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CONFERENCE ABSTRACTS

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Qualified persons in the Eurasian Economic Union (EAEU) pharmaceutical manufacturing: Staffing and structural analysis

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Background: This study aims to analyze the geographic distribution and qualification profiles of Qualified Persons (QPs) employed by pharmaceutical manufacturers within the Eurasian Economic Union (EAEU). The objective is to assess the human resource capacity of the pharmaceutical quality assurance system as an indicator of the integration of national pharmaceutical markets.

Method: The information base consisted of data from the Unified Register of Qualified Persons of Pharmaceutical Manufacturers, published on the official portal of the EAEU's general information resources and open data (as of December 3, 2025). Statistical and structural analysis methods were applied, complemented by an analytical approach to data interpretation.

Results: Analysis revealed that, among the 999 QPs registered in the Unified Register, the overwhelming majority (986 individuals) are employed in the Russian Federation, 10 in Kazakhstan, 2 in Armenia, and 1 in the Kyrgyz Republic. The qualification structure of QPs is as follows: 24.4% hold pharmaceutical education, 17.4% biotechnological, and 12.3% chemical. Examination of the organizational and legal forms of employers demonstrated the predominance of limited liability companies (48.5%) and joint-stock companies (34.9%). In the Russian Federation, most QPs were certified in 2021 (40.5%), while the share certified in 2025 accounted for 5.9%.

Conclusion: Although the procedure for acknowledging QPs was approved by the Decision of the EEC Council No. 73 "On the Procedure for the Certification of Qualified Persons of Pharmaceutical Manufacturers" in 2016, its practical implementation began only in 2021. This delay is associated with the entry into force of the Order of the Ministry of Health of the Russian Federation dated January 12, 2021, No. 7n, which established the list of documents, stages, and decision-making procedures for QP certification in accordance with the EEC Council Decision No. 73. The analysis of obtained data indicates an uneven development of the institution of authorized representatives of pharmaceutical manufacturers within the EAEU, with a pronounced dominance of the Russian segment.

Comparative analysis of requirements to qualified persons of pharmaceutical manufacturers in the countries of the European union and the Eurasian economic union

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Background: Ensuring the competence and accountability of Qualified Persons (QPs) plays a pivotal role in maintaining the quality, safety, and efficacy of medicinal products. In the context of deepening integration within the Eurasian Economic Union (EAEU), the alignment of regulatory approaches with the European Union (EU) standards represents a key factor in strengthening mutual market

access and promoting trust in pharmaceutical products. This study aims to compare the qualification requirements and legal status of QPs in the EAEU and the EU to identify key differences in regulatory frameworks and assess prospects for their harmonization.

Method: The analysis was based on the EEC Council Decision No. 73 of November 3, 2016, "On the Procedure for the Certification of Qualified Persons of Pharmaceutical Manufacturers," Directive 2001/83/EC of the European Parliament and of the Council of November 6, 2001, and related legal acts governing qualification requirements for QPs. A systems approach and comparative legal analysis were applied to examine the role of QPs within pharmaceutical quality and safety management systems.

Results: Both the EU and the EAEU impose a legal obligation on QPs to ensure that medicinal products are released into circulation strictly in compliance with the registration dossier and Good Manufacturing Practice (GMP) standards. In the EAEU, the scope of QP responsibility and certification procedures are determined by national legislation, whereas in the EU these requirements are harmonized at the Directive level. The content of higher education curricula for QPs is broadly similar across both systems. However, the EAEU requires a minimum of three years of quality control experience, compared to two years in the EU.

Conclusion: While the functional role of QPs in the EAEU aligns closely with that in the EU, the decentralized regulation of qualifications and certification in the EAEU may lead to divergence in competencies and recognition practices. Advancing regulatory harmonization and establishing a unified mechanism for mutual recognition of QP certification would contribute to improving product quality assurance, facilitating workforce mobility, and supporting the further integration of the EAEU pharmaceutical market within the global regulatory environment.

Fabrication pH-sensitive polyvinyl alcohol-co-carbopol/itaconic acid (PVA-co-Cbp/IA) based microgels for enhancing the dissolution of a lipophilic drug (FN)

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Background: FN is a poorly soluble BCS class II drug with limited oral bioavailability due to dissolution-rate-limited absorption and premature gastric release. Controlled intestinal delivery is essential to improve therapeutic efficacy and reduce dose-related side effects. Although pH-responsive microgels are promising carriers, few studies have explored polyvinyl alcohol and Carbopol 934 based systems. Developing PVA-co-Cbp/IA microgels addresses this gap by enabling targeted, sustained release and enhanced bioavailability.
The objective of this study was to develop and evaluate pH-sensitive PVA-co-Cbp/IA microgels for enhanced dissolution and controlled release of FN. It was hypothesized that the incorporation of ionizable polymers and itaconic acid would enable minimal drug release under acidic conditions while promoting sustained release at intestinal pH, thereby improving bioavailability and patient compliance.

Method: This experimental study involved the synthesis of nine pH-responsive PVA-co-Cbp/IA microgel formulations using free-radical polymerization technique. The formulations were prepared and characterized by the authors under controlled laboratory conditions. Swelling behavior, sol-gel fraction, and in vitro drug release of FN were evaluated at pH 1.2, 4.6, and 7.4 using standard analytical protocols. Biocompatibility was evaluated using the HET-CAM assay, while FN-polymer interactions were investigated through Monte Carlo simulations. All experiments were performed in triplicate, and data were recorded, statistically analyzed, and presented as mean ± standard deviation.

Results: All formulations exhibited pronounced pH sensitivity, with maximum swelling ~100 % observed at pH 7.4, while significantly reduced swelling occurred at pH 4.6 and 1.2. The gel fraction increased with higher polymer and monomer concentrations, confirming enhanced network stability. In vitro release studies demonstrated sustained drug release from the microgels at pH 7.4, achieving more than 90% FN release over 96 h, whereas release at pH 4.6 and pH 1.2 remained below 40% and 30%, respectively. In contrast, the commercial product Lipanthyl Supra showed a rapid release within the first 4–6 h, followed by a plateau. It reached approximately 48% release at pH 7.4, less than 45% at pH 4.6, and below 40% at pH 1.2 up to 24 h, with no further increase shown. HET-CAM results confirmed the non-irritant nature of the microgels, and computational simulations showed that FN adsorption within the polymeric matrix is primarily driven by hydrogen bonding and van der Waals interactions.

Conclusion: This study successfully developed pH-responsive PVA-co-Cbp/IA microgels capable of controlled intestinal delivery of FN. The microgels exhibited marked pH-dependent swelling, high gel fraction, good biocompatibility, and prolonged drug release (>90% over 96 h at pH 7.4), indicating enhanced dissolution and potential improvement in oral bioavailability. Methodological improvements may include optimization of crosslinking density, scale-up studies, and incorporation of advanced in vivo pharmacokinetic evaluations to further validate performance. Overall, this work forms part of a broader strategy to develop intelligent polymer-based oral drug delivery platforms, and future studies should focus on in vivo bioavailability assessment, long-term stability, and extension of this system to other BCS class II drugs.

Anti-hypoxia effect and potential mechanism of traditional Chinese medicine allii macrostemonis bulbus

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Background: This study aims to explore the effects and underlying mechanisms of Allium macrostemonis Bulbus (AMB) and its volatile oil in combating hypoxia, providing scientific evidence for the development of anti-hypoxia drugs and the prevention and treatment of high-altitude diseases.

Method: The volatile oil of AMB was prepared using supercritical carbon dioxide extraction technology, and its components were analyzed. A mouse hypoxia model was established to observe the effects of AMB and its volatile oil on the survival time of mice under conditions of normobaric closed hypoxia, acute hypoxia, chemical hypoxia, and exhaustive swimming experiments. A simulated high-altitude hypoxia rat model was also constructed to evaluate the effects on blood gas disorders, biochemical balance, organ damage, and inflammatory and oxidative stress indicators in hypoxic rats. Transmission electron microscopy was used to examine the damage to type II alveolar epithelial cells. Additionally, Western Blot and in vitro red blood cell hypoxia models were employed to investigate the mechanisms of hydrogen sulfide (H2S) generation enzyme regulation and the translocation of bisphosphoglycerate mutase (BPGM) from the cytoplasm to the membrane in red blood cells, as well as their impact on red blood cell structure and function.

Results: The results showed that AMB and its volatile oil significantly prolonged the survival time of mice under various hypoxic conditions. In the simulated high-altitude hypoxia rat model, AMB and its volatile oil significantly improved blood gas disorders and biochemical balance, and protected vital organs such as the heart, brain, and lungs. Histopathological examination revealed that lung tissue damage was significantly reduced in rats treated with AMB and its volatile oil, and the abnormal changes in inflammatory and oxidative stress indicators were also significantly improved. Transmission electron microscopy further confirmed the protective effect on type II alveolar epithelial cell damage. Moreover, AMB and its volatile oil were found to increase serum H2S levels and decrease 2,3-bisphosphoglycerate (2,3-BPG) content in rats. They may also regulate the expression of H2S generation enzymes, promoting the translocation of BPGM in red blood cells from the cytoplasm to the membrane, thereby improving red blood cell structure and function and enhancing oxygen affinity of hemoglobin.

Conclusion: This study, through the construction of a simulated high-altitude hypoxia rat model, thoroughly explored the anti-hypoxia effects of AMB and its volatile oil and preliminarily uncovered their mechanisms as exogenous H2S donors. The findings demonstrate that AMB and its volatile oil possess significant anti-hypoxia activity, providing a scientific basis for the development of AMB as an anti-hypoxia drug and laying the foundation for its application in the prevention and treatment of high-altitude diseases.

Key challenges limiting local vaccine production in Nigeria: A quantitative study among industrial and regulatory pharmacists

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Background: The COVID-19 pandemic highlighted the critical need for local and regional self-sufficiency in vaccine manufacturing, a challenge particularly critical in low- and middle-income countries like Nigeria. The reliance on imported pharmaceuticals and biologics makes these nations acutely susceptible to disruptions in the global supply chain. Purpose: This study explored the key challenges limiting local vaccine manufacturing in Nigeria from the perspectives of industrial and regulatory pharmacists, using a quantitative approach.

Method: A descriptive cross-sectional study was conducted among 314 industrial and regulatory pharmacists from June to August 2025. Data were collected using a validated, structured questionnaire and analyzed using descriptive and inferential statistics, with a statistical significance level of $p<0.05$.

Results: The study identified five key domains of barriers. Financial and economic barriers were the most prevalent, reported by 71% of respondents, followed by infrastructural and technological barriers (63.6%). A Friedman test confirmed a statistically significant difference, establishing these two as the most critical challenges to local vaccine production. Human resources (48.4%), policy, governance, and regulatory (48.1%), and supply chain and market (47.8%) were ranked as secondary barriers. Stakeholders frequently recommended establishing local and international partnerships and funding initiatives, as well as financial incentives such as grants and low-interest loans, to encourage local manufacturing of vaccines.

Conclusion: The findings confirm that financial and infrastructural deficits are the most significant barriers to vaccine production in Nigeria and provide a clear, actionable roadmap for fostering a robust local vaccine manufacturing ecosystem.

mRNA-LNP and zinc synergistically relieve the NUPR1-MT2 transcriptional brake on ferroptosis to alleviate diabetic cardiomyopathy

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Background: Diabetic cardiomyopathy (DCM) is a major cause of heart failure, driven by a self-perpetuating cycle of oxidative stress and ferroptosis. Current therapies lack mechanisms to break this cycle. Nuclear Protein 1 (NUPR1) is a stress-responsive transcription factor with emerging roles in ferroptosis resistance, but its function and therapeutic potential in the heart are unknown. We identified Metallothionein 2 (MT2), a zinc-binding antioxidant, as a putative NUPR1 target. We hypothesized that NUPR1 orchestrates a transcriptional checkpoint against ferroptosis in DCM via MT2, and that this axis can be therapeutically targeted.

Method: DCM was induced in C57BL/6J mice by high-fat diet/streptozotocin. Cardiac function was assessed by echocardiography, and ferroptosis by lipid peroxidation (MDA, 4HNE), iron assays, and mitochondrial electron microscopy. NUPR1-MT2 regulation was validated by ChIP-qPCR, luciferase reporter assays, and siRNA-mediated epistasis in high glucose/palmitate-stressed cardiomyocytes. Therapeutic efficacy was evaluated using cardiomyocyte-targeted AAV9 vectors and a novel subcutaneous NUPR1 mRNA-LNP formulation, with or without oral zinc supplementation.

Results: NUPR1 was upregulated in diabetic hearts and stressed cardiomyocytes, suggesting a compensatory response. NUPR1 knockdown worsened systolic dysfunction, fibrosis, mitochondrial damage and ferroptosis. Conversely, NUPR1 overexpression restored LVEF and FS%, reduced fibrosis, preserved mitochondrial structure and suppressed ferroptotic markers. ChIP-qPCR confirmed NUPR1 binding to the MT2 promoter, and luciferase assays demonstrated NUPR1-dependent MT2 transactivation; mutation of binding sites abolished activation. MT2 expression closely tracked NUPR1 levels. Importantly, MT2 silencing eliminated NUPR1-mediated protection, restoring lipid peroxidation, GPX4/FTH1 loss, mitochondrial dysfunction and reduced viability. NUPR1 mRNA-LNP achieved sustained cardiac NUPR1 and MT2 expression, significantly improving systolic function, reducing fibrosis and attenuating ferroptosis. Zinc alone modestly improved diastolic indices and stabilised MT2 but did not improve systolic function. Zinc failed to rescue dysfunction in NUPR1-deficient hearts, indicating NUPR1 is required for zinc-dependent protection.

Conclusion:
Conclusion: We identify the NUPR1-MT2 transcriptional axis as a critical endogenous checkpoint that disrupts the ferroptosis-oxidative stress cycle in DCM. NUPR1 governs ferroptosis susceptibility by directly driving MT2 expression. Therapeutic delivery of NUPR1 mRNA-LNP restores this checkpoint, providing robust cardioprotection. This work establishes transcriptional reinforcement of the ferroptosis defence as a novel and translatable strategy for DCM, with the NUPR1-MT2 axis representing a compelling new therapeutic gateway.

Imprints on oral solid dosage forms: A comparison of pad and design roll printing

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Background: Printing on oral solid dosage forms (OSDs) plays an important role in pharmaceutical manufacturing. Imprints help meet regulatory expectations, support safety, mitigate medication errors, and contribute to anti-counterfeiting strategies. As global regulatory frameworks increasingly mandate distinct and legible product identification marks, pharmaceutical manufacturers must select printing technologies that ensure high fidelity, robustness, scalability, and compliance with current Good Manufacturing Practice (cGMP). This presentation provides an overview of established and emerging imprinting techniques and focuses on a technical comparison between pad printing and printing with engraved design rolls.

Traditional imprinting approaches include debossing or embossing during tablet compression, offset rotogravure printing, flexographic printing, inkjet printing, laser marking, pad printing, and roll-based direct-contact printing systems. Debossing and embossing are integrated into the tablet tooling stage and provide durable identification without additional ink application; however, they are limited in graphical complexity and unsuitable for post-compression customization. Therefore, ink-based techniques offer greater flexibility, allowing alphanumeric codes, logos, and multi-color designs to be applied. Inkjet and laser systems enable variable data printing but require careful control of ink rheology, substrate wettability, drying kinetics, and thermal load to maintain product integrity and legibility. Pad printing is a widely implemented indirect gravure process. In this technique, ink is transferred from an etched cliché plate to the dosage form via a deformable silicone pad. The elastomeric pad enables printing of complex geometries, making the process particularly suitable for biconvex tablets and hard gelatin capsules beside all other tablet formats. Process performance depends on parameters including cliché depth, ink viscosity and thixotropy, pad hardness, transfer pressure, dwell time, and environmental controls. Printing with engraved design rolls - often implemented as rotogravure or direct-contact roll printing – represents a good alternative. In these systems, an engraved steel or polymer roll carries the ink pattern and transfers it directly to the dosage form.

Method: At Rottendorf Pharma (Ennigerloh, Germany) printing is performed with both printing techniques, by using either an "Agate S" pad printing system (Printing International, Aalter, Belgium) or a "Delta Ink Printer" (Ackley Hartnett, Langhorne, USA). Based on printing process parameters and data from manufacturing of initial feasibility or validation batches of three different commercial drug products (DPs), both printing techniques are compared by printing speed, rejection rate and quality of the imprint.

Results: The data gathered during the printing processes of different commercial OSDs are compared based on different process parameters. There are clear differences in sense of efficiency and productivity between the two printing systems. Furthermore, the imprint quality is evaluated via AQL (acceptable quality level). Exemplary images of printed film-coated tablets (FCTs) will be presented, demonstrating how the chosen printing technique influences the resulting imprint quality

Conclusion: With the data from commercial OSD manufacturing as foundation we present a guide to choose the ideal printing strategy. Both technologies compared are effective for pharmaceutical imprinting but serve different production needs. The selection should depend on production volume, dosage-form geometry, required resolution, changeover frequency, and validation strategy.

Formulation and evaluation of azadirachta indica and allium sativa herbal creams for treatment of bacteria and fungal skin infections

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Background: Skin infections occur commonly to all ages and both genders. They often present therapeutic challenges to practitioners due to the growing multi-drug resistant bacterial, viral and fungal strains. Various bacteria skin infections occur such as Staphylococcal infections of the skin such as impetigo and folliculitis. Dermatophyte infections caused by fungal pathogens also exist. . Herbal medicines are rapidly becoming more acceptable globally because it is affordable and safe with less side effects.The aim of the present study is to formulate and evaluate some topical creams using ethanolic leave extracts of Azadirachita indica (Neem) and Allium sativa (Garlic).

Method: Phytochemical tests were carried out on extracts of the herbs. In- vitro study on the antibacterial activities of the ethanolic extracts of the dried leaves of Neem and Garlic were determined by using the Agar cup diffusion plate method using different bacteria and fungi such as Staphylococcus aureus, Escherichia coli and Aspergillus nigricans. Using various concentration of the ethanolic extracts; 1.00, 1.50, 2.00, 2.50 % w/w of Azadirachita and Allium, oil in water creams were prepared. The oily base consisted of cetyl esters, stearic acids and emulsifying wax.. Evaluation of the herbal creams such organoleptic parameters(colour, odour) loss on drying, pH, spreadability, solubility, washability and non-irritancy were also carried out. In vitro drug release and in vitro antimicrobial activities against Staphylococcus aureus, Escherichia coli and Aspergillus nigricans were also done.. The stability of the creams were also carried out on the products at three different temperatures of 20, 30, 45 oC.

Results: The phytochemical composition of both extracts were, alkaloids, flavonoids, saponins, tannins and phenols. They were all light green homogenous, smooth and without characteristics odour. The cream's pH values ranged from 6.0 – 6.5, spreadability was 14.2 – 15.1gm.cm/s, viscosity ranged 2209.3 to 2213.0 mPa.s with no irritancy. The formula A3 with the concentration of 2.000 % had best antimicrobial activity. All the creams were stable with no changes in the organoleptic parameters for 8 weeks. The drug content uniformity of the creams were found to be 102 % each. Combined Garlic and Neem extract creams had significant antimicrobial activity with higher zones of inhibition on Staphylococus aureus. These had inhibition zone diameters [IZD] of 60.6 mm when combined and 60.0 mm when used singly. When used against Aspergillus nigricans, the IZD of 40 mm was obtained when combined and 30 mm when used singly. Thus, the combinations depict greater activity against the S. aureus and Aspergillus nigricans when used in combinations. The cream has no activity against E. coli.

Conclusion: The findings above demonstrated that herbal creams of Neem and Garlic were successfully formulated. Evaluation results showed that they passed all physiochemical parameters and were stable for 8 weeks When used singly and in combination have significant activities against Staph aureus and Aspergillus nigricans. .. The Combined herbal creams can serve as effective anti-infective topical antimicrobial agents for gram positive and Aspergillus infection. Hence, It can present as an alternative topical natural anti-infective drugs.

Comparative Determination of heavy metals in packaged and open-market red pepper and black pepper in Türkiye using ICP-MS

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Background: Spices such as red pepper and black pepper are widely consumed and constitute essential components of daily diets. However, their safety may be affected by contamination with heavy metals introduced during cultivation, processing, transportation, or environmental exposure. Products sold in open markets may be particularly susceptible to contamination due to direct exposure to airborne pollutants, whereas packaged products may reflect contamination originating from earlier stages of the supply chain. This study aimed to determine and compare the concentrations of selected heavy metals in packaged and open-market red pepper and black pepper samples in Türkiye.

Method: Red pepper and black pepper samples, including both packaged and open-market products, were collected and analyzed. Approximately 500–510 mg of each sample was subjected to microwave-assisted acid digestion using 6 mL of 65% nitric acid (HNO_3) and 2 mL of 30% hydrogen peroxide (H_2O_2), followed by dilution with bidistilled water. Quantitative determination of chromium (Cr), nickel (Ni), arsenic (As), cadmium (Cd), mercury (Hg), and lead (Pb) was performed using Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Results are expressed in mg/kg, and ND indicates that the analyte was not detected.

Results: Heavy metal concentrations varied considerably depending on spice type and market form. Chromium and nickel were the most prominently detected elements across samples. Chromium concentrations reached up to 1294.29 mg/kg in red pepper samples, while nickel exhibited notably high levels, with maximum values of 9489.93 mg/kg in open-market red pepper.

Open-market samples generally showed greater variability and, in several cases, higher concentrations compared to packaged products. Arsenic and cadmium were detected in selected samples, with arsenic reaching up to 81.43 mg/kg and cadmium up to 46.00 mg/kg. Mercury was consistently detected at lower concentrations, ranging approximately between 0.24 and 2.13 mg/kg.

Lead was not detected in some samples; however, measurable levels were observed in others, with concentrations reaching up to 62.99 mg/kg. Overall, red pepper samples, particularly those obtained from open markets, tended to exhibit higher metal concentrations compared to black pepper.

Conclusion: The findings demonstrate that both packaged and open-market spices may contain measurable levels of heavy metals, with notable variability between sample types. Higher concentrations observed in certain open-market samples suggest potential environmental contributions, while the presence of metals in packaged products indicates that contamination may also originate from earlier stages such as cultivation or processing. These results provide analytical insight into heavy metal occurrence in commonly consumed spices and highlight the importance of continued monitoring to ensure product quality.

Decoding drug market access in India: The role of AI in pricing and penetration strategies

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Background: The Indian pharmaceutical landscape is characterized by high out-of-pocket expenditure, fragmented regional economics, and a rapidly evolving multi-payer environment driven by initiatives like Ayushman Bharat. Traditional product launch and commercialization strategies, historically reliant on static benchmarks and manual data analysis they frequently struggle to navigate this complexity. As the window for measuring launch success evolves, pharmaceutical companies are increasingly moving away from siloed operations. Artificial Intelligence (AI) and predictive analytics are emerging as critical mechanisms to dynamically model market environments, simulate pricing tiers, and optimize penetration strategies in markets where traditional centralized insurance data is limited.

Purpose: This study aims to evaluate how pharmaceutical manufacturers utilize AI-driven predictive modeling and real-world evidence (RWE) to formulate drug pricing, design optimal market access strategies, and execute successful commercial product launches within the diverse Indian healthcare ecosystem.

Method: A comprehensive review of secondary data from industry analyses, consulting reports (including KPMG, Deloitte, and IQVIA), and recent pharmaceutical commercial case studies was conducted. The analysis focused on the deployment of machine learning algorithms across core commercial functions: pricing simulations, tender optimization, and predictive demand forecasting. Comparative assessments were made between traditional market access frameworks and AI-integrated commercial models, specifically evaluating performance metrics such as pricing forecast accuracy, institutional tender win rates, and overall launch cycle efficiencies.

Results: The integration of AI into industrial market access strategies demonstrates substantial commercial advantages. AI-powered pricing platforms, which analyze vast datasets encompassing regional affordability indices, competitor pricing, and epidemiological trends, improved pricing forecast accuracy by an estimated 20-30% compared to traditional models. In institutional sales and government procurement, automated tender optimization algorithms increased tender win rates by up to 17% while driving process efficiency. Furthermore, AI-driven predictive analytics enabled dynamic micro-segmentation and optimized supply chain orchestration, cutting logistics costs by 20-25% and reducing the risk of drug shortages during critical launch phases. Crucially, these AI tools effectively established viable, tiered pricing structures, allowing manufacturers to balance public reimbursement schemes with private out-of-pocket channels to maximize penetration.

Conclusion: AI is fundamentally transforming industrial pharmacy by shifting commercialization from static planning to dynamic, data-driven execution. In the complex Indian market, AI acts as a strategic equalizer, enabling pharmaceutical companies to align profitability objectives with patient affordability through precision pricing and targeted access strategies. To fully harness this potential, organizations must dismantle silos between health economics, medical affairs, and commercial operations, treating market access as an integrated, AI-powered growth engine rather than a late-stage administrative hurdle. Future research should explore the regulatory frameworks necessary to govern algorithmic pricing and the long-term impact of AI-driven commercial models on patient health outcomes in emerging markets.

Optimizing procurement strategies to prevent medicine shortages

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Background: Continuous access to safe, effective, and affordable medicines is essential for a functional health system. However, medicine shortages remain a persistent global problem, affecting both high-income countries and LMICs. These shortages often result in stockouts at healthcare facilities, leading to delayed treatment, therapeutic substitutions, increased out-of-pocket costs, and reduced confidence in health services. While upstream factors such as manufacturing disruptions and supply chain inefficiencies contribute to shortages, procurement practices play a critical role in determining medicine availability at the service delivery level. In LMICs like Ghana, challenges such as weak demand forecasting, fragmented procurement systems, delayed payments, and limited supplier responsiveness further exacerbate shortages. Despite this, procurement systems are often evaluated based on cost and compliance rather than service-level outcomes, creating a gap in evidence on effective procurement strategies for preventing shortages.

Purpose: This study aims to optimize procurement strategies to prevent medicine shortages within pharmaceutical supply chains. Specifically, it seeks to describe current procurement practices, assess the magnitude and patterns of medicine shortages, evaluate the relationship between procurement performance indicators and shortage outcomes, identify key operational and institutional constraints, and develop an evidence-based procurement optimization framework.

Method: A mixed-methods explanatory sequential design will be employed. The quantitative phase will involve retrospective analysis of procurement and stock records from 12–20 public health facilities in Ghana. Key indicators such as stockout frequency, duration, lead times, and order fill rates will be analyzed using descriptive statistics and regression models to determine associations between procurement practices and shortages. The qualitative phase will include 15–25 key informant interviews with pharmacists, procurement officers, and supply chain stakeholders to explore challenges in procurement processes and identify feasible optimization strategies. Findings from both phases will be integrated to generate practical, context-specific recommendations.

Results: The study is expected to demonstrate significant associations between procurement performance indicators—such as forecasting accuracy, supplier reliability, and lead-time variability—and medicine shortage outcomes. It is anticipated that weaknesses in demand planning, delayed procurement cycles, poor supplier performance, and financing constraints contribute to recurrent stockouts. The findings will also highlight variations in shortage patterns across facility levels and medicine categories, as well as identify key institutional and operational barriers affecting procurement effectiveness.

Conclusion: Medicine shortages are not solely the result of external supply disruptions but are significantly influenced by procurement strategies and system-level decisions. Strengthening procurement through improved forecasting, strategic contracting, supplier diversification, and efficient payment systems can enhance supply reliability and reduce stockouts. This study will provide an evidence-based procurement optimization framework to guide policymakers, procurement agencies, and healthcare institutions in implementing reforms that improve medicine availability, enhance health system efficiency, and promote equitable access to essential medicines. Ultimately, it positions procurement as a strategic lever for building resilient pharmaceutical supply chains and ensuring continuity of care.

Formulation and evaluation of antibacterial herbal creams

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Background: Rising anti-bacteria resistance (ABR) is a global health threat due to abuse of synthetic antibiotics which has led to the development of resistance strains of various organisms. Increasing bacterial resistance limits effectiveness of synthetic antibiotics. Hence, the leading cause of search of alternative treatments such as herbal medicines. Herbal plants have curative properties due to the presence of various complex chemical substance of different composition, which are found as secondary plant metabolites in one or more parts of these plants. Aloe vera and Azadirachta indica possess proven antibacterial and healing properties. Herbal formulations offer safe, affordable alternatives that are free from side effects. Herbal drugs are formulated in various dosage forms such as capsules, lozenges, tablets, ointments and creams.
This study focuses on formulating and evaluating creams containing ethanolic extracts of Aloe vera [AV] , Azadirachta indica [AI] (Neem) and their combinations for antibacterial effects.

Method: Azadirachta indica and Aloe vera ethanol extraction was carried out, concentrated and stored in a refrigerator The phytochemical compositions were thereafter analysed. The extracts were evaluated for microbial contamination.. Five concentrations of each extract (0.5, 1.0, 1.5, 2.0,2.5 %) were used to prepare oil in water emulsions using conventional method. Singly and combined herbal creams were prepared. Evaluation of the creams consisting of physical examination, pH value , viscosity and spreadability were carried out. The drug content was carried out at a wavelength of 308 nm in water solvent for Neem and 204 for Aloe vera in a UV spectrophotometer. The in-vitro agar diffusion assay to examine their antibacterial activity on two clinical isolates of Staphylococcous aureus and Escherichia coli was carried out using gentamicin cream as positive control.. The stability studies were also carried out after storage for 8 weeks.

Results: The phytochemical compositions of both extracts were alkaloids, flavonoids, saponins, tannins and phenols. All the creams were homogenous, smooth and without characteristics odour. The creams had good pH values ranges from 6.0 – 6.5, spreadability was 13.4 – 15.1 gm.cm/s, viscosity ranged 2192.4 to 2212.7 mPa.s, easily washable, and non-irritancy. All the creams had activity against S aureus with combined herbal having greatest inhibition zone diameter [IZD] of 60 mm against 40.0 cm when used singly. With exception of Neem, Aloe vera, combined Neem and Aloe vera and Gentamicin creams had clear activity against E coli at IZD of 50.5, 60, 60 mm respectively. The creams showed good stability after 8 weeks.

Conclusion: The findings, demonstrated that herbal creams of Aloe vera and Azadirachita indica (singly and combined) were successfully prepared and passed all physiochemical parameters as required by Pharmacopiea specifications. Aloe vera and Azadirachta indica have a good Gram positive antibacterial activity when compared with gentamicin cream while only Aloe vera had excellent Gram-negative antibacterial activity when compared to gentamicin. Hence, it can serve as an effective natural antibacterial agents which can serve as an alternative to synthetic anti-infective drugs. There combinations elicited significant gram positive activity.