermidis, proteus vulgaris and Aspergillus fumigatus. Results revealed that the selected nPEVs formulation was cationic, spherical, deformable, and displayed a size 132±3.3 nm. nPEVs managed to significantly enhance nail hydration and TIO transungual uptake (36%±4.5 for the free drug versus 53%±2.7 for nPEVs). From the tested pathogens, eleven were responsive and the zone of inhibition when TIO-nPEV was applied was significantly higher than the free form. The four resistant pathogens were Trichophyton mentagrophytes, Candida parapsilosis, Staphylococcus aureus, and Candida auris. Concerning the most common causative

agent of onychomycosis namely Trichophyton rubrum , the zone of inhibition of TIO-nPEV was 3 times more than the respective one of TIO free form. Those results suggest that nPEVs can be considered as a promising antifungal nanocarrier to increase nail penetration and enhance onychomycosis treatment outcome.

03-O-04
Meta-analysis of Nano-Phytosomes: Unleashing the Potential of Plant-Derived Compounds for Advancing Cancer Therapy

Ali Al-Samydai

Nano-phytosomes are considered an efficient drug delivery system for phytochemicals, enhancing stability and significantly improving the bioavailability and therapeutic efficacy of these compounds. Through a thorough meta-analysis of 93 articles, the size, charge, polydispersity index (PDI), and IC50 values of various phytochemicals versus their corresponding phytosomes were investigated. Multivariate Analysis of Covariance revealed significant effects of phytochemical types, even when accounting for cancer cell type and phospholipid type as covariates. Least Significant Difference (LSD) post hoc tests described unique attributes among various phytosomes: flavonoid-based phytosomes exhibited larger particle sizes than others, while terpenoid-based phytosomes displayed significantly lower charges. Flavonoids demonstrated higher PDI values compared to alkaloids and polyphenols, with alkaloids exhibiting more extensive PDI values and polyphenols having lower PDI values than terpenoids. Furthermore, flavonoid-containing nanoparticles exhibited higher IC50 values than terpenoids. In conclusion, nano-phytosomes offer promising prospects for revolutionizing drug delivery methodologies and advancing the development of innovative therapeutic solutions in the domain of cancer therapy.

03-O-05
Microfluidics-Produced Retinoic Acid Loaded Nanoparticles as Inhalable Host Directed Immunotherapy for Tuberculosis

Ahmad Bahlool

Multi Drug resistant TB (MDR-TB) may arise because of poor patient adherence to treatment due to lengthy treatment duration and side effects. Therefore, new treatment strategies are needed to overcome

this MDR problem. An adjunctive, host-directed therapy (HDT) designed to act on the host, instead of the bacteria, by boosting the host immune response through activation of intracellular pathways could help address this issue. The hypothesis of the project is that encapsulating a novel host directed therapy, all trans retinoic acid (ATRA), within inhalable nanoparticles suitable for nebulization improves both drug targeting to the site of infection and clinical efficacy. ATRA-PLGA NPs were manufactured using nanoprecipiation method and were tested in THP-1 derived macrophages and A549 alveolar epithelial cells TB infection models and have shown to reduce the bacterial growth in a dose dependent manner. Then, ATRA-PLGA NPs were integrated with Aerogen solo vibrating mesh nebulizer (VMN) and the resulted aerosol showed optimum properties for deep lung deposition as measured by cascade impaction and spraytec laser diffraction. The aerosol had a volumetric median diameter (VMD) of 4.09 µm and mass median aerodynamic diameter (MMAD) of 2.13 µm. A scalable nanomanufacturing approach was optimized using microfluidics mixing (Ignite Nanoassembler®,Precision Nanosystems, Canada) for both Blank PLGA NPs and ATRA-PLGA NPs. The delivered dose of MF-ATRA-PLGA NPs at the level of trachea nebulized at 10mg/mL in saline in an advanced 3D printed head models of adult and pediatric individuals under breathing simulation conditions was found to be 47.05 ± 3% and 20.15 ± 3.46 % for adults and paediatrics respectively. Overall, these results are promising for future research into inhaled host directed therapies for TB. The data generated on the efficacy of inhalable, scalable and regulatory friendly ATRA-PLGA NPs formulation provides a foundation on which further pre-clinical testing can be built.

03-O-06
Bridging the Gap between Pharma Industry and Academia: An Actual Proposed Initiative on the Way Ahead

Derar Omari

This lecture is an inspiration from the many industry-academy meetings held in Jordan as well as abroad. In one of these events, a big talk was about IAR (Industry-Academy-Regulatory) Triangle. Industry-academy relationship in Jordan is not as we wish. In this lecture I will present some proposed suggestions to reform. Establish clear communication

channels, develop joint research projects, Form industry advisory boards, develop collaborative funding opportunities, Establish technology transfer offices, Share facilities and resources, etc. these among others are just to mention. I also, will propose an initiative under the name “Jordan Pediatric Formulation Initiative” as a first actual step in the industry-academy collaboration. This initiative will be based on/and start from the problems in pediatric medicines like off-label use due to big shortage in child-appropriate forms, excipients added to drug products, palatability and taste masking, regulatory issues regarding the clinical and bioequivalence studies. Among these problems and the most important is that >70% of drugs worldwide have no child-appropriate forms. This will be a wide field of research and development for these formulations. This constitute a pathway of serious partnership between pharma industry and pharma faculties in Jordan Universities.

03-O-07
Novel Engineered Multi-walled Carbon Nanotubes for Selective Delivery of siRNA to the Colorectal Cancer Cells

Mohyeddin Assali, Naim Kittana, Ahmad Ghareeb

One of the latest tactics in cancer therapy is the application of siRNA to regulate gene expression. Nonetheless, the efficient administration of siRNA into cells presents a significant problem, especially in vivo. Researchers are creating innovative technology delivery ways to transport these chemicals with minimal impact. The advancement of drug delivery methods utilizing carbon nanotubes has garnered significant attention in this context. Our project seeks to establish a novel technique for the delivery of siRNA into colon cancer cells to specifically target the expression of the β-catenin protein, which is implicated in numerous developmental processes, including cell growth and proliferation, embryonic patterning, cell differentiation, and various cellular functions. The novel methodology relies on the creation of a new nano-system comprising multi-walled carbon nanotubes (MWCNTs) functionalized with a tetra-amine linker and mannose sugar as a targeting agent to enhance the nano-system's uptake and selectivity. We effectively functionalized MWCNTs with tetra-amine groups, subsequently attaching mannose molecules. The quantities of mannose and amine-conjugated groups were also measured. The N/P ratio necessary for the entrapment of β-catenin

siRNA was ascertained using agarose gel electrophoresis. Western blot investigation demonstrated that our product markedly decreased β-catenin protein expression ($p > 0.05$). The knockdown rate was 50% for f-MWCNTs. We predicted that the potential upregulation of mannose receptors on the surface of Caco-2 cells may enhance the transfection effectiveness of f-MWCNTs. The MTS results indicated that the down-regulation of β-catenin protein can inhibit cancer cell growth and limit cell proliferation, as evidenced considerably in both transfection methods, with an IC50 of 19.32 μg/ml for f-MWCNT-siRNA. This action can greatly enhance the efficacy of 5-FU in colon cancer compared to the control group. Consequently, we suggest that our methodology may be applied in the context of colon cancer treatment.

03-O-08
Double Impact on Bone Healing: Bioactive Graft Scaffolds and Nanostructured Implants for Enhanced Infection Control

Fathi Hassan

Bone infections present a persistent challenge in orthopedic surgery, particularly in cases requiring bone grafting and implant placement. This research introduces two synergistic innovations aimed at addressing these issues: the development of lysozyme-based bone graft scaffolds and the application of nanostructured coatings on titanium implants to mitigate biofilm formation.The lysozyme-enhanced scaffolds were engineered to provide osteoconductive, osteoinductive, and antibacterial properties, thereby improving the outcomes of nonunion fractures. These scaffolds demonstrated excellent biocompatibility, promoting M2 macrophage polarization—a key factor in enhancing bone healing. In both *in vitro* and *in vivo* models, the lysozyme-coated chitosan scaffolds supported cellular adhesion while effectively inhibiting bacterial colonization, offering a promising solution for infection-resistant bone regeneration. Simultaneously, nanostructured coatings applied to titanium screws were explored for their ability to reduce biofilm formation. The coatings exhibited robust biomechanical properties and significant resistance to bacterial adhesion, with Pseudomonas aeruginosa displaying a 7-fold reduction in adhesion and Streptococcus mutans demonstrating diminished colony formation compared to uncoated controls. Despite comparable

surface damage from torsional insertion, the nanostructured coatings showed superior biocompatibility by enhancing mesenchymal stem cell adhesion and supporting tissue regeneration.Together, these strategies offer a novel approach to combating bone infections through the integration of bioactive scaffolds and advanced implant materials. Future research will focus on optimizing the durability of nanostructured coatings and further enhancing the clinical efficacy of lysozyme-based bone graft substitute.

03-O-09
Use of Plant Extracts as Substituent of Synthetic Preservatives and Antioxidants in Pharmaceutical Preparations

Fuad Al-Rimawi

Although synthetic preservatives and antioxidant may provide high antimicrobial and antioxidant effectiveness, they are usually associated with adverse reactions. Currently, there is an increasing desire for high quality pharmaceutical products, with fewer chemicals, and with more natural compounds. Thus, there is an urgent need to develo pharmaceutical products preserved with natural materials from microbiological growth and oxidation during storage and use. The aim of this study is therefore to evaluate the antimicrobial activity and antioxidant activity of different plant extracts e.g. olive leaves extract, and thyme oil, and to use them as natural preservatives and antioxidants in different pharmaceutical preparations. The activity of olive leaf extract as well as thyme oil against three bacteria (one gram-positive and 2 gram-negative) and two fungi (one yeast and one mold) were determined. Those with such activity (working against two gram-negative bacteria, one gram-positive bacteria, one yeast and one mold) can be used as preservatives in a pharmaceutical syrup to replace chemical preservatives (methyl-propylparaben and benzalkonium chloride), and replacing Butylhydroxytoluene as chemical antioxidant. In this work, oleuropein (the main compound in olive leaves) with different concentrations (0.2, 0.4 and 0.6 % w/v) and extracts of olive leaves with concentrations (0.2, 0.3 and 0.4% w/v), and thyme oil with concentration (0.1% v/v) as well as a mixture of oleuropein and thyme oil with concentration (0.4% w/v and 0.1% v/v) were examined as natural preservatives in pharmaceutical syrups and very promising results were obtained. Results showed that oleuropein can be used as

preservatives with concentration (0.6 w/v), extract of olive leaf with concentration (0.4 w/v) and mixture between oleuropein and thyme oil with concentration (0.4 and 0.1 v/v) can also be used. The results showed that thyme oil and oleuropein have synergistic activity against microbes. The active compounds in the pharmaceutical prepartions were analyzed using HPLC. The results showed that pharmaceuticals preparations were stable for 6 months on accelerated condition (40 ± 2 °C /75%±5% RH).

03-O-10

Generation of Engineered Dermal Tissues Enriched with Chitosan-Multiwall Carbon Nanotube Complex for Utilization in Wound Healing

Naim Kittana, Mohyeddin Assali, Amal Al-Qato

The process of wound healing is complicated and involves four precise stages: hemostasis, inflammation, proliferation, and remodeling. When interrupted, this process can result in chronic wounds, constituting significant health and economic burden. Engineered skin tissues (EST) with different constituents have been proposed as a potential treatment. To generate engineered dermis tissues (EDTs) as a substitute for the dermis layer to enhance wound healing.The scaffolds of the generated EDTs were based on collagen, which is similar to the natural dermis, and it was enriched with chitosan, a natural biocompatible and biodegradable polymer that possesses wound-healing properties, and different concentrations of multiwall carbon nanotubes (MWCNTs) that can enhance the mechanical properties of the EDTs. The effect of incorporating angiotensin-II (Ang II) in the tissues on angiogenesis was also investigated. All tissues were populated by 3T3 cells. The EDTs were transplanted in a mouse wound model, and the wound sites were analyzed macroscopically and histologically by masson-trichrome stain after 14 days of transplantation to evaluate the quality of wound healing. Overall, our study found that transplanted tissue had no negative impact on animal health. It reduced contraction and facilitated epithelization but did not affect the percentage of wound closure. EDTs transplantation did not affect the thickness of the new epidermis, but it increased the thickness of the dermis. The incorporation of Ang II in the matrix of the EDT did not affect the degree of angiogenesis. The transplanted tissue enhanced the quality of wound healing by

promoting epithelialization and reducing contraction. This finding is significant for the development of potential treatments for slow-healing or high-risk scarring wounds.

03-O-11
Long-Term Biophysical Stability of Nanodiamonds Combined with Lipid Nanocarriers for Non-Viral Gene Delivery to the Retina

Nuseibah H. AL Qtaish, Ilia Villate-Beitia, Idoia Gallego, Gema Martínez-Navarrete, Cristina Soto-Sánchez, Myriam Sainz-Ramos, Tania B Lopez-Mendez, Alejandro J. Paredes, Francisco Javier Chichón, Noelia Z. Fernandez, Eduardo Fernández, Gustavo Puras, and José Luis Pedraz

In the present work, we combined nanodiamonds with niosome non-viral vectors, and the resulting formulations were named as nanodiasomes. The effect of such nanomaterial was evaluated over time in terms of physicochemical features, cellular internalization, cell viability and transfection efficiency both *in vitro* and *in vivo* in mouse retina. All these parameters were analysed at different storage temperatures and time points over 30 days. The main findings revealed that the incorporation of nanodiamonds into niosome formulations resulted in a 4-fold increase of transfection efficiency, and this difference was maintained over time. In addition, both formulations were more stable at lower (4°C) temperatures and nanodiasomes maintained their physicochemical properties more constant than niosomes. Finally, nanodiasomes were able to achieve high transgene expression levels in mouse retina after subretinal and intravitreal administration, both when injecting nanodiasome formulations freshly prepared and after 30 days of storage at 4°C.

03-O-12
Development of Antimicrobial Peptides… Current Status and Remaining Challenges

Dr. Mohammad H. Alsaggar

The development of antimicrobial peptides (AMPs) presents a promising strategy for addressing the growing threat of multidrug-resistant infections. AMPs are valued for their broad-spectrum activity, rapid action, and reduced potential for resistance compared to traditional antibiotics. However, their clinical advancement is hampered

by challenges such as vulnerability to enzymatic degradation, suboptimal pharmacokinetics, potential toxicity to host cells, and high production costs. Recent progress in peptide engineering, particularly structural and sequence modifications to enhance stability and specificity, is helping to mitigate these issues. Indeed, several novel peptides were designed based on sequences of existing natural peptides. Importantly, engineered peptides exhibit higher potency and enhanced safety profiles. Here, the rational design and characterization of few novel AMPs will be briefly described. Ongoing research to address remaining challenges and unlocking the potential of AMPs as a new class of antimicrobial agents will also be presented.

04-O-01

Act Now: The Urgent Need for DPYD Testing in Precision Medicine in Jordan

Nancy Hakooz

The fluoropyrimidine 5-fluorouracil (5-FU) has been the most extensively used chemotherapeutic agent in the treatment of advanced colorectal cancer for more than **40 years**. Dihydropyrimidine dehydrogenase (DPD) is responsible for the inactivation of more than 80% of the anticancer drug 5-FU in the liver. *DPYD* is a gene coding for DPD. Although generally well tolerated, roughly 10–40% of patients suffer from severe toxicity, including fatigue, anorexia, vomiting, nausea, severe diarrhea, dehydration, pain, mucositis, stomatitis, neutropenia, and hand-foot syndrome (Amstutz et al. 2018), and toxicity-related mortality occurs in ~1% of treated patients (Lunenburg et al. 2020). This is in part due to inter-individual variability in DPD activity. As 5-FU has a narrow therapeutic window, deficiency of the DPD enzyme, either complete or partial, can lead to inadequate breakdown of 5-FU, leading to overdosing and increased risk of severe toxicity and potentially death. Many polymorphisms in the *DPYD* gene have been identified that may result in partial or total loss of DPD activity. At least one of three variants (*DPYD*2A, DPYD*9B,* or *DPYD*13*) has been found in 30% of 5-FU-treated patients who developed severe toxicities. According to estimations, 3–5% of the population is partly or totally deficient in DPD enzyme activity. Additionally, certain patient characteristics—such as older age, female sex, underlying disease, high-dose irradiation, prior use of myelosuppressive agents, extensive bone marrow involvement, and impaired liver or kidney function—have also been linked to 5-FU toxicity. Carriers of these risk alleles are estimated to be 1.6–4.4 times more likely to experience severe adverse events and over 25% more likely to encounter lethal toxicity from 5-FU compared to non-carriers. Conversely, high DPD expression is associated with a poor response to treatment. Prospective genotyping of *DPYD* can identify patients with DPD enzyme deficiency and allow for prophylactic 5-FU dose adjustments, thereby reducing the likelihood of 5-FU-related toxicity without compromising the cancer treatment effect. The Clinical Pharmacogenetics Implementation Consortium (CPIC) has provided guidelines for the implementation of *DPYD* pharmacogenetics,

indicating that homozygote carriers of low-activity variants should be prescribed an alternative drug, while heterozygotes should receive half of the normal dose https://cpicpgx.org/guidelines/guideline-for-fluoropyrimidines-and-dpyd/). Few studies have investigated *DPYD* genotyping. Two of these studies used polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) in colorectal and breast cancer patients (Yousef et al (2018), Al-Khateeb et al (2017)). Almashagbah et al (2022) screened 80 colorectal patients for mutations in the *DPYD* gene using the Sanger sequencing technique and three variants (c.85T>C, c.1740+40A>G, c.1740+39C>T) and one novel (g.97515583_97515584insA) variant were identified in this study.

04-O-02

Understanding the Association Between Ulcerative Colitis and Helicobacter pylori Infection: Insights from a Case-Control Study

Iyad Ali, Qusay Abdo, Shayma'a M. Al-Hihi, Ansam Shawabkeh

Investigating the relationship between Ulcerative Colitis (UC) and Helicobacter pylori infection through a case-control study has been pivotal in gastrointestinal research. UC, characterized by chronic inflammation of the large intestine's mucosal lining, presents with symptoms like persistent diarrhea, abdominal pain, and rectal bleeding, significantly impacting patients' quality of life. Helicobacter pylori, a gram-negative bacterium known for causing gastritis and peptic ulcers, has drawn interest due to its potential role in gastrointestinal health. Despite its pathogenic effects, some studies suggest it may have a protective influence against UC, sparking the need for a detailed investigation. This study involved 35 UC patients and 105 age- and gender-matched controls without UC. UC diagnosis was confirmed via colonoscopy and biopsy, ensuring accuracy. H. pylori infection was assessed using stool antigen tests (HpSA), supplemented by detailed data collection through interviews and medical records. Statistical analysis using SPSS v20.0 included Pearson's chi-square and Fisher's exact tests to assess the association between H. pylori infection and UC. Findings revealed a significantly lower prevalence of H. pylori among UC patients compared to controls (14.3% vs. 41.9%), indicating a potential protective role (OR = 0.23, P = 0.003). This study provides crucial insights into microbial factors and UC pathogenesis, highlighting avenues for further research. Understanding these dynamics could

inform therapeutic strategies and enhance the management of UC and related conditions. Future studies should explore mechanisms underlying H. pylori's influence on UC, potentially guiding novel approaches to gastrointestinal disease prevention and treatment.

04-O-03
Impact of Alexithymia on Pharmacist-Patient Communication Skills in a Sample of Undergraduate Pharmacy Students

Amjad H. Bazzari, and Firas H. Bazzari,

Pharmacists are considered, by far, the most accessible primary healthcare providers to the public. Emotional intelligence and awareness of self- and others' emotions are very critical to ensure effective communication between pharmacists and patients. Therefore, this study aimed to assess the level alexithymia, simply defined as "no words for emotions", its associated factors, and its impact on communications skills, in a university sample of undergraduate pharmacy students. The study investigates the correlation between alexithymia and communication skills in addition to a number of associated demographic factors. A printed questionnaire was utilized, consisting of three main sections: (1) demographics, (2) Perth alexithymia questionnaire (PAQ) and (3) health professionals communication skills scale (HP-CSS). A total of 212 students participated. Moderate levels of alexithymia and relatively satisfactory communication skills were observed among the students. Male participants had higher levels of alexithymia and lower communication skills, while GPA values negatively correlated with alexithymia level but not communication skills. A negative correlation was also observed between the level of alexithymia and communication skills, which remained significant irrespective of gender. Moreover, alexithymia negatively correlated with all of the four domains of communication: informative communication, empathy, respect and social skills. A significant relation was noted between alexithymia and communication skills, which highlights the importance of emotional awareness in pharmacist-patient communication and care.

04-O-04

Determinants of Healthcare-Seeking Behavior from Pharmacies and Associated Out-Of-Pocket Spending: A Population-Based Study from Jordan

Rasha M Arabyat

Understanding reasons and predictors for health seeking from pharmacies is essential to justify the inclusion of new services. It is also important to identify the characteristics of individuals who choose pharmacies to receive healthcare to identify determinants of healthcare seeking from pharmacies in Jordan using Andersen's healthcare utilization model. Additionally, an analysis of the out-of-pocket (OOP) spending was performed. A secondary analysis of Jordan Population and Family Health Survey (JPFHS), a nationally representative survey of Jordanian households, was conducted. Weighted hierarchical multiple logistic regression models were employed to identify significant variables associated with seeking care from pharmacies in Jordan compared to other outpatient healthcare facilities. Out of the 12,716 respondents, 19.1% reported visiting a pharmacy within the past four weeks. The associated average OOP spending was JD17.7, significantly lower than for other outpatient healthcare facilities (JD 24.8). Among predisposing characteristics, females were more inclined to visit a pharmacy compared to males (Adjusted Odds Ratio [AOR] = 1.16; 95% CI: 1.02 -1.33). Positive enabling factor included residing in northern (AOR: 1.85; 95% CI: 1.19-2.87) or southern regions (AOR: 3.66; 95% CI: 1.57- 8.56) compared to center regions. The cost of transportation was a negative enabling factor (AOR: 0.24; 95% CI: 0.15- 0.40). Significant need factors that increased the odds of visiting a pharmacy included seeking care for fever/diarrhea (AOR: 1.99; 95% CI: 1.04-3.80). Preventive care/vaccination (AOR: 0.18; 95% CI: 0.05-0.68) decreased the odds of visiting a pharmacy. The geographical location of a pharmacy, as indicated by transportation costs and region, significantly influences visiting patterns. Pharmacies appeared to be convenient and accessible for managing minor ailments and they offer significant potential for cost savings. To enhance pharmacies' contribution to public health, integration of new services is strongly recommended Andersen's Healthcare Utilization Model, Healthcare Seeking, Community Pharmacy, Population-based study, Jordan, Out-Of-Pocket

04-O-05

Empowering Change: Addressing Antimicrobial Resistance in Jordan

Ahmad Al-Rusasi

This presentation proposes a comprehensive strategy to combat the pressing global health threat of antimicrobial resistance (AMR) within the specific context of Jordan. This presentation outlines the multifaceted challenges posed by AMR and emphasizes the urgent need for collaborative action at local, national, and international levels. Drawing upon current research and data, it examines the socioeconomic, environmental, and healthcare factors contributing to the emergence and spread of AMR in Jordan, while also highlighting the potential consequences of inaction. The presentation offers a roadmap for empowering change through a combination of policy interventions, public awareness campaigns, healthcare system strengthening, and research initiatives tailored to the unique challenges faced by Jordan. It underscores the importance of interdisciplinary collaboration involving government agencies, healthcare providers, researchers, and community stakeholders to implement sustainable solutions. By fostering dialogue and engagement, this presentation seeks to catalyze efforts to safeguard the effectiveness of antimicrobial agents and ensure the continued effectiveness of healthcare interventions in Jordan and beyond.

04-O-06

Effectiveness of Pharmacotherapy in Patients with Status Epilepticus: A Retrospective Observational Study from Saudi Arabia

Omar Almohammed et al.

Limited information exists about status epilepticus (SE) in Saudi Arabia. This retrospective study included adult patients with SE admitted to the emergency departments (EDs) of two hospitals between May 2015 and July 2021. It investigated the characteristics of these patients, the pattern of pharmacotherapy, the response to pharmacotherapy agents in different trials, and the reasons for treatment failure. We included 420 episodes (mean age 38.7±19.1 years and 54.8% male) of SE treated with benzodiazepines (BDZs) or antiepileptic drugs (AEDs) in ED. Most

patients had a history of epilepsy (89.0%) and were taking AEDs. Initially, BDZs and AEDs were used in 60.0% and 40.0% of patients, of whom 20.6% (52/252) and 84.5% (142/168) ($p<0.0001$) responded, respectively. Overall, there were 839 trials for BDZs, AEDs, or sedating agents (six trials); the overall response to BDZs was 24.8% (112/451), whereas it was 79.1% (302/382) for AEDs. Most patients (60.5%) were discharged without hospital admission. Underdosing was more prevalent for BDZs than AEDs (63.4% vs. 19.6%) and was significantly associated with a lack of therapeutic response (86.6% vs. 0.0%; $p<0.0001$). While the sex and age pattern of SE is similar to that of other populations, the pharmacotherapeutic agents and therapy response (especially to BDZs) differed. Moreover, underdosing significantly affected patient responses. Thus, educational and drug regulation awareness programs are urgently needed to optimize patient care by improving physicians' adherence to clinical guideline recommendations to improve the management of patients with SE in Saudi Arabia.

04-O-07

Pharmacists' Knowledge and Practice in Counseling Patients with Kidney Stones

Ensaf Y. Almomani

The recurring nature of kidney stones (KS) makes them difficult to control and treat. Pharmacists participate in healthcare services by educating patients about KS preventive measures and medications that greatly reduce the disease frequency and treatment cost. Insufficient pharmacists' knowledge and practice in managing patients with KS may affect the services' quality and result in misuse of KS medications. To evaluate the pharmacists' level of knowledge to provide adequate information about KS management, and to explore counseling practices and the perceived barriers in counseling patients with KS. A mixed approach using both quantitative and qualitative methods was used. An online descriptive survey was distributed among pharmacists to assess their knowledge of KS information and management. A group of pharmacists was selected using quota sampling from the knowledge of surveyed pharmacists to perform a qualitative study using semi-structured phone interviews. The COM-B Model of Behaviour Change was used to develop the interview guide and the analytical framework to assess pharmacist's practice in counseling patients with KS.393

pharmacists participated in the survey. Their overall level of knowledge about KS was intermediate. They had good knowledge about KS general information like types and etiology, and poor to intermediate about KS-specific information about treatment and medications. Seven pharmacists were interviewed for counseling practices of patients with KS. Counselling practices of patients with KS were categorized into five themes: (1) Pharmacists' beliefs about patient counseling (2) Most priority patients (3) Content of kidney stones-specific counseling (4) Duration of the counseling sessions (5) Barriers to patient counseling Pharmacists' knowledge about KS management through diet and medications need to be improved. Pharmacists can recognize the crucial role of KS counseling but face gaps in their practices. These gaps can be overcome by focusing on pharmacists' training for the effective implementation of knowledge in clinical practice, standardizing protocols of kidney stone treatment, promoting interprofessional communication, and improving communication strategies. Future research is needed to inform strategies that optimize patient counseling practices and facilitate improved outcomes.

04-O-08

Evaluating the Use of Paracetamol to Prevent Fasting Headache During the First Week of Ramadan: A Randomized, Open-Label Clinical Trial

Sary Alsanea et al.

Fasting headaches frequently occur during the first few days of Ramadan, and treatment is challenging because of fasting. This study aimed to evaluate the effect of extended-release paracetamol on preventing fasting headaches. A randomized, open-label clinical trial investigated the efficacy of extended-release paracetamol at a daily dose of 1330 mg in preventing fasting headache. Adults aged 18 years and older were recruited through the Clinical Trial Unit at the King Saud University Medical City. The eligible participants in the study fasted 13.5 hours during the first week of Ramadan. Participants in the treatment and control arms were followed up to investigate the occurrence, severity, and timing of headache symptoms via self-reporting using a standardized headache diary scale with a daily online link or phone call. The primary outcome was the frequency of headache episodes while fasting during the first week of Ramadan. A total of 238 participants

were enrolled and randomized. Of these, 173 followed the protocol (80 treated, 93 control) for at least the first day and were included in the analysis. Most participants were young and healthy, with a mean age of 32.2 ±10.2 years. More men were included in the study (102/173; 59.0%), a small proportion of participants were smokers (31/173; 17.9%), and almost all participants reported being coffee drinkers (165/173; 95.4%); nonetheless, these characteristics were evenly distributed between the two groups in the study. The overall incidence of headache episodes was 33.0% (57/173) on day 1 and decreased to 11.3% (18/159) on day 7. On average over the seven days, no significant effect was observed for the treatment on the incidence of headache, as the findings from the generalized estimating equation (GEE) model indicated (β=-0.398, p=0.084; OR=0.67, 95%CI 0.42–1.06). Moreover, there was no significant difference in the incidence of headache episodes between the treatment and control groups initially. However, the treatment group had significantly fewer headache episodes during fasting than the control group on day 3 [4/72 (5.6%) vs. 15/91 (16.5%), p=0.031; RR=0.34, 95%CI 0.12–0.97] and day 6 [5/69 (7.2%) vs. 20/90 (22.2%), p=0.010; RR=0.33, 95%CI 0.13–0.82]. No adverse effects were observed during the study period. No significant differences were observed in the occurrence of fasting headaches between the two groups on most days during the study period. Additional studies are required to address fasting headaches during the first week of Ramadan.

04-O-09

Medicine and Pharmacy Students' Knowledge, Attitudes, and Practice regarding Artificial Intelligence Programs and Relationship to Pharmacoeconomics: Jordan and West Bank of Palestine

Rami Musleh

Artificial intelligence (AI) programs generate responses to input text, showcasing their innovative capabilities in education and demonstrating various potential benefits, particularly in the field of medical education. The current knowledge of health profession students about AI programs has still not been assessed in Jordan and the West Bank of Palestine (WBP). This study aimed to assess students' awareness and practice of AI programs in medicine and

pharmacy in Jordan and the WBP. This study was in the form of an observational, cross-sectional survey. A questionnaire was electronically distributed among students of medicine and pharmacy at An-Najah National University (WBP), Al-Isra University (Jordan), and Al-Balqa Applied University (Jordan). The questionnaire consisted of three main categories: sociodemographic characteristics of the participants, practice of AI programs, and perceptions of AI programs, including ChatGPT. A total of 321 students responded to the distributed questionnaire, and 261 participants (81.3%) stated that they had heard about AI programs. In addition, 135 participants had used AI programs before (42.1%), while less than half the participants used them in their university studies (44.2%): for drug information (44.5%), homework (38.9%), and writing research articles (39.3%). There was significantly (48.3%, $P<0.005$) more conviction in the use of AI programs for writing research articles among pharmacy students from Palestine compared to Jordan. Lastly, there was significantly more (53.8%, $P<0.05$) AI program use among medicine students than pharmacy students. While most medicine and pharmacy students had heard about AI programs, only a small proportion of the participants had used them in their medical study. In addition, attitudes and practice related to AI programs in their education differs between medicine and pharmacy students and between WBP and Jordan.

04-O-10

The Impact of Palliative Care Consult on Medicine Optimization of Cancer Patients Referred to Hospice Care at the End of Life: A Longitudinal, Retrospective Cohort Study

Tahani Alwidyan, Omar Shamieh, Waleed Alrjoub, and Ghadeer Alarjeh

The transition of cancer patients with limited life expectancy to hospice care often results in a shift in benefit-risk assessment to cope with goals of care where symptom control becomes the main priority. To support clinical guidance toward optimizing pharmacotherapy in this vulnerable population, it is important to evaluate the prescription and deprescription trends in hospice care. Evaluation of Palliative Care Consult impact on the prescription and deprescription patterns in hospice cancer patients at the end of life. A longitudinal, retrospective cohort study where medical records of eligible participants were

reviewed, and data extracted at three time points: 1) at hospice admission, 2) at the first time of Palliative Care Consult and 3) on the day of death. Eligible patients were all cancer patients aged 18 years and older who were referred to the inpatient hospice care in Jordan, had a life expectancy of six months or less and were prescribed at least one preventive medication. Patients who were not seen by Palliative Care Consult before death were excluded. Polypharmacy was reported to be continued until death in 69.7% of 321 patients (mean age of 62.6 years). Polypharmacy was associated with an increase in the odds of discontinuing preventing medication events by more than two-fold (adjusted OR = 2.204; CI: 1.194–4.067; P= 0.011). Toward death, deprescribing activity is reactive. This study demonstrates the positive impact of Palliative Care Consult on discontinuing preventive medications; consequently, shifting polypharmacy toward appropriate approach among hospice cancer patients.

04-O-11

Prevalence and Antibiogram Pattern of *Klebsiella pneumoniae* in a Tertiary Care Hospital in Nablus, Palestine: A 5–year experience

Amal Battah, Taima Omari, Sarah Al- Saleh, Adham Abu Taha

This retrospective study was conducted in An Najah National University Hospital over five-year duration from January 2019 to December 2023. All *Klebsiella. pneumoniae*-positive samples of patients attending the hospital were included regardless of the source of the specimens and age of the patient. The study revealed a prevalence rate of 13.3% of *Klebsiella pneumoniae* among total isolates. This study shows that the isolation rate of *Klebsiella. pneumoniae* in varying patient categories greatly differs. Significantly, inpatient isolates of *K. pneumoniae* were far more frequent than outpatients. Further, the male patients present a higher proportion of *K. pneumoniae* isolates than the females (55% and 45% respectively) with statistical significance reaching a p-value of <0. 001. The incidence of carbapenemase-producing *K. pneumoniae* (CPKP)is increasing from 32.9% in 2019 to 52% in 2023, while the incidence of Extended-Spectrum Beta-Lactamases (ESBLs) - *K. pneumoniae* was high with average of 74.04%. The antimicrobial susceptibility profile of *K. pneumoniae* revealed an increase in the resistance rates in most of the analyzed antibiotics. This study found that *K. pneumoniae* infection rates have increased over

time. Additionally, antibiotic resistance remains a significant concern. Among the antibiotics studied, ampicillin showed the highest resistance level. The high incidence of CPKP has important implications for patient care, including limited treatment options, heightened morbidity and mortality, and potential delays or cancellations of procedures. Addressing CPKP infections requires vigilant surveillance, infection control measures, and judicious antibiotic use to minimize the impact on patient health and healthcare systems.

04-O-12

Assessment of Jordanian Pharmacists' Knowledge and Awareness of Liraglutide Injection and their Practice in Counseling Obesity Patients

Jumanah D. Al-Shawabkeh

Obesity is a complex disease and is among several risk factors related to various diseases and is considered a major contributing factor in metabolic syndrome. Weight reduction of up to 15% can enhance many obesity-related complications. Recently, the drug class of glucagon-like peptide 1 receptor agonists (GLP-1 RAs) (Liraglutide) is one of the most modern therapy options for managing these metabolic disorders. This study aimed to examine how pharmacists in Jordan perceive and use antidiabetic drugs, particularly Glucagon-like peptide-1 receptor agonists (e.g., Liraglutide injection), for body weight loss. A reliability-validated online survey was performed and sent out to the community pharmacists in Jordan to fill out and get knowledge about the use of Liraglutide injection. Social media was used to extend the survey to facilitate contact among pharmacists from multiple parts of the community. 395 pharmacists were involved in the study, with 70.9% being from the central area of Jordan. A considerable number of the participants (52.4%) had bachelor's degrees and were mostly female. Their average age was 29 ± 7.44 years. Our results showed that many pharmacists dispense 3 mg Liraglutide injection for weight loss and 93% of pharmacists saw a real improvement in the weight loss of patients using the drug. However, our study revealed that many pharmacists (62.3%) were agreed to dispense the drug over the counter without a physician’s prescription and unaware of the risks and side effects of injecting Liraglutide including vitamin D deficiency (21%), hypoglycemia (16%), fatigue (10%), pancreatitis (7%), and

hyperthyroidism (5%). Furthermore, the study showed the importance of pharmacists' awareness in preventing and controlling the side effects of Liraglutide injection. In conclusion, the research highlights the need to properly monitor prescription and distribution processes to avoid abuse, especially when contraindications occur. Education on Liraglutide injections is crucial to help Jordanian pharmacists improve the health of obese patients and drug users.

04-O-13

Assessing The Competency of Pharmacists in Writing Effective Curriculum Vitae for Job Applications: A Cross-Sectional Study and Readability Index Evaluation

Mohanad Odeh, Muna Oqal, Hanan AlDroubi and Basem Al-Omari

In today's competitive job market, pharmacists must have a well-crafted curriculum vitae (CV), cover letter, and personal statement. However, non-native English speakers may face challenges in crafting effective job application documents. Jordan is one such country where English is a second language for many, and little is known about the CV/job application writing skills of Jordanian pharmacists. Therefore, this study examined Jordanian pharmacists' ability to write job applications cover letters, and personal statements in English and investigated the association between several demographics and professional variables and the readability index of cover letters and personal statements. This study aimed to investigate Jordanian pharmacists' ability to write job applications cover letters, and personal statements in English and evaluate the readability of their personal statements and cover letters. The data were blindly and independently reviewed by two researchers. The readability of the cover letters and personal statements was assessed using an online calculator that assigns a readability index score. A readability score of 7–12 was considered "target", while scores above 12 or below 7 were considered "complicated" or "simple", respectively. The relationship between readability index scores and other variables was analyzed using the chi-square test with a statistical significance level of 0.05.The study recruited 592 pharmacists. Most applicants, specifically 62.3%, were female, and 60.0% of them graduated more than six months before submitting their job applications. While 78.2% of the applications included a personal statement, only 34.8% included a cover letter, and 27.2% provided

both. Of the 206 cover letters written in English, 43.2% were tailored, and 80.6% were structured. The study also found that the provision of an official photo was associated with providing a cover letter ($P < 0.001$, Phi(φ) = 0.14) while providing a structured cover letter was associated with including a personal statement ($P < 0.001$, Phi (φ) = 0.24). Only 102 cover letters and 65 personal statements had readability index scores within the target range. In this study, most Jordanian pharmacists undervalue the importance of cover letters and personal statements and lack job application writing skills. The study also highlighted the need for improved pharmacists' English proficiency to write effective job application documents in Jordan.

04-O-14

Treatment Adherence in Patients Receiving Monoclonal Antibodies: An Experience from a Secondary Care Hospital in United Arab Emirates

Syed Arman Rabbani

Monoclonal antibodies (mAbs) have emerged as transformative agents in the therapeutic landscape; however, their use is associated with several challenges, including variability in clinical responses, potential for medication-related problems, such as adverse drug reactions (ADRs) and drug-drug interactions (DDIs), and treatment non-adherence. This analytical cross-sectional study was conducted in the inpatient and outpatient departments of a secondary hospital in the United Arab Emirates (UAE). Treatment adherence in patients receiving monoclonal antibodies was evaluated using the 8-item Morisky Medication Adherence Scale (MMAS-8). Eleven different mAbs were prescribed to the study patients. Evolocumab was the most frequently prescribed mAb (135 patients). Majority of the patients (247, 71%) had medium to high adherence with a median MMAS-8 score of 7.0. Multivariate logistic regression analysis identified ethnicity (OR:2.458, 95%CI:1.202-5.026, P=0.014), education status (OR: 6.542 95% CI: 2.632-16.257, $P < 0.001$), presence of comorbid conditions (OR:0.316, 95%CI: 0.111-0.905, P=0.032), type of mAb prescribed (OR:10.041, 95%CI: 3.293-30.620, P<0.001), and length of the treatment (OR:1.068, 95%CI: 1.028-1.109, P=0.001)) as independent predictors of adherence to mAb treatment. This study highlights the high adherence to mAb treatment. It sets the groundwork for future

extensive studies on mAbs within the region, providing essential insights into these important aspects of mAbs utilization.

04-O-15
Technology-Based Interventions for Tobacco Smoking Prevention and Treatment: A 20-Year Bibliometric Analysis (2003–2022)

Waleed M. Sweileh

Substance abuse, particularly tobacco smoking, is a significant global public health concern. Efforts have been made to reduce smoking prevalence and promote cessation, but challenges, such as nicotine addiction, marketing tactics by tobacco industry, and cultural acceptability hinder progress. Technology has emerged as a potential tool to address these challenges by providing innovative scalable interventions. The objective of the study was to analyze and map scientific literature on technology-based intervention for tobacco prevention and treatment. A bibliometric methodology was conducted. Scopus database was used to retrieve relevant research articles published between 2003 and 2022. The analysis included publication trends, key contributors, research hotspots, research themes, the most impactful articles, and emerging research topics. A total of 639 articles were found, with a slow and fluctuating growth pattern observed after 2011. The Journal of Medical Internet Research was the most prominent journal in the field. The United States was the leading country in the field, followed up by the United Kingdom, and the Netherlands. Research hotspots included smoking cessation, randomized controlled trials, and technology-based methods such as internet, mHealth, smartphone apps, text messages, and social media. Four primary research themes were identified: development of smartphone applications, efficacy of text messaging interventions, acceptance and effectiveness of smartphone applications, and interventions targeting young adults and students using mobile phone and social media platforms. The top 10 cited articles demonstrated effectiveness of digital interventions in promoting smoking cessation rates and reducing relapse rates. Emerging research topics included the use of virtual reality interventions, interventions for specific populations through personalized tools, and technology-based interventions in non-Western countries. The findings of the current study highlight the potential of technology to address the challenges associated with tobacco smoking.

Further future research in this area is warranted to continue advancing the field and developing effective and evidence-based interventions to combat tobacco smoking.

04-O-16
Exploring Pain Management Strategies: A Cross-Sectional Study of the Palestinian Population

Anas Hamdan, Rami Mosleh

Pain perception and management vary widely across cultural contexts, yet little is known about how the general population in Palestine approaches pain. Existing research lacks specific insights into pain coping strategies in this region. This study aims to explore pain management among Palestine's general population, examining the prevalence, characteristics, and socio-demographic influences on pain experiences and treatment choices. Using convenience and snowball sampling methods, data were collected from 646 adults in Palestine. Participants' socio-demographic characteristics, pain experiences, and pain management strategies were analysed using descriptive statistics, chi-square tests, and binary logistic regression followed by multiple logistic regressions. Chronic pain is predominant, particularly among the elderly. Pain prevalence varies significantly across socio-demographic factors, including age, marital status, and education level. Participants employ diverse pain management strategies, such as self-medication, physician visits, complementary medicine, and physical therapy. The elderly prefer traditional medical interventions, while those with higher education levels show a reduced inclination towards conventional treatments. Gender differences are evident, with women more likely to seek specialized pain management. Pharmaceutical use is notable, with acetaminophen being the most commonly used medication. Other frequently used treatments include physical therapy, engagement in physical activities, and herbal remedies. The least employed interventions are advanced methods like Transcutaneous Electrical Nerve Stimulation (TENS), psychotherapies, and anti-epileptic medications. There is a significant association between the use of anxiolytics and self-medication. Participants who used acetaminophen, topical anaesthetics, vitamins, minerals, and herbal remedies were more likely to seek medical consultation from physicians. The use of herbs and narcotics is associated with a higher

likelihood of utilizing complementary medicine. Physical therapy is more likely among those receiving heat and cold therapy, whereas those relying on acetaminophen are less inclined to opt for physical therapy. Surgical treatment, topical anesthetics, narcotics, NSAIDs, and muscle relaxants significantly increase the likelihood of seeking specialized pain management from anaesthesiologists. This study underscores the complex interaction of socio-demographic factors, pain experiences, and treatment preferences in pain management. Personalized pain management strategies considering age, marital status, education level, and gender are crucial for improving treatment outcomes and patient satisfaction. Further research is needed to explore the cultural and socioeconomic factors influencing pain management in Palestine to develop more effective and inclusive healthcare policies.

04-O-17

Immediate Effects of Hemodialysis, on Lung Function in Patients with End Stage Renal Disease (ESRD)

Ezeddin Salem Gassar, Faiza Elhamdy, Jamal El-dressy, Negia Abdullah Emtawel Mohamed, Abdulla Elmadani

End stage renal disease (ESRD) marks the stage of kidney disease, necessitating dialysis or a kidney transplant for survival. Respiratory problems are prevalent among individuals with ESRD. This study aims to examine the changes in lung function among ESRD patients receiving hemodialysis. The main research question explores the impact of dialysis on lung function tests in ESRD patients and how different demographic, clinical and dialysis related factors play a role in these effects. The study goals were to assess the effects of dialysis on lung function tests in ESRD patients and to explore how various demographic, clinical and dialysis related factors affect these alterations. Employing a Quasi Experimental Pre-Post Observational Analytical design the research was carried out as an investigation at the Benghazi Nephrology Center from December 2022 to April 2023. A total of eighty-two patients undergoing hemodialysis were enrolled in the study. Pulmonary function tests using spirometry were conducted immediately before and after sessions. Robust regression analysis was utilized to pinpoint predictors of changes, in lung function. The research revealed significant improvements, in lung function with increases in

delta Forced Vital Capacity (FVC) and delta Forced Expiratory Volume in 1 second (FEV1). These improvements were statistically significant showing increases of 0.20 liters for FVC and 0.14 liters for FEV1. Additionally, delta FEV1 / FVC the ratio also shows a significant increase of 0.03. The study identified factors that influence changes in lung function through regression analysis. Factors such as KT/V adequacy and BMI were linked to changes in FVC while volume overload and age were associated with alterations in FEV1. Volume overload also played a role in changes to the FEV1/FVC ratio. Hemodialysis has been shown to have an impact on function among patients with end stage renal disease (ESRD). It underscores the importance of monitoring factors like KT/V adequacy, BMI and volume status to achieve pulmonary outcomes for ESRD patients. Regular monitoring of lung function is crucial for enhancing health and clinical results for people, with ESRD.More investigations are necessary to enhance the comprehension of these connections and enhance the strategies patients caring.

04-O-18
Diabetes-Related Microvascular Complications in Primary Health Care Settings in the West Bank, Palestine

Mohammad Dweib, Nuha El Sharif

Worldwide, retinopathy, nephropathy, and neuropathy are the major diabetes-related microvascular complications. In Palestine, a low-middle-income country, diabetes is the fourth reason for death. However, a few studies examined diabetes microvascular consequences and its management. Therefore, we carried out a national study that aims to investigate the factors associated with diabetes-related microvascular complications among individuals seeking care in primary healthcare settings of the West Bank of Palestine. Using a cluster systematic sampling technique, 882 participants with diabetes patients were chosen for a cross-sectional study from primary healthcare facilities operated by the Ministry of Health (PMoH), the United Nations Relief and Works Agency (UNRWA), and the Palestinian Medical Relief Society (PMRS). Data about patients related to diabetes-related complications, medication use, and other diseases were extracted from patients' medical records. In addition, an interview face-to-face questionnaire was used to collect

information about patients' sociodemographic variables, medical history, smoking habits, duration of the disease, presence of concurrent conditions previous referrals, and hospital admissions, as well as their level of knowledge regarding diabetes, complications, and treatments. Approximately 34.4% of persons with diabetes patients in Palestine encounter at least one microvascular complication associated with diabetes. The most prevalent diabetes-related microvascular complication was retinopathy (17.3%), 23.4% of participants had more than one microvascular complication, and 29% of male patients had erectile dysfunction. A higher probability of having any microvascular complications was associated with older age (over 60 years). Participants with diabetes patients with fundoscopy or ophthalmology reports, according to diabetes follow-up guidelines, were less likely to develop retinopathy. Also, those who performed regular kidney function testing were less likely to have nephropathy, and those who performed a regular foot exam were less likely to develop diabetic foot. Diabetes-related microvascular complications were associated with patient age, low education level, residency location, and adherence to diabetes follow-up guidelines of diabetes management, i.e., having been tested for HbA1c, consulting with specialists, regular kidney function, and foot examination. These factors can be utilized in setting up proper management protocols to prevent or delay microvascular complications in many patients.

01-P-01

Production and Chemical Characterization of a Natural Antibiotic Produced by Bacteria Isolated from Dead Sea Region

Dima Lafi

The emergence of antibiotic resistance has become a major concern, surpassing the development of new antibiotics. To tackle this challenge, it is crucial to explore bioactive metabolites from microbial sources and discover new antibiotic compounds for improved therapeutics against infectious diseases. The objective of the research mentioned was to identify antibiotics produced by a producer strain (DGSI), which was previously isolated from the Dead Sea region, in the search for a novel antibiotic. The identification of DGSI using the API kit has yielded the identification of *Bacillus subtilis* with a confidence level of 92.6%. However, through 16S rRNA sequencing, it was identified as *Bacillus vallismortis* (*B. vallismortis*) with a 99.63% match. This new strain was submitted to the NCBI GenBank as *B. vallismortis* DGSI strain under accession number OQ568809.The DGSI supernatant was extracted using n-hexane, and the resulting crude extract underwent purification through thin-layer chromatography (TLC). Using the bioautography method, the antimicrobial activity of the partially purified compound was determined, resulting in the discovery of two active compounds: compound 1 and compound 3. The study successfully isolated two distinct active compounds that exhibited potent antimicrobial properties. The minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) were determined for each compound. The results indicated that compound 3 demonstrated antimicrobial activity against both Gram-positive bacteria (*Bacillus cereus* and *Staphylococcus aureus*) and Gram-negative bacteria (*Escherichia coli* and *Pseudomonas aeruginosa*). On the other hand, the activity of compound 1 was limited to Gram-positive bacteria only.The structures of the two antibiotic compounds were identified based on their spectral data, including 1D, 2D nuclear magnetic resonance (NMR), and Fourier-transform infrared (FTIR) spectroscopy. The structural chemical analysis of compound 1 suggested that it is likely a lipopeptide or flavonoid, while compound 3 is most likely a peptide, although the possibility of it being a carbohydrate cannot be ruled out. However, determining the exact structures of the compounds proved to be challenging, and further chemical analysis is necessary to

precisely determine their structures and the potential for novel compound discovery.

01-P-02

Discovery of Novel TOPK Inhibitor as a Potential Anti-Cancer Using Ligand-Based Pharmacophore Modeling, Molecular Docking, and Molecular Dynamic Simulation

Hafidah Zaki Al-Qudah

Cancer is a significant public health concern as it is the second leading cause of death worldwide. As a result, scientists are actively seeking new macromolecular targets that are overexpressed in tumorous tissues compared to normal ones. The T-lymphokine-activated killer cell-originated protein kinase (TOPK) is a serine-threonine kinase that is rarely expressed in normal cells, except for in the testis and fetal cells. It plays a crucial role in tumor proliferation, metastases, inflammation, apoptosis, and drug resistance. As a result, TOPK is seen as a promising target for cancer treatment. Several TOPK inhibitors have been discovered, but some have shown toxicity and poor water solubility in preclinical studies, which has limited their progression to clinical trials. Consequently, there is still a high demand for potent and selective TOPK inhibitors. The present study aimed to discover new chemical scaffolds with potential TOPK inhibitory activity and feasible chemical synthesizability and optimization. Therefore, ligand-based and structure-based pharmacophore modeling, followed by virtual screening, and molecular dynamic (MD) simulation were utilized. Seven pharmacophore hypotheses were generated using the *Common Feature Pharmcophore Generation* and the *Interaction Pharmcophore Generation* Protocols in Discovery Studio. These seven hypotheses were then used as a 3D query for virtual screening, and hits were filtered based on their fit values alongside their drug-likeness and ADMET properties using Lipinski and Veber rules. The resulting hits were docked into the ATP-binding pocket of the Alphafold predicted structure of TOPK using the *Dock Ligands (CDOCKER)* Protocol. A set of 16 ligands falling into 6 different scaffolds was selected based on their favorable interaction within the ATP-binding pocket residues and tested *in vitro* to determine their inhibitory activity against the TOPK enzyme. Finally, the identified hit was subjected to MD simulation to analyze its binding modes and compare it to a more active TOPK

inhibitor. The Current research has successfully identified the 1*H*-benzo[*g*]indol-5-ol containing compound as a hit inhibitor for TOPK. It has a novel scaffold and an IC_{50} value of 60 μM. These findings, combined with existing knowledge of the structure-activity relationship at TOPK, could help in optimizing the identified hit to achieve the desired level of inhibition.

01-P-03

Trifluoromethylated Aryl Sulfonamides as Novel CETP Inhibitors: Synthesis, Induced Fit Docking, Pharmacophore Mapping and Subsequent *In Vitro* Validation

Reema Abu Khalaf, Hamza Al Shaiah, Dima Sabbah

Cardiovascular disease is one of the leading causes of death. Atherosclerosis causes arterial constriction or obstruction resulting in acute cardiovascular illness. Cholesteryl ester transfer protein (CETP) facilitates reverse cholesterol transport. It supports transfer of cholesteryl ester from HDL to LDL and VLDL. Inhibition of CETP by drugs limits cardiovascular disease, by decreasing LDL and increasing HDL. In this study, fourteen trifluoromethyl substituted benzene sulfonamides 6a-6g and 7a-7g were prepared.The synthesized molecules were characterized using 1H-NMR, 13C-NMR, IR and HR-MS. They were in vitro biologically tested to estimate their CETP inhibitory activity.In vitro biological evaluation showed that compounds 7d-7f had the highest inhibitory activity with 100% inhibition, while compounds 6a-6g, 7a-7c and 7g activities ranged from 2%-72% at 10 μM concentration. It was found that the addition of a fourth aromatic ring significantly improved the activity, which may be due to the hydrophobic nature of CETP. Also, presence of ortho-chloro, meta-chloro and para-methyl substituents result in high inhibitory activity. The induced fit docking studies revealed that hydrophobic interaction proceeds ligand/CETP binding interaction in addition to H-bond formation with Q199, R201, and H232. Furthermore, pharmacophore mapping displayed that this series approved the functionalities of CETP active inhibitors.

01-P-04
From Pixels to Pills: Showcasing AI's Triumphs in Drug Discovery

Taha A. Al-Hayali, Fadi G. Saqallah, and Belal O. Al-Najjar

In an era where artificial intelligence (AI) continually advances, its application has seamlessly extended into the field of drug discovery. This review article outlines the recent breakthroughs facilitated by AI in this field, encompassing the diverse dimensions of machine learning, deep learning, and natural language processing. Notable milestones in AI's contribution to drug discovery are highlighted, such as the emergence of DSP-1181, the first AI-designed drug candidate entering a clinical trial. Additionally, we emphasise on the discovery of abaucin, an AI-discovered antibiotic targeting *Acinetobacter baumannii* infections. However, this article also acknowledges the limitations and challenges associated with harnessing AI within this context, including data quality and accessibility to the interpretability and robustness of AI models, as well as the ethical and legal considerations inherent in this transformative landscape. Furthermore, this review explores specific AI-driven drug candidates that advanced through various stages of clinical trials, shedding light on their potential therapeutic applications, and offering insights into their progression within clinical settings. Lastly, we venture into the future perspectives of AI in drug discovery, envisioning its role in personalised medicine, *de novo* design, and the prediction of compounds' synthetic routes and physicochemical properties.

01-P-05
New Lipophilic Fluoroquinolones: Promising Anticancer and Antioxidant Properties

Yusuf M. Al-Hiari, Moneera Alzghoul, Violet Najeeb Kasabri,

In the context of repurposing antimicrobial fluoroquinolones (FQs), this study seeks to introduce new lipophilic fluoroquinolones with anticancer properties and to demonstrate that chelation is a potential anti-proliferative mechanism. For this study, 21 lipophilic-acid chelating FQs were synthesized and tested for their antiproliferative, antioxidant, and anti-inflammatory effects. In vitro Glo-I inhibition enzyme inhibition, complexation titration assay, and docking studies were also conducted.

The findings indicate that the reduced FQ series which exhinbit ethylene diamine bridge, specifically 14c, demonstrated similar efficacy in scavenging NO- and DPPH- radicals as indomethacin and ascorbic acid. Additionally, FQs 10a, 10b, and 14b exhibited notable antioxidant effects compared to the other compounds. The antiproliferative activities of reduced FQs were most effective against MCF7, HT29, T47D, and SW480, with many derivatives showing IC50 values below 10 μM, particularly with MCF7 and HT29. The reduced compounds (10a-d, 14a-d) displayed the lowest IC50 values against the strongest 4 cell lines compared to the nitro (9,13) and the triazolo series (11,15). Furthermore, the reduced series of hexyl phenyl 14 a, c, d with para halogens exhibited greater potency than hexyl amines counterparts 10a, c, d. In vitro cytotoxicities of the majority of novel Nitro-, Reduced-, and Triazolo-FQs in SW480 and HT29 72-hr incubations were either equipotent or, surprisingly, more potent than antineoplastic cisplatin. The pronounced effect of the reduced series 14 a, b, c, 10a, c, d is attributed to metal chelation within the C8-C7 ethylene diamine bridge, while the size and N1 imposed steric effect influenced the optimal space needed for chelation. Complexation studies revealed that central iron chelation is the main mechanism within cells, whereas Zn chelation was the main mechanism in Zn metalloenzyme GLoI. Mechanistically, NitroFQs 9d, 13a, d, and their respective Reduced FQs 14a, d were found to be unprecedentedly equipotent to Myricetin capacity of Glo-I enzymatic inhibition (IC50 value of 3.5 μM). Additionally, appreciably significant Glo-I inhibition with IC50 values ranging from 24-52 μM were obtained for Nitro- and their Reduced FQs. It is proposed herein the FQs mechanism of action involved Acidic groups and the formation of a Chelation Bridge between C8 and C7 ethylene diamine.

01-P-06
Heterocyclic Carboxamide Derivatives as Potential Antihyperlipidemic Agents

Hanin Kalloush, Yusuf Al-Hiari, Tariq Al-Qirim, Mohammad Alwahsh

This study focuses on the development of novel pyrazine-2-carboxamide derivatives and their evaluation for hypolipidemic activity using the Triton WR-1339 rat model. The compounds were administered at a fixed dose of 20 mg/kg. Additionally, various derivatives and linkers were examined under the same experimental

conditions. The target compounds include pyrazine-2-carboxamides of benzophenones, acetophenones, anilines, and amine derivatives, as well as pyrazine-2-carboxylate esters of benzophenones, acetophenones, substituted phenols, and alcohols. Methylpyrazine-2-carboxamide derivatives were also synthesized. The compounds were successfully synthesized, purified, and fully characterized through nuclear magnetic resonance (NMR) spectroscopy, with several also confirmed via high-resolution mass spectrometry (HRMS). Most derivatives were obtained by direct coupling of heterocyclic acyl chloride with the corresponding amines, using pyridine and triethylamine (TEA) as the acylation catalyst and acid scavenger, respectively. The reactions were conducted under reflux using conventional heating, which is anticipated to yield satisfactory results. Selected compounds were tested in vivo in a Triton WR-1339-induced hyperlipidemic rat model, following a single intraperitoneal injection of 300 mg/kg Triton WR-1339. Fenofibrate (65 mg/kg, orally administered) was used to validate the model. This research highlights key structure-activity relationship (SAR) criteria for identifying potent hypolipidemic agents.

01-P-07
Antiplatelet Effects of Isomahanine and Baeckein A as Potential $P2Y_{12}$ Receptor Antagonists

Mahmmoud Z. Al-Ghoul and Fadi G. Saqallah

Platelets, anucleate cell fragments originating from megakaryocytes in the bone marrow, are essential for haemostasis, inflammation, and wound healing. Their activation, which includes morphological changes, granule release, and enhanced aggregation, is primarily mediated through purinergic $P2Y_1$ and $P2Y_{12}$ receptors. Up to date, five $P2Y_{12}$ antagonists are available, classified as thienopyridines or nucleoside-nucleotide derivatives. This study aimed to identify novel $P2Y_{12}$ antagonists from natural sources by screening over 4000 compounds in the NADI Discovery Database using AutoDock Vina. The crystal structure of $P2Y_{12}$ (PDB ID 4NTJ) was employed, targeting $P2Y_{12}$'s main binding site. Eleven of the top 20 compounds were selected for further investigation using molecular docking simulations using AutoDock software. Cangrelor's binding profile served as a comparative benchmark. Results revealed binding energies ranging

from -7.06 kcal/mol for morelloflavone to -10.08 kcal/mol for isomahanine. Cangrelor's binding energy was found at -8.90 kcal/mol. Isomahanine, from *Murraya koenigii*, exhibited only one H-bond interaction with Val102 and multiple hydrophobic interactions, while baeckein A, from *Baeckea frutescens*, showed significant H-bond interactions with key residues, including Gln98, Tyr109, Ser156, Asn159, Gln195, and Lys280 due to its polyphenolic structure. These findings emphasise the potential use of isomahanine and baeckein A as $P2Y_{12}$ antagonists, while necessitating further *in-vitro* and *in-vivo* evaluations to establish the therapeutic potential and safety of these compounds as $P2Y_{12}$ antagonists.

01-P-08
Novel Glucokinase Activators: A Structure-Based Pharmacophore Modeling, QSAR Analysis, and Molecular Dynamics Approach

Mansour Al-Sayed Ahmad, Belal O. Al-Najjar, Ashok Shakya

Glucokinase (GK) activators are promising candidates for type 2 diabetes treatment. This study utilized structure-based pharmacophore modeling and QSAR analysis to identify novel activators. Virtual screening of a 250,000-compound library yielded eight new candidates with significant in vitro activity (over 50% activation at 25 µg/mL) and diverse structures. Molecular dynamics simulations revealed a potential mechanism involving a transient loop flip in the GK allosteric site, aligning with known activator behavior. The leading candidate, NSC12516, displayed superior hydrogen bonding with key residues (compared to known activator MRK501) and potentially stronger binding affinity due to favorable energetics. These findings clear the way for developing potent and selective GK activators for type 2 diabetes.

01-P-09
Comparative Study on the Chemical and Biological Characteristics of leaves and seeds of *Aloyasia citrodora* in Palestine

Fatima Al-Mohtaseb, Abdel Qawasmeh, Alaa Khraiwesh, Seema Fallah

Aloysia citrodora Paláu, known as lemon verbena, is a well-known medicinal plant that has a variety of therapeutic applications. This study is focused on the chemical and biological characteristics of the leaves

and seeds of *A. citrodora* in Palestine. Specifically the aims were to examine the antioxidant activities by DPPH$^{\bullet}$ and ABTS$^{\bullet+}$ scavenging assays; determine total phenolic content using the Folin-Ciocalteau method; determine the volatile compounds by GC-MS and the antimicrobial activities against G+ and G- bacteria. The methanolic extract (1:20 dilution) in antioxidant capacity test showed the highest activities observed in the leaves. The DPPH$^{\bullet}$ scavenging percentage for the leaves was 39.6%, while ABTS$^{\bullet+}$ scavenging was 55.27%. Total phenolic content in the leaves (254.091 mg GAE/g dry weight) was higher than the seed (199.1 mg GAE/g dry weight). Phytochemical screening indicated the presence of various bioactive compounds, including cardiac glycosides, alkaloid, flavonoids, glycosides, saponins, quinones, steroids, tannins, terpenoids and phlobatannins in the leaves and seeds of *A. citrodora*. Leaves and seeds expressed variably range of volatile compounds, including limonene, cineole, β-caryophyllene, ocimene, spathulenol, humulen, copaeneol, eucalyptol, carveol, neral, β-bourbonene and tocopherol (Vitamin E). The seed extract (300mg/ml, n=3) demonstrated significant antibacterial activity (expressed as % with the control) against *Staphylococcus aureus* (105.55% and 77.78%) inhibition in well and disk diffusion assays, respectively. Leaves and seeds displayed similar antibacterial activity against resistant *Staphylococcus aureus* with the leaves extract 90% in well diffusion and 63.33% in disk diffusion method. Whereas the seeds gives 82.46% in well diffusion and 68.42% in disk diffusion method. Only seeds extract showed mild antibacterial activity against *Klebsiella* species (35.48%). This study highlighted the potential of *A. citrodoria* extracts as a strong antioxidant herb with a significant antibacterial activity even against methicillin resistant *Staphylococcus aureus* (MERSA).

01-P-10
Phytochemical Screening and Biological Activity of *Salvia hierosolymitana* Leaves Extract

Hiba Swaity, Qawasmeh Abdel, Sami Makharzah, Seema Fallah

Salvia hierosolymitana is a perennial herb that belongs to the Lamiaceae family. Salvia plants have been known for their medicinal properties since ancient times. In this study, leaves of *Salvia hierosolymitana* have been investigated for their antibacterial activity, antioxidant activity, photochemical analysis, and volatile compositions.

Salvia hierosolymitana methanolic leaves extract showed antioxidants with 40.26% & 55.08% by using DPPH and ABTS assays, respectively. The photochemical screening of the leaves extract showed the presence of cardiac glucoside, phenolic groups, saponins, quinones, terpenoids, and steroids. The GC-MS analysis showed three compunds. The volatile compounds are Tetradecanoic acid, 10,13-dimethyl-methyl ester, Menthol, and 9H-Pyrido(3,4-B) indole, 8-methoxy-1-methyl. *Salvia hierosolymitana* methanolic extract has also been tested for its phenolic content showing 41.27 mg GAE/g dry weight by using Folin-Ciocalteu method. The antibacterial activity of this plant has been tested using both well and disk diffusion. *Salvia hierosolymitana* leaves extract showed antibacterial activity against *S. aureus* ATCC and MRSA using both method. This is first study to investigate the full biological profile of *Salvia hierosolymitana.* The findings summarized in this study supported the used of *S. hierosolymitana* in herbal medicine.

01-P-11

Structure-Guided Drug Repurposing Identifies Aristospan as a Potential Inhibitor of β-Lactamase: Insights from Virtual Screening and Molecular Dynamics Simulations

Moayad Jamal Saeed Shahwan

The rise of the β-Lactamase mediated antibiotic resistance is a major concern for public health, hence, there is an urgent need to find new treatment approaches. Structure-guided drug repurposing offers a promising approach to swiftly deliver essential therapeutics in the fight against escalating antibiotic resistance. Here, a structure-guided virtual screening approach was used involving, drug profiling, molecular docking, and molecular dynamics (MD) simulation to identify existing drugs against β-Lactamase-associated drug resistance. We exploited a large panel of FDA-approved drugs to an extensive *in silico* analysis to ascertain their ability to inhibit β-Lactamase. First, molecular docking investigations were performed to assess the binding affinities and interactions of screened molecules with the active site of β-Lactamase enzymes. Out of all the screened candidates, Aristospan was identified to possess promising characteristics which include appropriate drug profiles, high binding specificity, and efficiency towards the binding pocket of β-Lactamase. Further analysis showed that Aristospan

possesses several desirable biological characteristics and tends to bind to the β-Lactamase binding site. To explore the interactions further, the best docking pose of Aristospan was selected for MD simulations to assess the thermodynamic stability of the drug-enzyme complex and its conformational changes over 500 ns. The MD simulations demonstrated that the β-Lactamase-Aristospan complex was stable in the 500 ns trajectory. These enlightening results suggest that Aristospan may harbor the potential for further evolution into a possible β-Lactamase inhibitor, with relevance to combating resistance to antibiotics.

01-P-12

Chemical and Biological Comparative Evaluation of Palestinian *Ceratonia siliqua* Parts (Peel, Seeds, and Leaves).

Qawasmeh Abdel, Alaa Khraiwesh, Samah Alshareef

Medicinal plants have long been integral to traditional medicine and continue to contribute to modern pharmacological research. *Ceratonia siliqua* (carob) is a notable example, belonging to the Leguminosae family is a valuable medicinal plant in traditional and modern pharmacological research. Native to the eastern Mediterranean, carob trees thrive in warm, dry climates and produce nutrient-rich pods. The nutritional profile of carob includes high sugar content, low fat, and significant amounts of dietary fiber, vitamins, and minerals. It serves as a natural sweetener and cocoa substitute, free from caffeine and theobromine. Phytochemical analysis reveals that carob is rich in tannins, polyphenols, flavonoids, and phenolic acids, contributing to its antioxidant properties. This study examines the antioxidant and antibacterial properties of diluted (1:20) methanolic extracts from various carob plant parts. Antioxidant capacity was assessed using DPPH● and ABTS●+ free radical scavenging assays, with the highest activities observed in the leaves. The DPPH● scavenging percentage for the leaves was 83.31%, while ABTS●+ scavenging was 94.78%. Total phenolic content, expressed as gallic acid equivalents (GAE), was also highest in the leaves at 781.26 mg GAE/g dry weight. Phytochemical screening indicated the presence of various bioactive compounds, including alkaloids, flavonoids, phenolic groups, glycosides, saponins, quinones, steroids, and terpenoids in different plant parts. GC-MS analysis identified at least five different volatile

compounds in each carob part, including tetradecanoic acid, pentadecanoic acid, nonanoic acid, methyl hexadecanoate, eicosanoic acid, s-tocopherol (Vitamin E), hexanoic acid ethyl ester, heptadecane, and phytol. Antibacterial activity was evaluated against Gram-positive Staphylococcus aureus and Gram-negative bacteria such as E. coli, Pseudomonas aeruginosa, and Klebsiella spp. using disk and well diffusion. The leaves extract demonstrated significant antibacterial activity, particularly against Staphylococcus aureus, with 133.33% and 111.1% inhibition in well and disk diffusion assays, respectively, at stock concentration. Antibacterial efficacy decreased with dilution but remained notable in the leaves extract. The antibacterial test was also done in two pathogenic bacteria, which are e.coli and resistance Staphylococcus aureus. The carob leaves extract showed remarkable results on both bacteria with for *E. coli* strain 53.125% inhibition in well diffusion and 48.387% in disk diffusion, whereas in resistance Staphylococcus aureus with 126.31% inhibition in well diffusion and 115.7% in disk diffusion. The study highlights the potential of carob extracts, particularly from leaves, as natural sources of antioxidants and antibacterial agents, suggesting their use in developing natural health products.

01-P-13

Exploring the Potent Antioxidant and Antibacterial Properties of *Rosmarinus officinalis* L. Leaf Extract: Health-Promoting Benefits of Rosemary Leaf Extract

Jummana M Makhammra, Rezq Basheer-Salimia, and Hatem A Hejaz

Rosmarinus officinalis L. belongs to the Lamiaceae family. Over time, *Rosmarinus officinalis* has been employed for its potential contributions to health. This study aimed to investigate the antioxidant and antibacterial properties of *R. officinalis* leaves. *Rosmarinus officinalis* leaves were collected from various locations in the southern region of Palestine, subjected to air-drying, grinding into powder, and then extracted. The methanol extracts obtained were subsequently analyzed using Gas chromatography-mass spectrometry (GC-MS). The sections were evaluated for their antioxidant activities through assays measuring 2,2-diphenyl-1-picrylhydrazyl (DPPH) and [2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid)] (ABTS) radical scavenging and their antibacterial activities were examined by disk diffusion. The

analysis successfully separated and identified various volatile compounds and semi-volatile phytochemicals. Eucalyptol (1,8-cineole) and camphor were the primary components in all analyzed *Rosmarinus officinalis* samples. The analyzed samples' extracts demonstrated scavenging abilities ranging from 73.25% to 88.82% and 73.25%-76.36%, using the ABTS and DPPH assays, respectively. In antibacterial investigations, inhibitory zones were observed against *Klebsiella pneumonia*, *Escherichia coli*, and *Staphylococcus aureus*. These findings regarding *Rosmarinus officinalis* antioxidant and antibacterial properties suggest its potential as a promising antioxidant and potential antibacterial solution.

01-P-14
Toxic Metals Safety Assessment of fish oil supplements prescribed for pregnant women in Jordan

Hadeel N. Alhesa and Ala A. Alhusban

Physicians particularly Gynaecologists recommend omega-3 pharmaceutical supplements due to their positive outcomes for pregnant women and the fetus. This study objective is to assess the potential contamination by toxic metals including Pb, Cd, As, Al, and Hg in these prescribed products for pregnant women in Jordan. In the Jordanian market, there are only 20 registered products for pregnant women in JFDA that contain omega-3 fatty acids and are prescribed regularly for pregnant women during the middle stages of their pregnancy, especially in the second and third trimesters. To investigate the toxic metal content of omega-3 products, the wet digestion technique using nitric acid at high temperatures was used to eliminate the organic matter in the samples which will facilitate metal detection using atomic spectroscopic techniques. The developed open wet digestion procedure accuracy was assessed using a Certified Reference Material to investigate the recoveries of each metal. The results indicated that Hg was below the limit of qualification, and the recovery% for Pb, Cd, As, and Al were 92%, 88%, 107%, and 93%, respectively. Following digestion, metal levels in samples were assessed using validated Inductively Coupled Plasma - Optical Emission Spectrometry (ICP-OES) with a Limit of Detections (LODs) of (Al) 0.006 mg/kg, (Pd) 0.005 mg/kg, (As) 0.0017 mg/kg, (Hg) 0.008 mg/kg, and (Cd) 0.0025 mg/kg. Both Pb and Cd were detected in 25%

of the samples of omega-3 products, whereas As was only detected in 5% of the samples. Al was found in 50% of the assessed samples. In addition, none of the assessed omega-3 pharmaceutical products had detectable Hg levels. Data were compared based on World Health Organization (WHO) guidelines for heavy metal levels. Most pharmaceutical omega-3 products (Pd, Cd, As, Al, and Hg) had levels under permitted hazardous metal limits. Moreover, pharmaceutical omega-3 products did not exceed the regulatory authorities' daily tolerated intake of metals. It can be assumed that the registered omega-3 products intended for use by pregnant women in Jordan consumption are safe within the allowable daily dosage.

02-P-01

Development of a Physiologically-Based Pharmacokinetic Model to Predict Empagliflozin-Metoclopramide Interaction in Gastroparesis

Abdallah Monther Alnabelsi

Gastroparesis which is common in diabetic patients is defined as a delay in the gastrointestinal tract movement due to enteric nervous system impairment affecting the stomach. This delay can be treated with prokinetic agents such as metoclopramide. This study aims to predict and quantify the drug-drug interaction (DDI) among commonly prescribed combination to diabetic patients suffering from gastroparesis; empagliflozin 10 and 25 mg and metoclopramide 20 mg four times daily. Gastroplus® (Version 9.8.3; Simulations Plus, Inc., Lancaster, California, USA) was utilized to modify the ACAT model and mimic gastroparesis in virtual Caucasian male. The transit time was modified from 0.25 hour to 1 hour. Metabolic profile of both study drugs were collected from literature. Pharmacokinetics of empagliflozin and metoclopramide in normal conditions were simulated under both fast and fed state. Then, similar conditions were simulated in gastroparesis. The DDI was then simulated for 24 hours considering empagliflozin the victim drug. Empagliflozin pharmacokinetics in gastroparesis did not alter significantly when metoclopramide was administered over 24 hours in both fast and fed conditions or in gastroparesis for the 10 and 25 mg doses. Empagliflozin C_{max} and $AUC_{0-\infty}$ in gastroparesis under fasting conditions for the 10 mg dose were 2.66 ng/mL and 10.05 ng.hr/mL while after metoclopramide they were 2.72 ng/mL and 10.38 ng.hr/mL, respectively. For the 25 mg, C_{max} and $AUC_{0-\infty}$ were 7.24 ng/mL and 21.69 ng,hr/mL and after metoclopramide they were 7.27 ng/mL and 21.89 ng.hr/mL, respectively. The results of this study indicates there is no significant interaction when metoclopramide is administered to patients talking empagliflozin leading to alterations in the drug concentration and exposure. Additionally, gastroparesis does not seem to be a significant factor altering the pharmacokinetics of empagliflozin despite the fact that empagliflozin itself induces gastroparesis. Thus, further research is warranted on clinical cohort to confirm this conclusion.

02-P-02

The Innovative Programmable Bridge RNA: The Next Generation beyond RNA Interference and CRISPR

Dima Ahmad Amin Hattab

Recent progress in RNA interference (RNAi) and programmable DNA nucleases enabled scientists to modulate accurately any gene in almost all cells and organisms. Numerous RNAi-based and CRISPR-based therapies have been approved for their clinical applications. However, these gene editing techniques are complicated, and imprecise with high errors. A new RNA-guided DNA recombination platform with high accuracy, flexibility, and fewer errors was recently discovered. The highly selective and specific insertion sequences of the IS*110* family and IS*1111* family encode non-coding RNAs (ncRNAs)-derived RNA molecule (Bridge RNA) associated with their self-encoded recombinase. The bridge RNA, as described by Hsu, consists of two distinctive loops; one loop recognizes the IS donor DNA, and the other loop guides the recombinase to identify the specific IS genomic insertion target site. The bases of one segment match the top strand, whereas the second segment is complementary to the bottom strand of the target. The dual-strand match between the bridge RNA and the target DNA explains its high accuracy in selecting a specific target DNA sequence. The IS-encoded protein (recombinase) and RNA permit them to cut and paste themselves into selective and site-specific targets in a single-step mechanism and without breaking DNA strands. Interestingly, the resultants' bridge RNA could be reprogrammed to target different genomic sequences specifically. The programmed bridge RNA showed a robust capability to specifically insert large segments of DNA (up to multi-kilobases) into the genome. The programmable bridge RNA holds the promise to induce genetic rearrangement, insertion, excision, and inversion, on a large DNA segment or even the whole genome. Nevertheless, manipulations of a large-scale or even the whole genomic sequence are also a limitation for RNA-guided technology allowing for unintentional consequences that may affect the person itself or the next generations. To date, these studies are being conducted in vitro or on bacteria, and further investigations on animal models and mammalian models are needed to apply and modify human genomic sequences. However, the programmable RNA-based gene editing system holds the promise to

upload genes in cell-based therapies for cancer treatment, to remove the repetitive mutated segment of DNA responsible for neurodegenerative disorders such as amyotrophic lateral sclerosis and Huntington's disease, and to replace the damaged genes for treating inherited diseases. The small size of the new gene-editing machinery and its ability to insert a large segment of DNA, thousands of bases long, without breaking DNA strands will revolutionize the genetic engineering era surpassing the challenges associated with the preceding gene-editing technologies.

02-P-03

Downregulation of Aquaporins and PI3K/AKT and Upregulation of PTEN Expression Induced by the Flavone Scutellarein in Human Colon Cancer Cell Lines

Noor Tarawneh, Lama Hamadneh, Walhan Alshaer, Abdel Qader Al Bawab, Yasser Bustanji and Shtaywy Abdalla

Scutellarein has an anticancer potential, but the pathway of its action has not been elucidated. This study investigated scutellarein efficacy against human colorectal cancer (CRC) and explored the possible pathway of its action. MTT assay was employed to detect scutellarein effect on HT-29, SW-480, and HCT116 cells viability. Annexin V-FITC/PI staining and flow cytometry was used to study scutellarein impact on apoptosis. Wound healing and transwell chambers were used to detect its role on migration and invasion. Aquaporin (AQP) 1, 3, and 5 expressions before and after scutellarein treatment were studied by reverse transcription-quantitative polymerase chain reaction (RT–qPCR) and immunostaining while Western blotting was used to explore scutellarein effect on PI3K/AKT signaling pathway. Scutellarein induced apoptosis and necrosis in CRC cells, thus inhibiting proliferation, migration, and invasion. Colon cancer cells exhibited positive staining for AQP 1, 3, and 5 which was downregulated by scutellarein. PI3K/AKT pathway mediating cell proliferation and growth was also modulated by scutellarein; phosphatase and tensin (PTEN) was upregulated, whereas PI3K, AKT, and p-AKT expressions were downregulated, and the downstream mTOR and p-mTOR were also suppressed at the protein level. Data indicated that scutellarein inhibited growth, migration and invasion of these CRC cells by downregulating AQP 1, 3, and 5 expressions and upregulating PTEN where the latter inhibited the

PI3K/AKT pathway at the gene and protein levels. The data indicate that scutellarein is a promising therapeutic agent that inhibits growth, migration, and invasion of CRC cells by down-regulating AQP 1, 3, and 5 expressions and up-regulating PTEN, thus inhibiting PI3K/AKT. These molecular alterations represent potential prognostic biomarkers for colon cancer metastasis, where the down-regulation of AQPs enhances patient survival.

02-P-04

The Nurr1 Ligand Indole Acetic Acid Hydrazide Loaded onto $ZnFe_2O_4$ Nanoparticles Suppresses Proinflammatory Gene Expressions in SimA9 Microglial Cells

Tuqa Abu Thiab

The nuclear receptor-related factor 1 (Nurr1), an orphan nuclear receptor in microglia, has been recognized as a major player in attenuating the transcription of the pro-infammatory genes to maintain CNS homeostasis. In this study, we investigate Nurr1 trans-repression activity by targeting this receptor with one of the indole derivatives 3-Indole acetic acid hydrazide (IAAH) loaded onto zinc iron oxide ($ZnFe_2O_4$) NPs coated with PEG. XRD, SEM, FTIR, UV–Vis spectroscopy, and DLS were used to characterize the synthesized IAAH-NPs. The anti-inflammatory properties of IAAH-NPs on LPS stimulated SimA9 microglia were assayed by measuring pro-inflammatory cytokine gene expressions and protein levels using RT-PCR and ELISA, respectively. As a result, IAAH-NPs showed an ability to suppress pro-inflammatory genes, including IL-6, IL-1β, and TNF-α in LPS-stimulated SimA9 via targeting Nurr1. The current study suggests that ZnFe2O4 NPs as a delivery system can increase the efficiency of cellular uptake and enhance the IAAH ability to inhibit the pro-inflammatory cytokines. Collectively, we demonstrate that IAAH-NPs is a potential modulator of Nurr1 that combines nanotechnology as a delivery system to suppress neuroinflammation in CNS which opens a window for possible ambitious neuroprotective therapeutic approaches to neuro disorders.

02-P-05
Exploring the Antioxidant and Anti-Inflammatory Effects of Rhoifolin Isolated from *Teucrium polium* on Rats' Lungs Exposed to Tobacco Smoke

Eveen Al-Shalabi, Suhair Sunoqrot, Thanaa Al-Zuhd, Rahaf S. Alshehada, Ali I. M. Ibrahim, and Alaa M. Hammad

Cigarette smoking exacerbates respiratory diseases, while plant-derived polyphenols offer antioxidant and anti-inflammatory benefits. This study explored the effects of Rhoifolin (ROF), a polyphenol from Jordanian Teucrium polium, on lung health in rats exposed to tobacco smoke. Male rats were divided into two groups: one exposed to cigarette smoke (CS), and the other to ROF treatment alongside smoke exposure (CS/ROF). ROF was administered orally for 21 days before smoke exposure. Results showed smoke-induced lung inflammation and oxidative stress, mitigated by ROF treatment. Histological examination revealed smoke- related morphological changes in lung tissue. ROF treatment reduced oxidative stress and inflammation, as evidenced by decreased proinflammatory cytokines. In silico docking demonstrated ROF's potential as an inhibitor of proinflammatory cytokines. This study demonstrates the therapeutic potential of ROF and similar polyphenols in mitigating the harmful effects of cigarette smoke on lung health.

02-P-06
An in vitro Anticoagulant Effect of Aqueous Extract of Sumac *Rhus coriaria* L.

Shoroq Shawar, Hatem A. Hejaz, and Rezq Basheer-Salimia

In the realm of global health, cardiovascular diseases, particularly thromboembolic disorders, continue to impose a significant burden, representing a leading cause of both morbidity and mortality. Contemporary medicine places paramount importance on the prevention and management of these diseases, driving a growing interest in natural sources of anticoagulant compounds as potential alternatives or supplements to existing therapies. Among these natural alternatives, Sumac (*Rhus coriaria L.*), a widely used spice with a rich history of medicinal applications, has emerged as a promising source of natural anticoagulant compounds. The bioactive compounds

inherent to *Rhus coriaria* have demonstrated a remarkably diverse array of health-promoting properties. Despite its multifaceted health benefits, research on the impact of Sumac extract on blood coagulation, a critical factor in thromboembolic diseases, is notably scarce. This study aims to bridge this knowledge gap by investigating the potential impact of Palestinian and Turkish-cultivated aqueous Sumac extract on blood coagulation through two common tests: prothrombin time (PT) and activated partial thromboplastin time (aPTT). The in vitro effects of Palestinian and Turkish aqueous Sumac extracts, each at a concentration of 5% and administered at varying volumes (50, 75, and 100 µL), were assessed using platelet-pure plasma samples collected from five healthy volunteers. The investigation revealed that Sumac extract had no discernible effect on PT, while both Palestinian and Turkish Sumac extracts consistently and dose-dependently prolonged aPTT. These findings suggest the promising potential of Sumac extract as a natural anticoagulant agent, offering prospects for the development of innovative therapeutic approaches or complementary strategies in the management of thromboembolic disorders. Further research is imperative to explore this potential and unravel the underlying mechanisms, thereby advancing our understanding of Sumac's role in promoting health and preventing these critical medical conditions.

02-P-07
Impact of Novel Carboxamide Derivatives in Hyperlipidemic rats Induced by Triton WR-1339

Aya Hasan, Mohammad Alwahsh, Suhair Jasim, Sameer Al-Kouz, Yusuf Al-Hiari, Lama Hamadneh

Hyperlipidemia is a lipid metabolic condition that causes an abnormal rise in lipid levels in the blood. Hyperlipidemia increases the risk of cardiovascular diseases such as coronary artery disease, stroke, atherosclerosis and other illnesses which are leading causes of death and morbidity globally. Genetics, inactivity, poor eating habits, obesity can all contribute to hyperlipidemia. Lifestyle adjustments, such as diet and exercise, are frequently used to manage hyperlipidemia, and lipid-lowering drugs used as well. The purpose of this study was to investigate the effect of new carboxamide derivatives (X, Y, and Z) on a hyperlipidemic male rat model produced by Triton WR-1339 in

comparison to fenofibrate different tissue samples. These novel compounds were compared to fenofibrate to determine their molecular hypolipidemic effects. The gene expression alterations in triglyceride-related pathways have been evaluated in rats with hyperlipidemia using RT-PCR. The three novel compounds significantly improved the lipid profile by lowering elevated levels of triglycerides. Triton WR-1339 has been shown to overexpress several genes, such as CPT1A in liver tissues. Carboxamide derivatives downregulated the overexpressed genes, with significant decreases in CPT1A gene expression levels. In conclusion, in Triton WR-1339-induced rats, the three novel compounds were found to decrease lipid abnormalities such as hypertriglyceridemia, indicating that they could be useful options for treating individuals with TG abnormalities.

02-P-08
The Effect of Dimensions on Cancer Cell Behavior

Dima Almajali and Mohammad Alwahsh

Breast cancer is the most common cancer in women. It can be classified into several categories based on its genetic characteristics (Luminal A, Luminal B, HER2-enriched, and basal-like). Luminal A tumors are a hormone-dependent type of breast cancer that has a relatively low rate of cell proliferation, making them usually more responsive to hormone therapy represented by MCF-7 and MDA-MB-415 cells and highly responsive to hormone therapies like tamoxifen. To study their growth patterns, both 2D and 3D culture models were used. First to produce a reliable 3D model from breast cancer cell lines. Then, comparison between 2D and 3D cancer models to assess genetic variations, resistance to treatment, cells viability (obtain IC values) and overall cell behavior. Cancer cell lines MCF-7 and MDA-MB-415 were cultured in 2D and 3D forms treated with Tamoxifen. 3D cells produced using 3D microtissue molds. Cell viability was assessed using an MTT assay, and gene expression of the PIK3CA gene was evaluated by qPCR. Tumor cells cultured in 3D environment displayed higher resistance (higher IC50) to tamoxifen treatment compared to those grown in a 2D environment in both cell lines. This increased resistance might be due to the complexity of the 3D microenvironment, which more closely mimics the interactions between cancer cells and the surrounding environment in vivo which is confirmed with alteration

in expression of PIK3CA gene significantly between the two models in both cell lines. These findings suggest that 3D models may be a valuable tool for developing more effective therapies and for gaining a better understanding of how tumors respond to different treatments.

02-P-09
Untargeted NMR-based Plasma Metabolic Profiling in Hyperlipidemic Rats

Rahaf Alejel, Mohammad Alwahsh, Lama Hamadneh, Rosemarie Marchan, Suhair Jasim, Ala A Alhusban, Yusuf Al-Hiari, Tariq Al-Qirim, Roland Hergenröder

Hyperlipidemia is a metabolic disorder defined as an abnormal elevation of circulating levels of one or more plasma lipids and lipoproteins and considered one of the major risk factors for cardiovascular diseases (CVDs). CVDs are the leading causes of mortality and morbidity globally. Therefore, hyperlipidemia is considered a major health issue that requires early detection and management. In this study, we aim to explore the plasma metabolic profiles of hyperlipidemic rats as well as to identify plasma candidate biomarkers associated with hyperlipidemia pathogenesis. A hyperlipidemia model was established in male Wistar rats by the administration of Triton WR-1339. Lipid profile assay was conducted to confirm the induction of hyperlipidemia. Plasma samples of hyperlipidemia group and control group were collected, and metabolically profiled employing nuclear magnetic resonance (NMR) spectroscopy equipped with a cryogenic probe. Univariate and multivariate analysis were performed to investigate the metabolic changes and identify altered metabolites. Significantly increased levels of triglycerides were observed in hyperlipidemia rats indicating the induction of hyperlipidemia. Partial least squares-discriminant analysis (PLS-DA) and orthogonal partial least squares-discriminant analysis (OPLS-DA) analysis demonstrated a distinct clustering demonstrating the metabolic difference between control and disease group. Metabolomics results revealed a list of differential metabolites that were significantly associated with hyperlipidemia. Hyperlipidemia was found to be related to disturbance in lipid metabolism, energy metabolism and amino acid metabolism. Our findings identify a set of metabolites as potential biomarkers associated with hyperlipidemia and provide

insights into the underlying metabolic changes in hyperlipidemia development. These results denote the importance of untargeted metabolomics approach for the analysis of metabolic alterations and biomarker discovery.

02-P-10

A Comparison between the Cytotoxic and Molecular Effect of 2D and 3D Cell Cultures on H1299 Cell Line Treated by Chemotherapeutic Drugs

Amani Aldoridee, Lama Hamadneh, Suhair Jasim, Roland Hergenröder, Mohammad Alwahsh

Traditional two-dimensional (2D) monolayer cell cultures cannot mimic the complex tumor microenvironment that exists in vivo, limiting its use in cancer research. Three-dimensional (3D) multicellular tumor spheroids (MCTS) better resemble in vivo circumstances, permitting deeper insights into tumor biology and medication resistance. This study investigates the effects of four chemotherapeutic agents—colchicine, cisplatin, paclitaxel, and doxorubicin—on 2D and 3D cultures of H1299 lung cancer cells. Compare drug sensitivity and gene expression (PIK3CA, AKT1, PTEN) in H1299 cells cultured in 2D and 3D growth systems. H1299 cells were cultivated in both 2D and 3D. The MTT assay was used to assess cytotoxicity, whereas qPCR was utilized for investigating gene expression. Statistical significance was established using one-way ANOVA. 3D spheroids required higher drug doses to achieve comparable cytotoxicity to 2D cultures. Paclitaxel's IC50 varied from 6.23 μM in 2D to 13.87 μM in 3D cultures. Gene expressions of PIK3CA, AKT1, and PTEN were considerably increased in 3D spheroids, especially following doxorubicin treatment. 3D cultures show increased resistance to chemotherapy, rendering them a more reliable model for evaluating treatment efficacy and resistance mechanisms, particularly in the PI3K/AKT/PTEN pathway.

02-P-11

Synergistic Antiproliferative Effect Against Lung Cancer Cell Lines Using a Combination Treatment of Doxorubicin and Proteasome Inhibitors

Alia Abuzaid, Osama H. Abusara and Mohammad Alwahsh

Chemoresistance presents a significant obstacle in the treatment of lung cancer, mainly due to its correlation with the prevention of apoptosis in cancer cells. As anti-cancer monotherapy results were insufficient to meet the clinical needs for treating lung cancer, combination therapy has been used to overcome the limitations of the current treatment approaches used in lung cancer. Combination therapy has the potential to enhance each one's therapeutic efficacy, minimize their drawbacks and side effects, and reduce drug resistance. The present study aims to investigate the effect of proteasome inhibitors and Doxorubicin (DOX) on lung cancer cell lines as single agents or in combination with an emphasis on multidrug resistant cell line. In addition, they were used in 2D monolayer and 3D spheroids models. Cell viability assays on both models, 2D and 3D, were performed using 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) and Resazurin assays. Polymerase Chain Reaction (PCR) was performed to explore and quantify the fold change in the expression of apoptotic genes before and after treatment. Combination treatments provided significantly greater efficacy as measured in comparison with treatment with proteasome inhibitors or DOX alone. Moreover, it was found that the gene expression of pro-apoptotic genes was notably upregulated, whereas the gene expression of the anti-apoptotic gene was significantly downregulated in both lung cancer models (2D and 3D) treated with proteasome inhibitors and in combination treatments. It is known that that to mimic the cellular and molecular changes that occur in vivo, 3D cultures seem more promising than 2D cell culture technique. Giving that our results showed promising activity against lung cancer in 3D model, it is worth investigating these treatment options in vivo. Moreover, our study has found that the combination treatment improves both medications' efficacy due to lower IC50 values obtained as compared to utilizing proteasome inhibitors and DOX alone. This combination was done for the first time with interesting positive results for this type of cancer.

03-P-01

Development Of Chitosan Nanoparticles as Drug Carriers for Pulmonary Management of Cystic Fibrosis

Ameera Bataineh, Shereen M. Assaf, Mohammad Fandi

Cystic fibrosis disease is a genetic respiratory disease associated with severe respiratory complications with problematic drug delivery. Pseudomonas aeruginosa pulmonary infections is considered a leading cause of pulmonary morbidity in adult patients with cystic fibrosis. Levofloxacin is recommended for the treatment of Pseudomonal pulmonary infections. Levofloxacin is available as oral and IV formulations. It is, however, not available yet as an aerosol inhaler and there is only limited data available on the pulmonary delivery of inhaled levofloxacin. The present study aimed to prepare and optimize nanoparticles loaded with levofloxacin based on low molecular weight chitosan in combination with mucolytic n-acetylcysteine as a cross linker. Ionic gelation method was used to prepare the nanoparticles. An evaluation of the particle size, zeta potential, encapsulation efficiency and loading capacity was carried out. Levofloxacin nanoparticles were also evaluated using Fourier transform infrared spectral analysis, differential scanning calorimetry analysis, thermogravimetric analysis, and X-ray diffraction. The morphology of the nanoparticles was observed using scanning electron microscopy and transition electronic microscopy. The optimal formulation that was identified and further underwent characterization and analysis was with a ratio of 2:1 of chitosan to levofloxacin. The size of the developed nanoparticle was 168 nm, with poly dispersity index 0.30, zeta potential 11, encapsulating efficiency 79.94% and the loading capacity 11.99%. The in-vitro release study revealed 63% drug release after 30 hours for the freeze-dried nanoparticles and 65% drug release after 30 hours for unfreeze-dried nanoparticles. These formulas showed burst drug release. The present study found appropriate size of the nanoparticles that encapsulated levofloxacin, which was promptly released in-vitro, which will improve the drug delivery.

03-P-02
siRNA Knocking Down in HepG2 cells Identifies PFKFB4 and HNF4α as Key Genes Important for Cancer Cell Survival

Amer Imraish

Liposomes are versatile delivery systems for encapsulating small interfering RNAs (siRNAs) due to their ability to enhance cellular uptake and gene silencing. This study compares the new liposome formula to commercial lipofectamine in delivering siRNAs targeting hepatic carcinoma genes, focusing on HNF4-α and PFKFB4. Flow cytometry and confocal microscopy revealed efficient internalization of PE-Rhod-B labeled lipoplexes in HepG2 cells, while cytotoxicity assays demonstrated significant reductions in cell viability, particularly with siHNF4-α and siPFKFB4. The newly formulated liposomes showed superior efficacy, achieving nearly 93% cytotoxicity at 100 nM, compared to just 50% with lipofectamine at the same concentration. Furthermore, real-time PCR confirmed that the liposome-encapsulated siHNF4-α reduced HNF4-α mRNA expression by tenfold at 100 nM, compared to a twofold reduction with lipofectamine at 200 nM. Similarly, siPFKFB4 delivered via liposomes showed a dose-dependent 35-fold reduction in PFKFB4 mRNA expression at 100 nM, outperforming the maximum reduction achieved by lipofectamine. The IC50 values for all siRNA treatment groups were significantly lower when using the liposome formula, reflecting improved delivery efficiency. These results demonstrate the potential of liposome formulations for therapeutic siRNA delivery. The encapsulation enhances cellular uptake and gene silencing efficiency, making the liposome formula a promising candidate for targeted gene therapy in hepatic carcinoma. Further research should explore it's in vivo biodistribution and potential combination therapies.

03-P-03
Studying the Effect of Functional Group and Size of Silica Nanoparticles Loaded with Quercetin on their *in vitro* Characteristics

Lina M. Ibraheem, Areen M. Khattabi

Silica nanoparticles (SNs) possess unique properties making them ideal carriers for many agents.Both the size and the surface chemistry

are important features that impact the *in vitro* characteristics of their loaded agents. In this study, different surface functionalization of SNs witha particle size of 200 nm (propyl thiol, propyl carboxylic acid, and propyl amine) and two differentsizes of propyl amine SNs (200 and less than 100 nm) were investigated. The nanoparticles (NPs)parameters were characterized using Dynamic Light Scattering (DLS) and their Encapsulation Efficiency (EE) and Loading Capacity (LC) with quercetin were measured using UV Spectrophotometer. Quercetin cumulative release was studied in phosphate buffer saline (PBS) (pH 7.4, 37°C) and its *in vitro* cytotoxicity toward HeLa cells was evaluated using an MTT assay.Our results showed that the mean particle size of all samples increased after drug loading and thepolydispersity (PD) values were all within the acceptable range (0.2-0.5). All SNs exhibited negative values of zeta potential with the highest value for propyl-carboxylated NPs. The EE andLC percentages of quercetin in SNs depend on the type of surface functional group where the aminated SNs showed higher percentages compared to the other groups. A direct relation was observed between the drug release rate and the cytotoxicity where the highest and smallest valueswere exhibited by thiolated and aminated SNs, respectively. Surface modifications have thus a more pronounced effect on the *in vitro* properties of our studied SNs compared to the size.

03-P-04
Preparation of Cefdinir Nanocrystals for Enhancing their Water Solubility

Asma Abd Al-monem Mohammad Ababneh

Since cefdinir antibiotic which is a third-generation cephalosporin with broad-spectrum activity suffers from low water solubility (class IV BPS). This causes many problems like low absorption, and bioavailability, which requires high doses. Various have been employed to enhance cefdinir's solubility, including solid dispersion, microspheres, amorphization, complexation with cyclodextrin, and nanocrystalization. Nanocrystals, defined as crystalline particles in the nanometer size range, significantly enhance the solubility and bioavailability of drugs that suffer from low solubility. In this work, stable cefdinir nanocrystals were prepared to overcome this problem by enhancing cefdinir saturation solubility and thus its dissolution, and bioavailability. The

nanocrystals were prepared using the antisolvation method using three different stabilizers (PVP K30, PVA, and P407). The effect of each stabilizer and its concentration were investigated. The produced nanocrystals were characterized to know their physical properties. Using the zeta sizer device the size, size distribution, and charge of the prepared particles were measured and the results were promising. The size was lower than 100 nm, PDI was lower than 0.5 which indicates good dispersity, and the charge was shallow negative. The solubility test was also done and the saturation solubility was enhanced 3-5 times as compared to the bulk cefdinir saturation solubility. SEM, FTIR, and XRD were also used to characterize the nanoparticles.

03-P-05
Niosomal Delivery of Celecoxib and Metformin for TargetedBreast Cancer Treatment

Haneen A. Basheer, Maram A. Alhusban, Ahlam Zaid Alkilani, Anas Alshishani, Lina Elsalem

Breast cancer continues to be a prominent worldwide health concern and requires continued investigation into innovative therapeutic approaches. Here, we report the first investigation into the therapeutic efficacy of combining Metformin (MET) and Celecoxib (CXB), both in free and niosomal form, for the treatment of breast cancer. Our investigation encompassed the characterization of these niosomal drug carriers, their stability assessment, and their effect on breast cancer cell models. The thin-film hydration technique was employed to prepare niosomes with spherical, uniform-size distributions and high encapsulation efficiencies. The niosomes were characterized by TEM, particle size analyzer, and ATR-FTIR. The niosomes with an average size of 110.6 ± 0.6 and 96.7 ± 0.7, respectively, for MET and CXB were stable when stored at 4 ◦C for three months with minimal drug leakage, minor changes in encapsulation efficiency and size, and unchanged physicochemical parameters. Evaluation in two-dimensional (2D) and three-dimensional (3D) viability assays demonstrated an increased cytotoxicity of encapsulated drugs when compared to their free-drug counterparts. Additionally, the combination of Metformin Niosomal Particles (MET NPs) and Celecoxib Niosomal Particles (CXB NPs) led to decreased cell viability in both 2D and 3D models compared to each drug

administered individually. When comparing the effect of the niosomal versus the free combination of the drugs on cell migration, we found that both interventions effectively prevented cell migration. However, the efficacy of the niosomes' combination was not superior to that of the free drug combination ($p < 0.05$). In conclusion, the results of this study provide valuable insights into the potential application of combining MET and CXB nanoparticle delivery systems to breast cancer treatment. Exploring the in vivo application of this drug delivery system could open new avenues for more effective and targeted therapeutic approaches for breast cancer patients.

03-P-06
Transdermal Delivery of Rizatriptan Using Microneedles Array Patch: Preparation, Characterization and In Vitro/ In Vivo Study

Nareman Ali Aldajah

Given the various gastrointestinal side effects of rizatriptan in oral administration and its delayed absorption during a migraine attack as a result of gastric stasis, focus has been on transdermal delivery. The main purpose of this study is to prepare and assess transdermal formulation of rizatriptan, loaded on hydrogel microneedles delivery system, to eliminate the undesirable side effects and also improve its percutaneous permeation rate. Rizatriptan hydrogel microneedles were prepared using micromolding method and evaluated in terms of mechanical strength, encapsulation efficiency, permeation and in vivo skin absorption. The degradation behavior of the rizatriptan microneedles were also characterized with the help of an accelerated stability study. Different compositional and technical variables were considered to optimize the formulation based on design of experiment and drug release performance from the rizatriptan encapsulated hydrogel microneedles' formulation. Different formulations of rizatriptan microneedles (F1-F5) were successfully prepared using different concentrations of carboxymethyl cellulose and gelatin type A. Rizatriptan hydrogel microneedles demonstrated favorable mechanical properties, demonstrating its mechanical strength to withstand insertion forces, thereby enhancing its skin insertion ability. Rizatriptan hydrogel microneedles showed high encapsulation efficiency indicated that fabrication process was effective with little drug loss and acceptable for

scaling up. FTIR and DSC analyses revealed no interaction between rizatriptan and polymer in microneedle formulation. XRPD analysis confirmed that rizatriptan existed in amorphous form in microneedle formulation. In permeation study the percent cumulative drug released after 24 hours ranged between 93.1-100% which means that microneedles were able to deliver the drug effectively. For in-vivo study, F3 formulation was selected due to its superior characteristics over other formulations as it exhibited the highest swelling capacity, demonstrated favorable mechanical properties. Furthermore, F3 showcased the most controlled drug release over a 24-hour period. Relative bioavailability of F3 microneedles was 179.59% compared to oral administration based on the AUC_{0-24}. The observed AUC_{0-24} in F3 microneedles was statistically significant and 1.80 times greater than that in oral administration. The higher rizatriptan level in the microneedle demonstrated adequate drug permeability through the rat skin, suggesting the potential of microneedles for enhanced therapeutic effectiveness. Rizatriptan hydrogel microneedles were stable at room temperature and in refrigerator but they were affected by higher temperature and humidity (40 °C/ 75% RH). In conclusion, rizatriptan hydrogel microneedles were able to control drug release for 24 hours and increase bioavailability 1.8 times as compared to oral administration.

03-P-07
Effect of Post-Compaction Thermal Treatment on Properties of Kollidon SR Matrix Tablets of Caffeine

Rand Mohammad Mahmoud Rabi

Caffeine matrix tablets were formulated using various excipients, including Kollidon® SR, microcrystalline cellulose (MCC), Ludipress®, and glyceryl monostearate-self emulsifying (GMS-SE). Kollidon® SR is an amorphous polymer with a low glass transition temperature of 29-31°C. Therefore, the current study aims to investigate the effects of thermal treatment (curing) and the impact of different types and levels of excipients on the physical properties and drug-release behavior of caffeine matrix tablets. Caffeine tablets of different compositions were compacted at an applied compression pressure of 32 MPa. Tablets were subjected to different conditions before being tested. These conditions were immediately after production (ambient), storage at

room temperature under 75% RH for 1 hour, storage at 59°C under 75% RH for 1 hour, and storage at 59°C under 75% RH for 24 hours. The physical properties, such as tablet hardness and tensile strength, were measured and dissolution studies were carried out in 900 ml phosphate buffer of pH equal to 6.8 for 8 hours.It was found that thermal treatment of tablets at 59°C under 75% RH increased the averages of tablet hardness, and tensile strength for all formulations that contained Kollidon® SR. In addition, the rate of release of the drug from the tablets was retarded after thermal treatment. These effects were more pronounced when the thermal treatment was conducted for 24 hours compared to 1 hour. It was also found that a composition of GMS-SE in the formulation enhanced the retardation of the drug release compared to other ingredients (MCC and Ludipress®). Fitting the in vitro drug release data to the Higuchi model indicated that drug molecule release is through diffusional pathways of the porous structure of the matrix tablet during dissolution. Post-compaction thermal treatment of tablets improved the mechanical properties and slowed down in vitro drug release, particularly when conducted for an extended duration. The inclusion of GMS-SE further enhances the retardation effect compared to other excipients.

03-P-08
Formulation and Characterization of Maleimide-Poly(Ethylene glycol)-b-Poly(ε-Caprolactone) (MAL-PEG-PCL) Polymersomes for the Oral Delivery of Insulin

Raneem Alhusban

The many physiological barriers in the gastrointestinal track (GIT) pose a hurdle to delivering insulin, a lifesaving peptide, orally. Polymersomes are polymeric nanoparticles that physiologically mimic the membrane bilayer. They are made of amphiphilic copolymers. Polymersomes have been studied for the oral delivery of peptides in order to protect them from the harsh GIT environment. Mucoadhesive groups have been recently heavily researched as a way to enhance the delivery of therapeutics by interacting with the mucin groups in the mucosal layer to increase the residence time of the drug at the site of absorption. Maleimide-poly (ethylene glycol)-b-poly(ε-caprolactone) (PEG average Mn 5,000, PCL average Mn 10,000) or MAL-PEG-PCL is a biodegradable amphiphilic di-block polymer attached to a

mucoadhesive group, maleimide. MAL-PEG-PCL polymersomes for the oral delivery of insulin were made using nanoprecipitation. 1 mg of polymer was dissolved in 0.2 ml tetrahydrofuran (THF) and added to a solution of 1 mg, 3 mg, 6 mg, or 9 mg insulin in 0.8 ml acetic acid (AcOH, 1% v/v). The aim of this study was to see the effect of different polymer to insulin ratios on the size, ζ- potential, and entrapment efficiency of the polymersomes. The chemical stability and in vitro release of the most promising formulation (3 mg of insulin in 1 mg MAL-PEG-PCL) were tested. It was concluded that the most efficient polymer to insulin ratio is 1:3, with a z-average of 243 nm, a ζ-potential of +4.58 mV, and round vesicular, bilayer morphology according to TEM. The stability in 1% AcOH and simulated gastric fluid (SGF) for up to 4 hours according in (Sodium dodecylsulfate polyacrylamide gel electrophoresis) SDS-PAGE need to be confirmed.

03-P-09

Formulation Development and Characterization of a Probiotic Gel for Topical Administration

Ola Alaboshe, Amal G. Al-Bakri, Rania Hamed

Topical applications of probiotics have attracted growing attention for managing various skin disorders. The primary concern with probiotic-containing formulas is maintaining the viability of the probiotics over time. This study focuses on developing potential water-in-oil-in-water (W1/O/W2) double emulsion designed to encapsulate a probiotic bacterium and preserve its viability effectively. In a double emulsion gel formula, we used gelatin type A as internal and external water phases and oleic acid, isopropyl myristate, or tea tree oil (TTO) for the oil phase. *Lactiplantibacillus plantarum* ATCC 8014 (*L. plantarum*) were encapsulated in the W1 water phase in count *ca.* 10^7 -10^ 9 CFU/g, and then their survival was investigated over time using the Miles and Misra plate method. The TTO-containing formula showed a significant bactericidal effect within 48 h, whereas isopropyl myristate was better at maintaining bacterial survival and count than TTO. Oleic acid-containing formula was able to preserve the viability of *L. plantarum* over 12 days, especially when MRS broth was added to the W1 and W2 phases. Physicochemical characterizations, including viscosity, temperature sweep, and stability studies, were conducted to assess the effectiveness of the double emulsion formulation in preserving the

viability of *L. plantarum* count over time. In conclusion, while the water-in-oil-in-water (W1/O/W2) double emulsion gel partially maintained *L. plantarum* viability, further studies are necessary to optimize its protective efficiency.

03-P-10
Design and Preparation of 3D Printed Medical Device for the Treatment of Nail Infection

Ayah Aljariri, Rawan Huwaitat, Ala A. Alhusban, Ola Tarawneh, Sara Almasri

Onychomycosis, also known as *Tinea unguium*, is a fungal infection of the nail. Symptoms include white or yellow nail discoloration, thickening of the nail,and separation of the nail from the nail bed. The main causative pathogens include dermatophytes, *Candida spp.* and nondermatophytic molds. Prognosis of the disease may cause loss of nail, if not treated, may ease the passage of microbes to the bloodstream and cause serious health issues. Typically, onychomycosis can be treated with antifungal medications, either topically or orally. Medications that may be taken orally include terbinafine, itraconazole, and fluconazole. Topical agents include ciclopirox nail paint, amorolfine, and efinaconazole. Some topical treatments need to be applied daily for prolonged periods (at least one year) and the used organic solvent may weaken the nail eponychium (cuticle). Herein, we propose the use of 3D printer to prepare F1 and F2polymeric platform containing antimicrobial agents to be applied at the site of application. AutoCAD design (Tinkercad software) was used to design the intended polymericplatforms and optimize of printing parameters. Determination of minimum inhibitory concentration (MIC), minimum fungal concentration (MFC), the average zone of inhibition (ZOI) for each formula and mechanical properties were applied. The antimicrobial agent showed MIC of 62.5µg\mL and MFC of125µg\mL. The average ZOI for F1 was 36.9 mm and for F2 was 21.5 mm. Polymeric antifungal agents were prepared successfully using 3D printers and were capable of inhibiting microbial growth.

03-P-11

Assessment of Mesoporous Silica Nanoparticles Loaded with Carvacrol: Impact of Shape and Size on Cellular Uptake, Oocyst Count and Viability of *Cryptosporidium parvum*

Moataz M. Rashad, Shaimaa M. Kasem, Khaled E. El-Kelany, Sara A. Abdel Gaber

Cryptosporidium parvum (C. parvum) is a protozoan parasite responsible for causing a gastrointestinal illness that resists conventional treatment. Mesoporous silica nanoparticles (MSNs) have gained a significant attention in the field of drug delivery due to their inertness and porous surface area allowing for high loading capacities. However, the shape and size of these nanoparticles play a crucial role in determining the efficiency of their anticipated biological response. Carvacrol (CV) is a naturally driven phenolic phytochemical that is recognized with its broad spectrum activity against various pathogens, yet it is hydrophobic which limits its bioavailability. This study aims to enhance the bioavailability of CV through loading it on MSNs and evaluating the response of the nanosystem on CV cellular uptake, oocyst count and viability of *C. parvum*. Additionally, a comparison between three different shapes of MSN (small spheres, large spheres and rods) is conducted to study the effect of shape and size on the efficiency of CV delivery and thus disruption of the *C. parvum* lifecycle. Three forms of MSNs were synthesized using a combination of hydrothermal, sol-gel and micro- emulsion techniques and loaded with CV. The synthesized NPs were characterized with different techniques including SEM, EDX, FTIR, DLS and zeta potential. Fecal samples were collected from *C. parvum* infected male albino mice with 3000 oocysts 7 days' post Infection. *In vitro* oocysticidal test were determined after incubation of5 ascending concentrations of free and CV-MSNs at room temperature (25°C) for 96 h. The oocyst counts and LC_{50} were calculated. The morphological changes and sporulation percentage of oocysts were evaluated with field emission and optical microscopy. The cellular uptakes of free CV and MSN-CV were quantified using HPLC. SEM micrographs revealed the success in the synthesis of spherical MSN 1 and MSN 2 while MSN 3 wererod - shaped. Among the particles, MSN 2 demonstrated the smallest average size, about 52.5±1.96 nm whereas MSN 3 had the highest zeta potential, around – 43.44 mV. Notably, CV-MSN 2 showed the lowest oocyst count andviability from

at a concentration starting from 0.5 mg/mL. Overall, the spherical MSNs displayed a stronger oocyst destructive effect compared to the rod-shaped ones and free CV. It is worth to mention that free MSNs showed minimal activity against *C. parvum* oocyst count and viability. Interestingly, oocyst uptake of CV reached its maximum value in case of MSN 2 compared to other MSNs and free CV. This study suggests the use of MSN as an efficient carrier system for CV and confirms that the smaller, spherical-shaped MSNs are recommended over the large spherical or rod shaped ones resulting in the most potent destructive effect against cryptosporidiosis.

03-P-12
Nanoemulsion-loaded In Situ Gels for Hair Growth

Islam Halalat, Osama Abu Sara, Rania Hamed

Alopecia is a sudden hair loss in response to an autoimmune disease that attacks the scalp or other parts of the body due to viral and parasitic infections, anxiety, and stress. Nanoemulsions and thermo-responsive gels are delivery systems that can be used for topical applications for hair growth by administering drugs such as minoxidil and essential oils such as rosemary oil. This study aimed to incorporate three different nanoemulsions (NEs), minoxidil (MIN), rosemary oil (RO), and the combination of both (MIN-RO) into thermo-responsive gels to promote hair growth. The optimized MIN, RO, and MIN-RO NEs were spherical with diameters of 65.9, 12.3, and 172.8 nm, respectively, suitable for hair follicle targeting and hair growth promotion. MIN, RO, and MIN-RO NEs showed good physical stability, with no significant phase separation. Then, the optimized MIN, RO, and MIN-RO NEs were loaded into thermo-responsive gels of P1-P6, prepared at various Pluronic F127 and F68 concentrations, using the cold method. The P1-P6 were clear and transparent. P6-loaded X9, P2-loaded R5, and P1-loaded MR9 had Tsol→gel of 32.3 ± 0.4, 32.2 ± 0.7, and 32.9 ± 0.9°C respectively, which is suitable for skin temperature to ensure the complete inversion of sol-state into gel-state when applying it on the skin. Thermo-responsive in situ gels exhibited pseudoplastic flow and viscoelastic properties. Therefore, MIN, RO, and MIN-RO NEs loaded thermo-responsive in situ gels could be a potential strategy for accelerating hair growth.

03-P-13
Self-Healing Hydrogel Patch for Wound Dressing

Wasan Mortada Al-Farhan, Ahlam Zaid Alkilani, Mohammad Abu-Sini, Rania Hamed

Hydrogels are crosslinked polymer chains with a 3D network. Hydrogels are a drug delivery system used widely in pharmaceutical formulations due to the ability of crosslinking polymers with different characteristics to gain a hydrogel with optimum properties. In this study, we aimed to formulate a hydrogel dressing patch with a distinctive self-healing property for wounds that might affect the skin, especially on joints and stretchable parts of the body. This patch is characterized as being affordable and practical at the same time. It provides a physical barrier and keeps an appropriate environment for wound healing. Polyvinyl alcohol (PVA) and sodium carboxymethyl cellulose (Na-CMC) were crosslinked with borax, which reacts with the active hydroxyl groups in both polymers to form a hydrogel. The patches were loaded with ciprofloxacin HCl, a broad-spectrum antibiotic considered an ideal choice for preventing and treating wound infections. Hydrogels were subjected to rheological, antimicrobial activity, ex-vivo release, and self-healing ability studies. The minimum inhibitory concentration of ciprofloxacin HCl loaded patch was investigated for five types of bacteria. Microscopic images showed a porous, cross-linked matrix. The hydrogels showed shear-thinning and viscoelastic properties. Therefore, the ciprofloxacin HCl-loaded PVA/Na-CMC/Borax patch could be an effective wound dressing.

03-P-14
In Situ Gels Loaded with Prednisolone Niosomes for the Treatment of Skin Inflammation

Rafa Aburayya, Ahlam Zaid Alkilani, Alaa Hammad, Osama Abu Sara, Rania Hamed

Prednisolone (PRD) is known for its anti-inflammatory effects on the skin. In this study, PRD was loaded into non-PEGylated and PEGylated niosomes to develop a dermal delivery system while maintaining vesicles' integrity and avoiding their aggregation. Niosomes, prepared using the thin-film technique, were then incorporated into thermoresponsive in situ gels to enhance dermal application. Niosomes

exhibited an average size of 354 nm, polydispersity index (PDI) of 0.3, and ζ-potential of -19.4 mV. Niosomal PEGylation enhanced the niosomal size, PDI, ζ-potential, entrapment efficiency, and drug loading. The thermoresponsive in situ gels loaded with niosomes exhibited a pseudoplastic flow behavior and safety and efficacy against human gingival fibroblasts. Stability studies demonstrated that PEGylated niosomes and their corresponding in situ gel were stable for 3 months at 4ºC. Therefore, PEGylated niosomes loaded in situ gel showed intriguing potential for treating localized skin inflammation.

03-P-14
Predictive Modeling of Skin Permeability for Molecules: Investigating FDA-Approved Drug Permeability with Various AI Algorithms

Rami M. Abdallah, Hisham E. Hasan, Ahmad Hammad

There is an increasing interest in using the skin as a convenient route for drug administration. However, there are challenges for the effective delivery through the skin such as that the drug must have suitable physicochemical properties to penetrate the stratum corneum. Objectives Develop a regression model using AI algorithms, for predicting LogKp of new compounds. The model will be utilized for the prediction of LogKp values for FDA-approved drugs. Cluster analysis will be employed to categorize these drugs into distinct classes in order to elucidate their permeability patterns. Investigate the drugs permeability patterns through their classification according to the Anatomical Therapeutic Chemical (ATC) code.

04-P-01

Burnout and Associated Factors: A Cross-Sectional Study Among Community Pharmacists in Jordan

Danah Al-Shorman, Amjad H. Bazzari, Firas H. Bazzari

Job burnout is a major issue that influences employees' performance, job satisfaction and their overall well-being. There is limited evidence that points towards poor profession status and general dissatisfaction among community pharmacists. This study aimed to investigate burnout and associated factors among community pharmacists in Jordan.The study was conducted via an online questionnaire composed of three main domains: demographics, occupational factors and Copenhagen burnout inventory (CBI), and a total of 400 community pharmacists participated. Total burnout scores among the participants were elevated (49.72±16.65), with 43% exhibiting a high total burnout level. Burnout scores negatively correlated with age, exercise level, perceived sleep quality and financial status, while positively correlated with body mass index. Living alone status had elevated odds for high burnout compared to living with family or roommate(s). Regarding occupational factors, burnout level negatively correlated with the number of pharmacies the participants have worked in, working hours per day, how enough they perceive their salary and how much they enjoy working in a community pharmacy setting. On the other hand, a positive correlation was observed for the number of work days per week, requirement to work on national holidays and perceived workload. Moreover, working on night shifts and working alone both had higher odds for exhibiting high burnout levels. The results call for employers and policymakers to take into consideration factors influencing burnout among community pharmacists for the development and implementation of interventional strategies to mitigate burnout and enhance the well-being of community pharmacists.

04-P-02

Health Insurance Misuse and Fraud in Jordan: Insights and Opinions from Healthcare Workers

Lina Wali, Talal Aburjai

The main objective of this cross-sectional study was to explore the extent of health insurance misuse and fraud practices in Jordan from

healthcare workers' perspectives and examine the causes and consequences of these practices on the healthcare system.A survey was conducted among 109 healthcare workers from various occupations and settings. The majority (63.3%) were employed in the public sector, and more than half (56.9%) worked primarily in hospitals. Additionally, a significant portion of the participants (76.1%) had over ten years of experience in the field. Key findings highlight significant gaps in patient awareness, with 49% uninformed about their insurance rights and 77% lacking proper usage awareness. Private health insurance shows higher satisfaction level than government insurance. Around 80% of healthcare workers revealed that health insurance misuse and fraud practices are significant issues in Jordan. Common forms of misuse include obtaining unnecessary services and excessive utilization caused by economic challenges and insufficient system oversight. Suggested measures to control these issues included implementing a comprehensive computerized system, enhancing regulatory oversight, and increasing public education. Healthcare workers also showed the misuse of health insurance has multiple negative consequences, such as reduced healthcare quality, increased financial burden, adverse health effects from medication overuse, and reduced trust in the system. In conclusion, the study highlights significant challenges within Jordan's health insurance system, emphasizing the urgent need to consider this problem and its consequences and take the necessary measures to create a fair and efficient system.

04-P-03

Knowledge, Attitude, and Practice of Pharmacists Regarding Menaquinone (Vitamin K2): A Community Pharmacies-Based Survey in Irbid Governorate

Mohammad Malkawi, Bushra AbdelHadi

Pharmacists play an essential role in the healthcare system and have a stronger influence on the success of public health initiatives. Patients who want dietary supplement guidance assume the job of community pharmacists, which includes recommending effective dietary supplement products. However, there is limited evidence on how community pharmacists in Irbid governorate, Jordan deal with dietary supplements. Our study aimed primarily to create and test a novel

survey to measure the knowledge and practice of community pharmacists regarding vitamin k2 (vit K2) supplements in Irbid governorate, Jordan. Secondly, to compare these measurements with socio-demographic factors of community pharmacists. A community pharmacies-based survey was conducted among community pharmacists in Irbid governorate, Jordan, from February 1, 2024, to March 31, 2024. Data were collected via an online questionnaire. Data were analyzed using two: a t-test (e.g., gender) and an ANOVA for comparing means across multiple groups (e.g., education level). A total of 426 participants (24% males and 76% females) completed the survey, yielding a response rate of 100%. The survey consisted of twenty-one multiple-choice questions divided into four socio-demographic questions and seventeen questions assessing pharmacists' knowledge and practice regarding vit K2 supplements. Only (188) 44.05% of the participants answered all questions correctly. There are substantial disparities in the socio-demographic characteristics of the participants who answered correctly, with the highest percentage seen with each demographic being 25-34 years old (51.97%), bachelor's degree (81.35%), and up to 5 years' experience (35.768%). Our study found a significant knowledge gap among community pharmacists about the indications, recommended doses, and adverse effects of vit K2 supplements. Given pharmacists' critical role in healthcare delivery, continuous education and training are essential for improving their knowledge and counseling abilities.

04-P-04

Information Seeking Behavior for Arabic Medication Information Iin Healthcare Information Service Websites: Scoping of Community Pharmacists in Jordan

Njoud Nabeel Saleh Al-dabbas

The community pharmacists' unique position as the most accessible healthcare providers fosters patient care responsibilities. Information-seeking provides patient counseling and serves as a reliable information source. The study aims to examine the community pharmacists' information-seeking behavior toward Arabic medication information on healthcare information service websites. Additionally, investigates variables that influence community pharmacists' information-seeking behavior. The study was a cross-sectional, online

questionnaire study. Convenience sampling was used to collect data from 477 community pharmacists. Variables influencing the frequency and number of websites used related to demographic and socioeconomic variables, institutional variables, health information needs, perceptions and beliefs, and facilitators and barriers were investigated using bivariate analysis. P values less than 0.05 were considered statistically significant. The study found that 78.2% of participants often used Arabic medication information on healthcare information service websites. There was a statistically associated relationship between community pharmacists information-seeking behavior and educational level (P value=0.021), tasks numbers performed by community pharmacists (P value=0.001), Arabic medication information types they searched for (P value=0.001), reasons that made them search for it (P value=0.002, technology tools availability at the workplace (P value=0.037), Internet networks types available in the workplace (P value=0.001, and having enough time to perform the search (P value=0.036). This is the first study conducted to investigate the Jordanian community pharmacists' information-seeking behavior toward Arabic medication information on healthcare information service websites. Community pharmacists often use this information. There is a key need for reliable and accessible Arabic medication information.

04-P-05
Investigation of Jordanians' Knowledge, Attitudes, and Perceptions of the Use of Rosemary

Saif Alislam Y. Alamleh, Abdullah M. Aboqubo, Abdullah S. Aljebori, Razan I. Nassar, Samar Thiab

Rosemary (*Rosmarinus officinalis*) has been historically valued for its diverse benefits,such as promoting hair growth, offering antioxidant and antibacterial properties, and serving as a skin conditioner and fragrance enhancer. In Jordan, rosemary cultivation iscommon, and its use is becoming increasingly popular. To evaluate Jordanians' knowledge, attitudes, and perceptions regarding the use ofrosemary.A cross-sectional study was carried out involving at least 385 participants through social media platforms. The questionnaire was assessed for face and content validity byindependent researchers. The questionnaire was divided into three sections: demographics, knowledge, and

attitudes towards rosemary use. Statistical analysis was performed using SPSS, including descriptive statistics, chi-square tests, and multiple linear regression.The study included 407 participants with a mean age of 30.98 years (SD = 12.76). Participants' knowledge scores ranged from -5 to 7, with an average of 2.96 (SD = 2.61). Younger participants had higher knowledge scores about rosemary. Approximately 48.2% of participants used rosemary for medical purposes, with around three-quarters using rosemary oil, although a higher percentage used the leaves. Most participants administered it orally or applied it topically. Rosemary was mostly obtained from home cultivation or herbalists. Family and friends were the primary sources of influence for rosemary users. The majority (94.4%) agreed that plants have healing properties. The most common reasons for using rosemary were to improve hair condition (82.1%) and address gastrointestinal issues (67.9%). The study highlights the prevalent use of rosemary for various purposes and of application. Improving knowledge and correcting misconceptions could help in making informed choices and ensuring the safe and effective use of herbal remedies.

04-P-06

Community Pharmacists' Knowledge of Marketing Mix: A Cross-Sectional Questionnaire-Based Study in Jordan

Sima Dababneh, Ibrahim Alabbadi, Ibrahim Mukattash, Firas Mahasneh, Hamzeh Almomani, Tareq Mukattash

Community pharmacies, integral to the healthcare system, are urged to adopt innovative marketing strategies to effectively reach and engage their target customers while addressing potential challenges. This research, which assesses community pharmacists' familiarity with the marketing mix through a descriptive, cross-sectional survey, reveals a significant potential for growth. While most respondents areacquainted with the marketing mix and can identify its components, there are disparities in their ability to articulate and apply each element effectively. Specifically, respondents reported varied practice scores forproduct (68.69%), price (67.3%), place (69.9%), and promotion (68.8%). These insights underscore the potential for enhancing pharmacists' understanding and utilization of the marketing mix in Jordan's pharmaceutical landscape. Such understanding is crucial for

refining marketing strategies, adhering to regulatory guidelines, and improving service delivery and patient care.

04-P-07

Real-world Comparison of Health-related Quality of Life Associated with Use of Immune-Checkpoint Inhibitors in Oncology Patients

Abdulrahman Alwhaibi, Miteb A. Alenazi, Saleh A. Alanazi

Immune checkpoint inhibitors (ICIs) offer a new treatment approach for cancer with an improvement in patients' survival. However, it remains unclear whether their use impact the quality of life of treated patients. This study aims to compare health related quality of life (HRQoL) of patients treated with different anti-PD-1, anti-PD-L1, several single or combination therapies. **:** This is a prospective observational study conducted between 2008 to 2022 at King Khalid University Hospital (KKUH) and National Guard Hospital (NGH) on adult cancer patients who received at least one dose of anti-PD-1 or anti-PD-L1. HRQoL of all adult patients was assessed through completing the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire C30 (EORTCQLQ-C30) version 3, Arabic version. A total of 199 patients were found to be eligible for this study. Of these, 93 patients (82 on single medication and 11 on multiple ICIs) completed the questionnaire, resulting a response rate of 46.7%. The median age and body mass index (BMI) were 61 years and 26 kg/m^2, respectively. The majority were on pembrolizumab (39.8%) followed by nivolumab (35.5%). Most of the patients were diagnosed with advanced and solid malignancies with a significant difference between treatment groups, 87.1% (p=0.023) and 88.2% (p=0.021) respectively. Upon assessing patients functioning, the median score was 84.7% (IQR=19.8) with no significant difference between treatment groups (p=0.752). Notably, role, cognitive, emotional and social functioning scores were > 80%; however, physical functioning scored the lowest 73.3% (33.3) with no significant difference between treatment groups (p=0.97). Complains of fatigue and pain have been noted in more than half of the patients which influenced the overall cohort's score related to these symptoms, 88.8% (33.3) and 83.3% (33.3) respectively. Interestingly, although no significant variation in the scores of all combined symptoms among all groups (p=0.931), patients receiving anti-PD-1 + anti-PD-L1 seem to

have more complains about fatigue, pain, dyspnea, and constipation, hence had the worst, yet not significant, scores compared to other treatment groups, p=0.234, p=0.79, p=0.704 and p=0.86 respectively. All combined groups scored 83.3% (25) in global health scale. Nevertheless, nivolumab-treated patients had the worst global health compared to other groups, yet not significant (p=0.809). Our findings revealed no significant difference in the impact of different ICIs on HRQoL of cancer patients.

04-P-08
Knowledge, Attitudes, and Practices of Oncology Specialists Regarding DPYD Genetic Testing Prior to Fluoropyrimidine Anticancer Drug Prescription

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This study evaluated the knowledge and practices of healthcare practitioners in Palestine regarding screening for dihydropyrimidine dehydrogenase (DPD) deficiency prior to prescribing fluoropyrimidines (FP), specifically capecitabine and 5-fluorouracil. The aim of the study was to assess awareness, prevalence, and utilization of DPD testing and pharmacogenomics among oncologists, residents, and clinical pharmacists working in Palestinian hospitals. A cross-sectional survey was distributed to 106 healthcare practitioners across various hospitals in Palestine. Results indicate a notable deficiency in training and implementation of pharmacogenomics, with over 70% of participants lacking formal training in the field. Although there is high awareness of DPD deficiency and its impact, fewer than 50% of participants screen for DPD deficiency prior to prescribing FP. Standardization and promotion of DPD testing are low, and guidelines for prescribing FP are lacking, leading to variations in practice. These findings highlight the need for enhanced training, standardized protocols, and increased awareness to improve patient safety and outcomes in cancer treatment in Palestine.

04-P-09
Investigating the Prevalence of Smoking and Obesity among Students at Al Rasheed Private University

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Atherosclerotic cardiovascular disease (IHD) is the main cause of

morbidity and mortality worldwide, Obesity and smoking are the main causes of cardiovascular diseases, as obesity is the main risk factor for developing type 2 diabetes, which in turn lead to cardiovascular diseases, as well as the turn of smoking in resulting atherosclerosis, high arterial pressure, and thus cardiovascular diseases. To investigate the prevalence of obesity, overweight, and smoking among a sample of students at Al-Al Rasheed Private University. A descriptive cross-sectional study was conducted in the period between March and May 2024 on a sample of 473 students at Al-Rashid Private University of Science and Technology. Data was collected after distributing the questionnaire, weight and height variables were measured for them, to calculate the body mass index to determine the prevalence of obesity and overweight, also waist circumference and hip circumference, and through this, central obesity was calculated**,** In addition to their answers to the questionnaire, they showed the prevalence of smoking. The results indicated that the rate of obesity was (11%), and that there was a noticeable increase in the prevalence of smoking (45.2%), with the majority being male. The results also indicated a decrease in physical activity (37.2%).

04-P-10

Jordanian Regulatory Affairs Pharmacist's Readiness to Practice at the Time of Graduation-A Cross-Sectional Study

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Regulatory affairs pharmacists are essential in the licensing and regulating of pharmaceutical products and medical devices. Consequently, it is crucial to establish the necessary competencies, skills, and knowledge to improve pharmacists' performance in the medicines licensing sector. The study's primary aim is to assess to what extent regulatory affairs pharmacists were ready to practice at the time of graduation and to assess if currently practicing regulatory affairs pharmacists possess regulatory affairs skills. In a cross-sectional study, a questionnaire was developed to assess the readiness of Jordanian Regulatory Affairs Pharmacists to practice upon graduation. The study utilized a descriptive design, and all pharmacists currently engaged in regulatory affairs in the public and private sectors were eligible to participate. The study included 347 pharmacists. The study involved

347 pharmacists divided into youth (61.2%, predominantly female) and adult groups (over 35 years old, with a male majority). Most participants had a Bachelor's degree in Pharmacy (73.7%) and 15 years or less of experience (86.7%), with a majority employed in the private sector (87.5%). The study instrument demonstrated strong internal consistency with an overall Cronbach's Alpha of 0.882. Participants showed good knowledge in clinical trial phases (78.7%), solubility tests (83.3%), and bioequivalence studies (74.9%), but less proficiency in statistical analysis and literature evaluation. Familiarity with dosage form development and manufacturing was moderate, with 60.6% demonstrating understanding, while ethical and legal considerations showed a need for further education, with 23.6% understanding these aspects. Knowledge in pharmacovigilance and surveillance was also varied, with 40.8% showing understanding. Interpersonal and administrative skills varied, with strong communication and teamwork skills but lower proficiency in business writing. Overall, drug discovery and development were deemed most crucial (70.1%), followed by dosage form development (60.6%), highlighting the importance of scientific and regulatory knowledge. The Study reveals the mixed competencies of Regulatory Affairs pharmacists in Jordan, recognizing strengths in some areas but identifying gaps in other areas. It underscores these pharmacists' vital role in drug safety and efficacy, impacting the broader pharmacy and healthcare sectors. To address these gaps, the study recommends creating specialized, sustainable educational and training programs focusing on the identified weaknesses while enhancing personal and managerial skills. These programs should be adaptable to ongoing legal and technological advancements in the field, ultimately improving healthcare quality and safety and fostering a more progressive and sustainable healthcare community.

04-P-11

Artificial Intelligence in Pharmacy Practice and Pharmacy Education: Perspectives from Students and Faculty Members in the MENA Region

Hisham E. Hasan, Deema Jaber, Samaa Al Tabbah, Nabih Lawand, et al.

Artificial intelligence (AI) is revolutionizing healthcare, including pharmacy practice. AI is reshaping pharmacy practice globally, from drug discovery to patient care, necessitating understanding, training, and favorable attitudes among pharmacists and educators. Successful integration hinges on resource availability, regulatory compliance, and institutional support, promising to revolutionize operations and patient outcomes. Understanding the knowledge, attitudes, and practices (KAP) of pharmacy students and faculty members towards AI is essential for preparing future pharmacists to harness its potential effectively. This study explores KAP towards AI in pharmacy practice in the Middle Eastern and North African (MENA) region.

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