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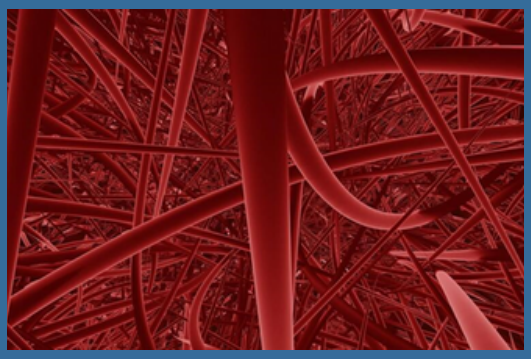
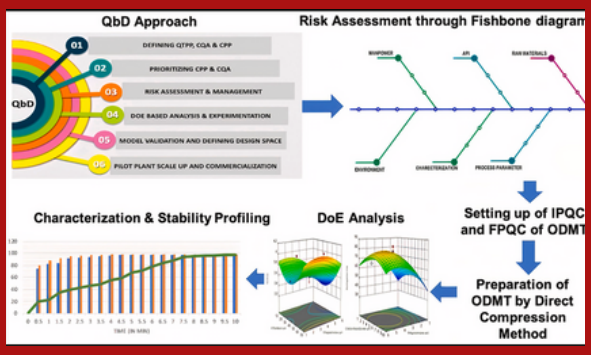


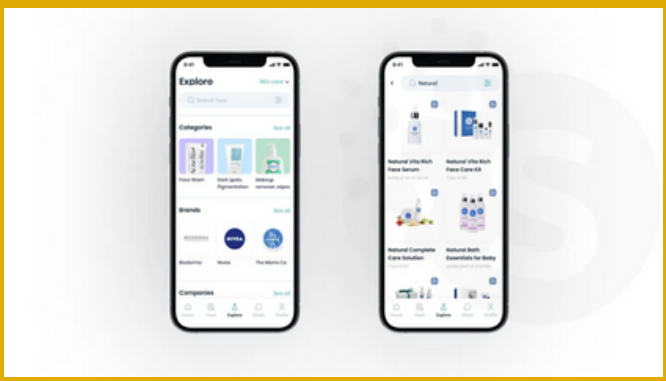
NETWORKING NANO BIOSENSORS FOR WIRELESS COMMUNICATION IN THE BLOOD

- Advancements in Nano Biosensors
- In-Depth Research: Networking Possibilities
- Industry Innovations
- Challenges and Solutions
- Regulatory Insights
- Future Visions

QBD IN TABLET COMPRESSION

- Lamination problems can be predicted or troubleshooted with a tableting equipment
- Quality by Design (QbD) plays a crucial role in this optimization process.
- Formulation scientists, guided by Quality Target Product Profiles (QTPP) and process flow charts, identify material attributes (MA), quality attributes (QA), and process parameters (PP) necessary to achieve the desired QTPP.

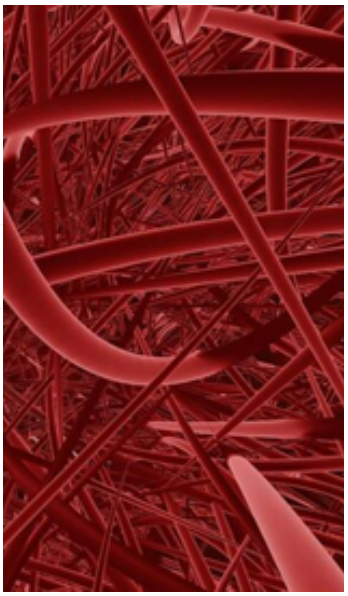




MEDICONNECT

- MediConnect is a mobile application that serves as a tool to connect doctors with companies that deliver medical products.
- Our main goals in developing this app

NETWORKING NANO BIOSENSORS FOR WIRELESS COMMUNICATION IN THE BLOOD



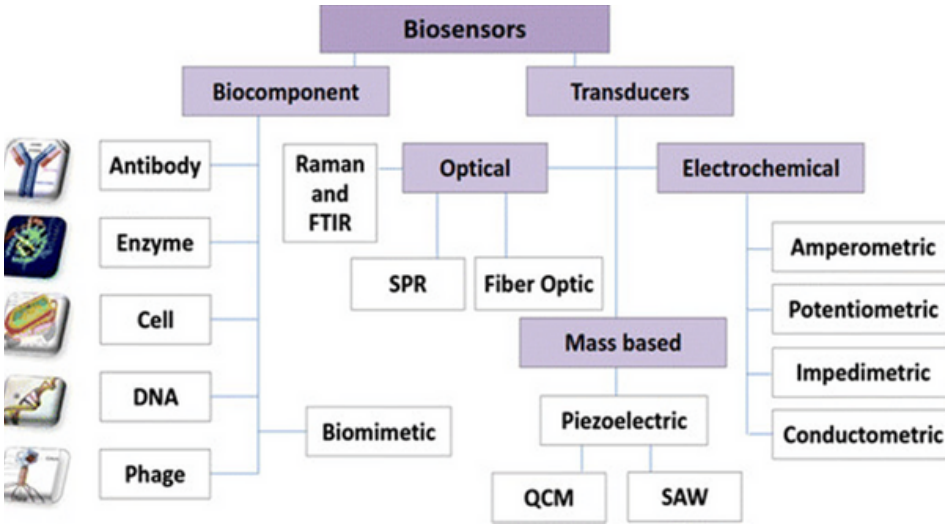
Embark on a journey into the future of healthcare with our feature, "Networking Nano Biosensors in Bloodstream Communication." Delve into the latest nano biosensor advancements, exploring miniaturization and real-time monitoring. Witness the integration of wireless communication technologies within the bloodstream and gain insights into groundbreaking research projects. Stay abreast of industry leaders shaping this transformative landscape, revolutionizing patient care.

First, there was the Internet of Things (IoT) and now, at the interface of computer science and biology, the Internet of Bio-Nano Things (IoBNT) promises to revolutionize medicine and health care. The IoBNT refers to biosensors that collect and process data, nano-scale Labs-on-a-Chip that run medical tests inside the body, the use of bacteria to design biological nano-machines that can detect pathogens, and nano-robots that swim through the bloodstream to perform targeted drug delivery and treatment.

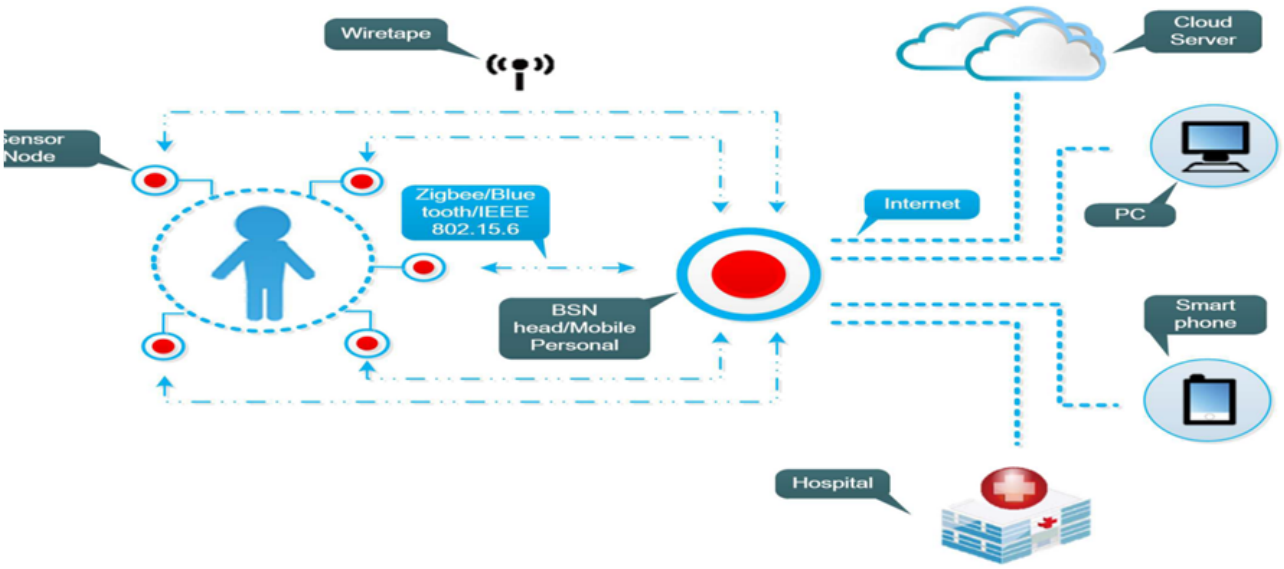
"Biomolecular communication has emerged as the most suitable paradigm for networking nano-implants". It's an incredible idea that we can send data by encoding it into molecules which then go through the bloodstream and we can communicate with them, guiding them on where to go and when to release their treatments, just like hormones.

· In the realm of nano biosensors, cutting-edge developments are reshaping the landscape with a focus on miniaturization, sensitivity, and real-time monitoring. Recent advancements have propelled sensor technology to new heights, allowing for the creation of smaller, more efficient devices. Enhanced sensitivity ensures precise detection of biomolecules, while real-time monitoring capabilities empower healthcare professionals with instantaneous access to critical data, revolutionizing diagnostics and personalized medicine. These strides mark a significant leap forward in the application of nano biosensors for improved healthcare outcomes.

Advancements in Nano Biosensors:



WIRELESS NETWORKING IN THE BLOOD



Enter the era of Wireless Networking in the Blood, where the integration of wireless communication technologies is revolutionizing healthcare. Nano biosensors act as information nodes, communicating crucial health data within the bloodstream. This seamless integration enables real-time monitoring and data transmission without reliance on traditional electromagnetic waves. Witness the convergence of biology and technology, connecting the dots to establish a sophisticated network for continuous health monitoring and personalized medical interventions. This breakthrough promises to redefine how we approach healthcare and diagnostics.

IN-DEPTH RESEARCH: NETWORKING POSSIBILITIES

IN THIS RESEARCH SPOTLIGHT, WE DELVE INTO THE EXPLORATION OF THE NETWORKING CAPABILITIES OF NANO BIOSENSORS. SCIENTISTS AND RESEARCHERS ARE INVESTIGATING HOW THESE MINUSCULE SENSORS CAN ACT AS INTERCONNECTED NODES, COMMUNICATING VITAL INFORMATION WITHIN THE BLOODSTREAM. THE FOCUS LIES ON UNDERSTANDING THE INTRICATE WEB OF INTERACTIONS, SIGNALLING PATHWAYS, AND DATA TRANSMISSION MECHANISMS, UNLOCKING THE POTENTIAL FOR ADVANCED HEALTHCARE MONITORING SYSTEMS. THIS RESEARCH MARKS A SIGNIFICANT STRIDE TOWARDS REALIZING THE FULL NETWORKING POTENTIAL OF NANO BIOSENSORS IN THE CONTEXT OF IN VIVO APPLICATIONS.

REGULATORY INSIGHTS

The regulatory journey for in vivo networking systems involves meticulous scrutiny. Biocompatibility assessments ensure the safety of components within the bloodstream, while data security protocols safeguard patient information. Navigating through regulatory processes demands rigorous documentation and adherence to standards, fostering confidence in the reliability and ethical deployment of this transformative healthcare technology. Engaging with regulatory bodies ensures a thorough understanding of evolving compliance requirements, guiding the seamless integration of in vivo networking into the healthcare regulatory framework.

TECHNOLOGICAL SPOTLIGHT: WIRELESS PROTOCOLS AND NANOMATERIALS:

Breakthroughs in wireless communication protocols facilitate efficient data exchange, promoting real-time monitoring. Meanwhile, nanomaterial advancements empower nano biosensors with enhanced sensitivity and biocompatibility, crucial for their integration into the bloodstream. This synergy of wireless communication and nanomaterial prowess marks a significant leap in the evolution of in vivo monitoring systems.

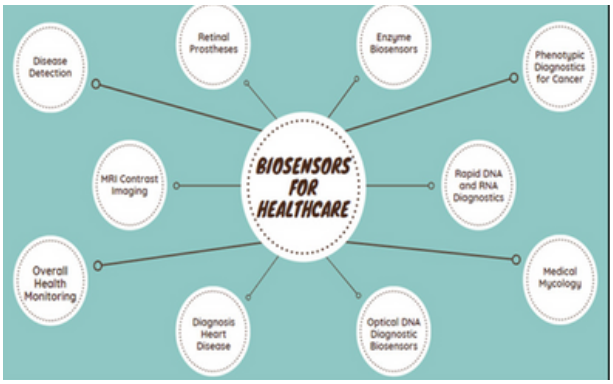
Future Visions:

"Envisioning Tomorrow: The Future Landscape of Bloodstream Communication," consider the convergence of emerging technologies. Picture a landscape where nano biosensors seamlessly integrate with smart healthcare ecosystems, leveraging the power of predictive analytics and proactive interventions. Anticipate a future where real-time health insights, empowered by the interplay of biology and technology, lead to personalized treatment strategies and improved patient outcomes. The horizon of bloodstream communication holds the promise of not just monitoring health but actively shaping a healthier tomorrow.

As we conclude our exploration with "Wrapping Up: Key Takeaways from the World of Bloodstream Networking," reflect on the pivotal insights gained. From overcoming biocompatibility challenges to envisioning the future of healthcare, the journey unraveled the potential of networking nano biosensors. Embrace the transformative impact on patient monitoring and healthcare paradigms, highlighting the collaborative efforts shaping a dynamic future in the realm of bloodstream communication.

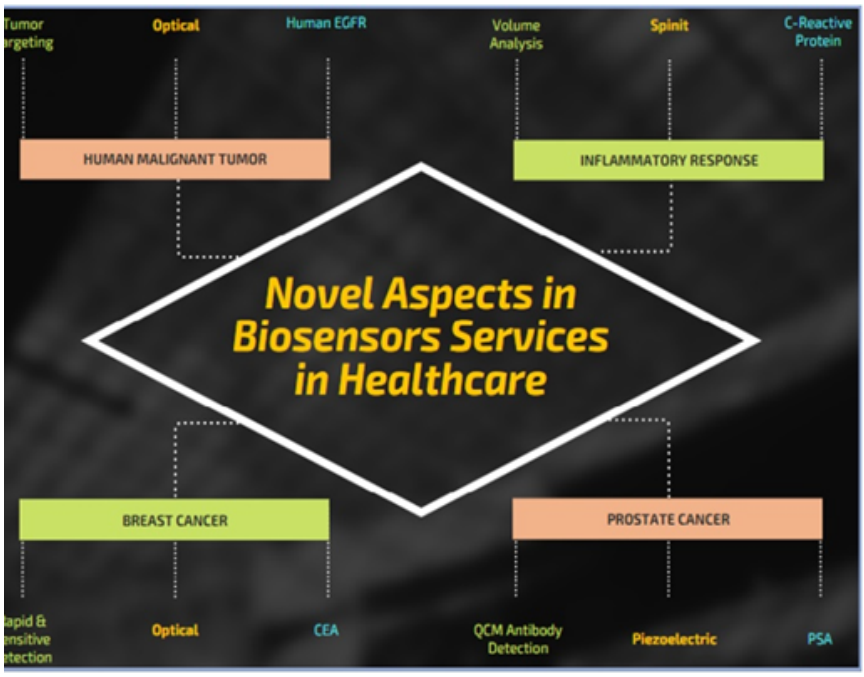
INDUSTRY INNOVATIONS

Discover the forefront of innovation with industry leaders pioneering Networking Nano Biosensor Technologies. Companies at the vanguard of this movement are driving advancements in miniaturization, communication protocols, and biomedical engineering. By combining expertise in nanotechnology and healthcare, these pioneers are shaping the future of diagnostics and personalized medicine. Their commitment to pushing boundaries underscores the transformative potential of Networking Nano Biosensors, establishing them as trailblazers in the integration of technology with healthcare.



Healthcare Applications :

- These biosensors, acting as nodes in a network, enable continuous and real-time tracking of vital health parameters within the bloodstream.
- The implications span from personalized medicine to improved diagnostics, promising a transformative impact on patient care.



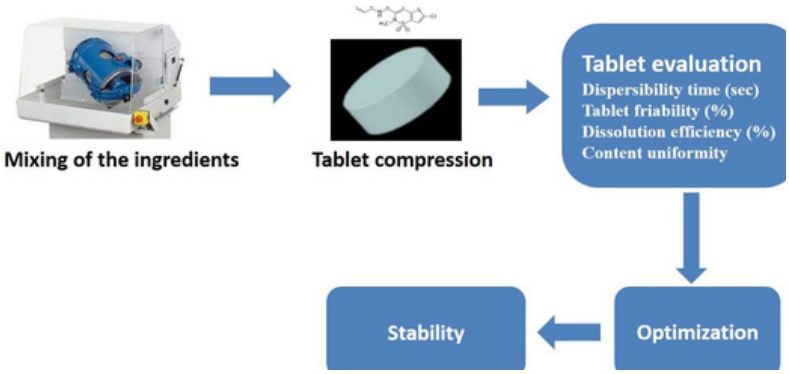
CHALLENGES AND SOLUTIONS:

DISCOVER THE HURDLES FACED IN THE DEVELOPMENT OF BLOODSTREAM NETWORKING, FROM BIOCOMPATIBILITY ISSUES TO THE INTRICACIES OF DATA TRANSMISSION. THIS SEGMENT NAVIGATES THROUGH THE TERRAIN OF CHALLENGES, SHEDDING LIGHT ON HOW RESEARCHERS AND INDUSTRY EXPERTS ARE CHARTING PATHS TO ENSURE THE SEAMLESS INTEGRATION OF NETWORKING NANO BIOSENSORS FOR EFFECTIVE AND RELIABLE IN VIVO MONITORING.

1. **BIOCOMPATIBILITY CHALLENGES:**
2. **DATA TRANSMISSION INTEGRITY:**
3. **POWER EFFICIENCY IN MINIATURIZED DEVICES:**
4. **SECURITY AND PRIVACY CONCERNS:**
5. **INTEGRATION WITH EXISTING HEALTHCARE INFRASTRUCTURE:**
6. **PATIENT ACCEPTANCE AND ETHICAL CONSIDERATIONS:**

ADDRESSING CHALLENGES IN BLOODSTREAM NETWORKING MANDATES A COMPREHENSIVE APPROACH. RIGOROUS RESEARCH INTO BIOCOMPATIBLE MATERIALS, SOPHISTICATED ALGORITHMS FOR DATA TRANSMISSION, INTEGRATION OF ENERGY-EFFICIENT TECHNOLOGIES, ROBUST ENCRYPTION FOR SECURITY, STANDARDIZED PROTOCOLS FOR INTEGRATION, AND PATIENT-CENTRIC ETHICAL CONSIDERATIONS COLLECTIVELY ENSURE SUCCESSFUL IMPLEMENTATION AND REVOLUTIONIZE HEALTHCARE MONITORING.

QBD IN TABLET COMPRESSION



Lamination problems can be predicted or troubleshooted with a tableting equipment. In a trial conducted with a client of Mede pharm, a blend was crushed utilizing compression tooling from two separate suppliers on a high-speed single-punch tableting machine. The tablets created with the initial punch set lacked lamination, mimicking the high-speed rotation of a Kikusui rotary tablet press. Despite the fact that every process parameter was the same for both punch sets, the tablets created with the second punch set showed lamination. The disparity in mechanical tolerances between the die bore and the punch tip was identified as the root cause of lamination. In this instance, the tableting instrument was utilized to identify the parameter that needed to be changed (i.e., switch punch suppliers) and troubleshoot manufacturing concerns.

Pre-compression is the second process parameter that can be changed, following tooling shape. By doing this, extra air will be removed from the powder bed, which will probably improve the tablets' cohesiveness. It is expected that this extra cohesiveness will mitigate the shear stress imposed by the tablet's form and prevent capping.

Every pharmaceutical lab's ultimate goal is to reduce "time to market." Prescription, over-the-counter, and generic medicine makers have a competitive advantage when their products are the first on the market. By using quality-by-design (QbD) principles at the formulation stage, tablet flaws can be prevented early on, which will significantly cut down on time spent on the difficult and time-consuming "scale-up" phase. Scientists may be forced to address formulation problems at the pilot level or, worse still, during actual production if they wait until late in the development process, during the "production-size phase." On the other hand, a QbD method ensures maximum safety during the scale-up to production from the start.

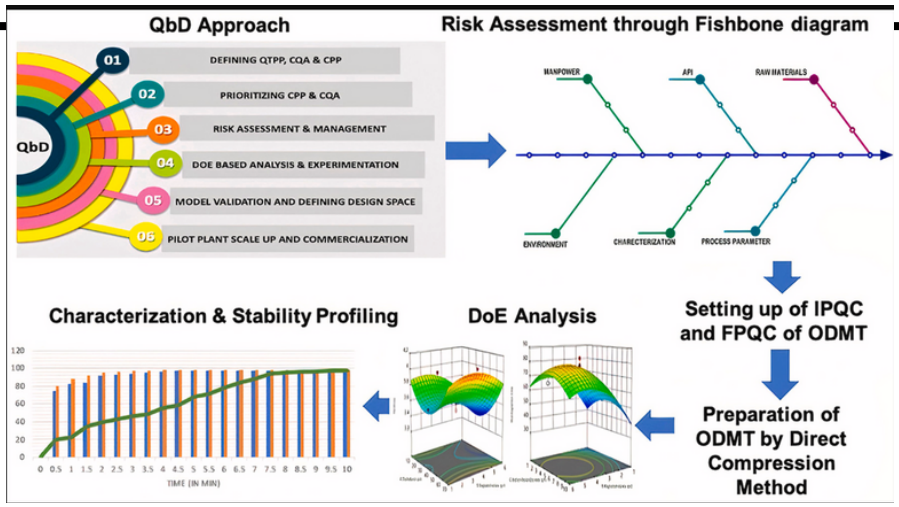
The compression/edge thickness (i.e., punch spacing) is the fourth process parameter. The capping should vanish quickly as the compression thickness increases because this will mechanically reduce the compression force. However, there will also be a decrease in the tablet breaking force (cohesion), which is likely to alter the disintegration time and dissolution profiles. It is necessary to thoroughly evaluate this process parameter.

It takes a lot of time and blend to adjust all these parameters on a commercial-size press, but single punch presses with high strain rate capability can be used to assess capping. These compaction simulators can be used to quickly troubleshoot tablet faults using modest amounts of mix by carrying out the previously outlined tests.

Using tableting devices (compaction simulators) to mimic high-speed presses, one can do direct scale-up and in-depth material characterization using a quality-by-design (QbD) method.

Every pharmaceutical lab's ultimate goal is to reduce "time to market." Prescription, over-the-counter, and generic medicine makers have a competitive advantage when their products are the first on the market. By using quality-by-design (QbD) principles at the formulation stage, tablet flaws can be prevented early on, which will significantly cut down on time spent on the difficult and time-consuming "scale-up" phase.

QBD IN TABLET COMPRESSION

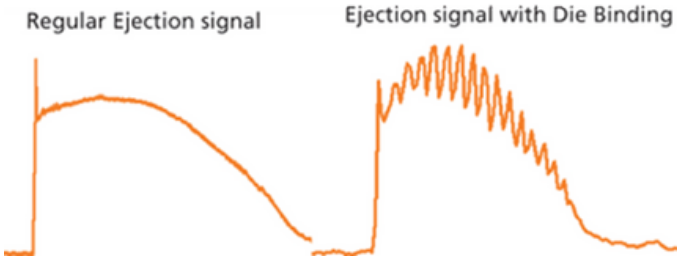


Adjusting the numerous parameters on a commercial-size press to troubleshoot tablet defects is a time-consuming process requiring substantial quantities of blend. However, a viable alternative involves the use of single punch presses with high strain rate capabilities, enabling the evaluation of capping issues with smaller blend quantities promptly. This method proves effective in addressing tablet defects on compaction simulators during the early development stages, aiding formulators in optimizing formulations before scale-up.

Quality by Design (QbD) plays a crucial role in this optimization process. Formulation scientists, guided by Quality Target Product Profiles (QTPP) and process flow charts, identify material attributes (MA), quality attributes (QA), and process parameters (PP) necessary to achieve the desired QTPP. Through a risk assessment process based on scientific understanding and experience, critical attributes and parameters are pinpointed and assessed using compaction simulators, aligning with the tablet formulation process.

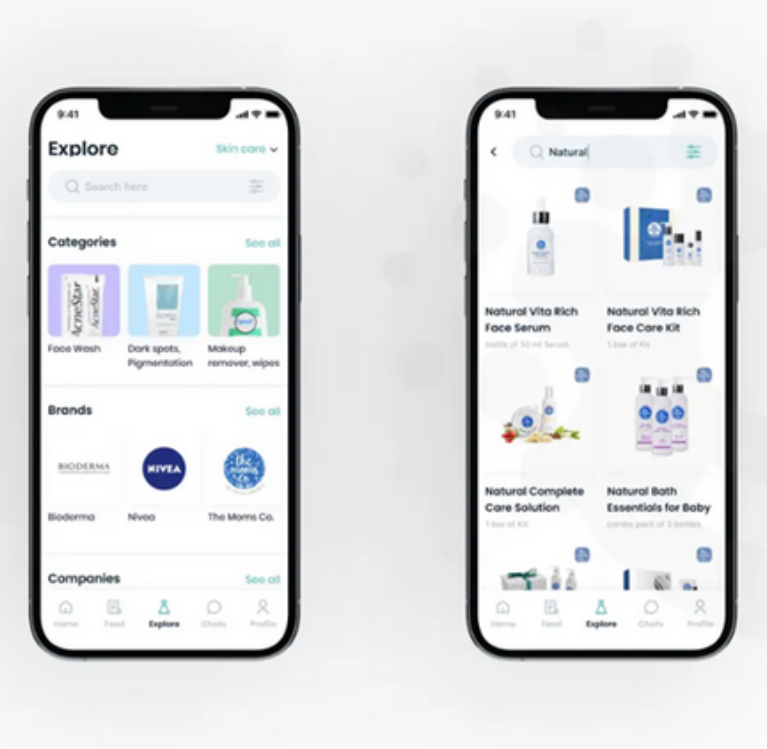
Altering compression thickness affects the compression force, leading to a common misconception that the compression thickness knob directly controls compression force. However, when the operator increases the dosage height, the compression force also increases, challenging the classification of compression force as a process parameter; it is, in fact, a quality attribute.

Furthermore, evaluating lubrication in tablet formulations is crucial. The conventional belief in the necessity of 0.5–1% lubricant quantity is questioned, with a focus on ejection force and additional quality attributes such as oscillations in the force signal after the peak. The consideration of the transmission coefficient, a ratio of upper and lower punch force, provides a comprehensive view, necessitating force sensors on both punches in an equipped R&D press for accurate measurement.



The compression force, often viewed as a process parameter, is fundamentally a quality attribute. When operating a basic rotary tablet press, an operator can manipulate dosage height and compression/edge thickness, with compression force measured by strain gauges on the pressure rolls.

By plotting the relation between compression force and tablet weight, the formulator can modify the process parameter "dosage height" to simulate changes in powder density.



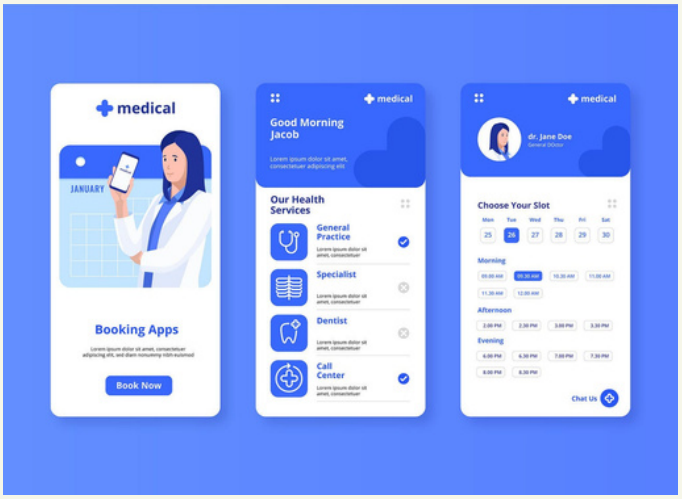
MediConnect is a mobile application that serves as a tool to connect doctors with companies that deliver medical products.

We developed this application considering two groups of users:

- Doctors. Here, we have presented a convenient search for medical products and services.
- Healthcare product companies. For them, we have added video and audio communication features to make interacting with doctors and selling products and services easier.

Our main goals in developing this app were:

- Increasing the effectiveness of interaction between doctors and healthcare product companies
- Opening new sales channels for product companies
- Creating a user-friendly interface



WE IMPLEMENTED VIDRTC, OUR VIDEO AND AUDIO COMMUNICATION TECHNOLOGY, ALLOWING SEAMLESS AND HIGH-QUALITY P2P COMMUNICATION. AZURE SPEECH RECOGNITION HAS ENHANCED THE EASE OF USER INTERACTION FURTHER AND ELIMINATED LANGUAGE BARRIERS. OUR DEVELOPERS HAVE ALSO INTEGRATED PAYPAL FOR IN-APP PAYMENTS.

AS A RESULT, MEDICONNECT ATTRACTED 360 HEALTHCARE COMPANIES AND 9,267 PHYSICIANS IN THE FIRST SIX MONTHS AFTER LAUNCH. NOW, EVERY DOCTOR USES OUR APP AT LEAST FOUR TIMES A MONTH.

MARCH 2024

ISSUE #6

New Drug Approvals

- Filsuvez (birch triterpenes)
  Date of Approval: 12/18/2023
  Treatment for: To treat wounds associated with dystrophic and junctional epidermolysis bullosa

- Fabhalta (iptacopan)
  Date of Approval: 12/5/2023
  Treatment for: To treat paroxysmal nocturnal hemoglobinuria

- Ogsiveo (nirogacestat)
  Date of Approval: 11/27/2023
  Treatment for: To treat adults with progressing desmoid tumors who require systemic treatment

- Zelsuvmi (berdazimer)
  Date of Approval: 1/5/2024
  Treatment for: To treat molluscum contagiosum.

- Exblifep (cefepime, enmetazobactam)
  Date of Approval: 2/22/2024
  Treatment for: To treat complicated urinary tract infections

- Letybo (letibotulinumtoxinA-wlbg)
  Date of Approval: 2/29/2024
  Treatment for: To temporarily improve the appearance of moderate-to-severe glabellar lines

- Wainua (eplontersen)
  Date of Approval: 12/21/2023
  Treatment for: To treat polyneuropathy of hereditary transthyretin-mediated amyloidosis

- Truqap (Rcapivasertib)
  Date of Approval: 11/16/2023
  Treatment for: To treat breast cancer that meets certain disease criteria

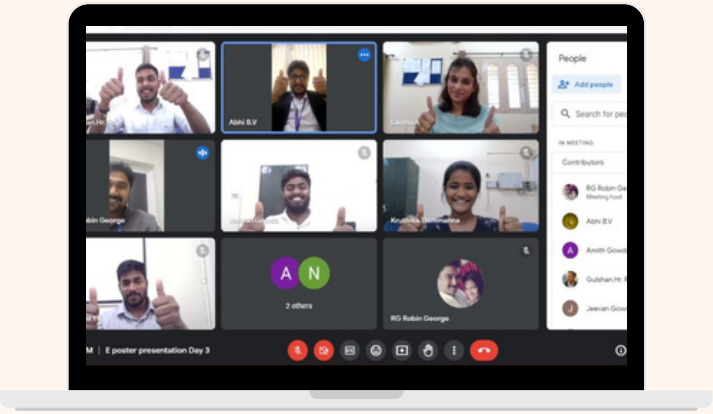
- Ryzneuta (efbemalenograstim alfa-vuxw)
  Date of Approval: 11/16/2023
  Treatment for: To treat neutropenia

DEPARTMENT ACTIVITIES

Patent

Dr. N Raghavendra Naveen has been granted a patent (number **202041040933**) for his innovation on **"SYSTEM FOR ORGANIZING MEDICINE TO MONITOR VITALS AND MANAGE DISEASES".** After a dedicated and rigorous three-and-a-half-year examination process, the patent recognizes the significance and novelty of invention contribution to healthcare. Congratulations on obtaining the grant for the fourth patent

Awards & e-Posters



Congratulations Ms. Likitha A, for Securing Best e-Poster Award 🥇.

We're thrilled to announce that **Manisha S Jain**, a student in the 7th semester of B. Pharm, along with **Srikruthi K S**, have had their paper accepted by **Oral Oncology Reports (Elsevier and Scopus Indexed)**. The paper, titled **"Navigating the Frontier: Comprehensive Insights into CRISPR Technology Advancements, Delivery Strategies, and Ethical Considerations in Cancer Research,"** was guided and supported by Dr. Prakash Goudanavar and Dr. N Raghavendra Naveen from the Department of Pharmaceutics.

DEPARTMENT ACTIVITIES

Publications (Jan & Feb) in Scopus Indexed Journals

Design and Development of Anti-fungal Topical Gel Loaded with Solid Lipid Nanoparticles for Wound Healing

Girish Meravanige[1], Ranjitha B[2], Prakash Goudanavar[2], GSN Koteswara Rao[3], B Nirmala Devi[4], N. Raghavendra Naveen[2,*], Afzal Haq Asif[5], Sree Harsha Nagaraja[6,7], Mohammed Monirul Islam[8], Pavan Kumar Pavagada Sreenivasalu[9], Mallikarjun Telsang[10], Krishna Swaroop Duddi Sreehari[1]

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[10]Department of Surgery, College of Medicine, King Faisal University, Al-Ahsa, SAUDI ARABIA.

ABSTRACT

Background: The topical administration of antifungal drugs by Solid Lipid Nanoparticles (SLNs) has enormous potential. This study aimed to develop a topical 5-flucytosine-loaded SLNs gel to improve the efficacy of the well-known antifungal drug in the treatment of wound healing. **Materials and Methods:** In order to create 5-flucytosine SLNs, a five-level, two-factor Central-composite design was used. Stearic acid and Poloxamer 407 concentrations of surfactants were chosen as independent factors, and particle size and %Entrapment Efficiency (%EE) were chosen as dependent variables. The produced 5-Flucytosine-SLNs were examined using SEM analysis, zeta potential, polydispersity index, and particle size measurements. Additionally, Carbopol 934 was used to incorporate the improved 5-Flucytosine-SLN formula into gel. **Results:** The outcomes demonstrated that 5-Flucytosine-SLNs had colloidal sizes with an essentially spherical shape and no aggregation. 5-Flucytosine-SLNs were discovered to have a particle size of 720.4 nm and an Entrapment Efficiency (EE) of 90.28%. The *in vitro* release, among other assessment criteria, was evaluated for the improved SLN gels. **Conclusion:** The study's conclusions imply that the topical gels made with 5-Flucytosine-loaded SLNs must be effective in the management of wound healing.

Keywords: 5-Flucytosine, Solid lipid nanoparticle, Central-composite design, Topical delivery, Optimization.

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Accepted: 22-10-2023.

INTRODUCTION

The diverse applications of Nanoparticles (NPs) across a range of biological, pharmacological, and medical fields have led to a high level of value in recent years. When seen structurally, they scarcely even approach 100 nm in size. Several drugs, including vaccines, tiny hydrophobic and hydrophilic chemicals, and biological molecules, can be controlled by these NPs.[1] NPs can be utilized as scaffolds for tissue engineering, for targeted medication delivery, and for disease diagnosis, among other things.[2] Nanoparticles (NPs) are frequently used as drug delivery systems, cellular scaffolds, carbon nanotubes, nanofibers, and nanocapsules. In order to successfully deliver a given drug at a precise time and place for maximal efficacy, it is imperative to manage particle size, surface characteristics, and other aspects of NP production as a drug delivery system.[3] In addition to being biocompatible and biodegradable, the NPs used for drug delivery should also have the following characteristics: prompt release, optimal mechanical properties, and ease of production. Surface modification enables the tracking of NPs that are ingested through phagocytosis or the circulatory system and then preserved in the circulatory system.[4]

SLNs are advantageous in many ways, including their low toxicity, ease of incorporation, ability to improve the bioavailability of lipophilic compounds, ability to stop the degradation of

DOI: 10.5530/ijper.58.1.13

Nasal Administration of Dolutegravir Loaded Nanoparticle Based Mucoadhesive *in situ* Gel: Design and *in vivo* Assessment

Nagaraja Sreeharsha[1,2,*], Sandhyanjali Cherukuri[2], Nimbagal Raghavendra Naveen[3], Prakash Goudanavar[3,*], Santosh Fattepur[4], Bandar Aldhubiab[1], Rashed M Almuqbil[1], Anroop B Nair[1]

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[3]Department of Pharmaceutics, Sri Adichunchanagiri College of Pharmacy, Adichunchanagiri University, B.G. Nagar, Karnataka, INDIA.
[4]School of Pharmacy, Management and Science University, Seksyen, Shah Alam, Selangor, MALAYSIA.

ABSTRACT

Background: To assess the potential for targeting the brain through intranasal delivery, this study focuses on optimizing and developing a mucoadhesive *in situ* gel formulation containing Dolutegravir nanoparticles. **Materials and Methods:** Employing a central composite design, the study optimized the concentration of variables of Hydroxypropyl methylcellulose (HPMC, X_1) and Poloxamer 407 (X_2) on the gelation temperature (Y_1) and drug release (Y_2). The optimized drug loaded nanoformulations were assessed for various pharmaceutical features, *in vitro* release and evaluated *in vivo*. **Results:** Both variables significantly impacted the responses ($p<0.05$). The selected formulation displayed beneficial rheological characteristics and prolonged drug release. *In vivo* pharmacokinetic analysis in rats post-intranasal administration of the optimized *in situ* gel demonstrated markedly higher ($p<0.0001$) C_{max} (2-fold) and AUC_{0-t} (3-fold) values in the targeted brain tissue as compared to intravenous administration. Reduced Dolutegravir exposure in the central compartment validates limited absorption with nasal therapy. **Conclusion:** The study affirms the potential of the *in situ* mucoadhesive nasal gel in delivering Dolutegravir to the brain. Thus, the optimized nasal gel emerges as a promising therapeutic alternative for Neuro AIDS by efficiently delivering Dolutegravir to the brain.

Keywords: Dolutegravir, *in situ* gel, Nasal route, Brain, *in vivo*.

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INTRODUCTION

Nasal medicine delivery is one of the most difficult problems that current pharmaceutical scientists must deal with. In comparison to oral drug administration, nasal delivery is significantly more effective and has limited side effects.[1] From a pharmacokinetic standpoint, intranasal administration overcomes the poor absorption in the digestive system, bypasses the blood brain barrier and evades first-pass metabolism, which in turn results in improved bioavailability.[2,3] The nasal route provides direct delivery of actives to the brain via the intranasal pathway and the endothelium membrane is highly permeable with a rich blood supply.[4] In this context, the potential of nanocarriers for brain targeted delivery has been extensively studied in the recent past.[5,6] On the other hand, drug delivery techniques that produce in situ gel by forming a solid or semi-solid depot from a liq formulation have received attention in the last two decade When subjected to physiological circumstances, *in situ* activ gel-forming systems change from a liquid phase to a gel pha *In situ*-gelling liquids have been widely investigated in di brain delivery of therapeutic actives by applying them in nasal cavity.[10] Liquids applied inside the nasal cavity are cap of changing from liquids to gels due to a chemical or phys change brought on by the physiological settings.

The use of poloxamer 407 in developing *in situ* gel has b explored in various studies.[14] Typically, this polymer is a non-i triblock synthetic copolymer that is capable of phase transi when applied to the mucous membrane. Indeed, it posse some distinctive characteristics like mucoadhesion, low toxic tissue sensitivity, controlled drug release and is compatible various pharmaceutical actives and excipients.[15] The combina of poloxamer with Hydroxypropyl Methylcellulose (HPMC) demonstrated its potential as an *in situ* gel in delivering sev drug molecules in various investigations.[14,16,17]

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Navigating the frontier: Comprehensive insights into CRISPR technology advancements, delivery strategies, and ethical considerations in cancer research

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ABSTRACT

This review article provides a thorough exploration of the multifaceted landscape surrounding CRISPR technology, with a specific focus on its evolution from genome editing to therapeutic applications in cancer research. Beginning with an overview of the principles underpinning CRISPR technology, the narrative unfolds to elucidate the intricate cellular pathways influenced by CRISPR. The review delves into the advancements that have propelled CRISPR to the forefront of molecular biology, detailing key elements and formats of the CRISPR/Cas9 system. A critical aspect of this review is the comprehensive analysis of CRISPR delivery strategies, encompassing transfection methods, common strategies, and the obstacles encountered in the process. The discussion extends to the burgeoning field of tumor research modeling using CRISPR, shedding light on its potential applications and challenges. Furthermore, the article explores the application of CRISPR/Cas9 gene editing to overcome cancer-mediated resistance and its potential role in drug delivery. A significant portion of the review is dedicated to the integration of nanotechnology with CRISPR for cancer treatment, discussing nanoparticle systems and their effectiveness in enhancing delivery precision. Addressing concerns related to CRISPR genome editing, the review examines off-target effects and underscores the importance of bioethical considerations in the implementation of CRISPR technology. The synthesis of information across these diverse domains contributes to a holistic understanding of CRISPR's current status, challenges, and promising avenues in cancer research and therapeutics.

1. Introduction

CRISPR, or Clustered Regularly Interspaced Short Palindromic Repeats, refers to concise, repeating DNA sequences present in the genomes of many bacteria. These sequences are interspersed with spacer segments containing distinct genetic codes. Within the genetic makeup of bacteria and archaea, one encounters naturally occurring CRISPR elements. Initially identified as integral components of the prokaryotic immune system, these elements serve as a defense mechanism against viral and plasmid DNA. Equipped with a genetic memory, they empower cells to adeptly recognize and eliminate pathogens. The CRISPR system comprises essential elements (genetic codes) such as CRISPR arrays, CAS proteins, a protospacer adjacent motif (PAM), single guide RNA (sgRNA) and Target DNA Modification [1]. The CRISPR array, a potent genomic editing tool, consists of two main components: a cassette with DNA repeats (21–47 base pairs) interspersed with non-repetitive sequences, and a collection of CAS genes strategically marked by duplicate DNA sequences (repeats) interspersed with variable sequences (spacers) [2].

CAS proteins, coded by operons near the CRISPR sequence, function as nucleases, helicases, polymers, and polynucleotide binding proteins. Acting like scissors, CAS genes, distributed across different CRISPR regions, identify and cut foreign DNA during viral attacks based on information stored in the CRISPR array [3]. The innate CRISPR system involves guide RNA transcribed from the CRISPR array, directing CAS proteins to invading viral or plasmid DNA. The guide RNA includes Tracer RNA as a binding scaffold and crispr RNA (crRNA), a 17–20 nucleotide sequence complementing the target DNA. This dual RNA structure guides CAS proteins to precisely cleave the targeted genetic material.

Adjacent to target DNA in bacterial and archaeal genomes, PAM sequences are crucial for CAS proteins to recognize the target DNA, influencing the specificity of the CRISPR mechanism. The CRISPR

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Original Artic

FORMULATION AND EVALUATION OF SUSTAINED-RELEASE FLOATING MATRIX TABLETS O VALGANCICLOVIR HYDROCHLORIDE

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ABSTRACT

Objective: The present study aimed to formulate and evaluate the formulated sustained-release floating matrix tablets of valganciclo hydrochloride to produce a stable and bioavailable dosage form.

Methods: The tablets were prepared using hydrophilic and hydrophobic polymers such as ethyl cellulose, Hydroxy-propyl methylcellulose (HPM and Povidone. The formulations were subjected to evaluation characteristics such as drug content, hardness, friability, floating lag time, to floating time, and *In vitro* drug dissolution studies.

Results: The formulation composition and method of manufacturing are novel for this particular active moiety and robustness was assessed usin central composite design. All the formulation trials exhibited more than 90% of drug release in 12 h duration, with a floating lag time of more th 11 h, and drug content was found more than 90% across the batches. The hardness and friability profiles were found to be uniform across t batches. The preliminary evaluation confirms the received drug is pure and FTIR results show that the drug and excipients are compatible. T hardness and friability profiles were found consistent across the batches. All the formulation trials of central composite design have shown mo than 90% of drug release in 12 h duration, with a floating lag time of more than 11 h, and drug content was found more than 90% across t batches.

Conclusion: The formulated valganciclovir hydrochloride sustained release floating matrix tablets showed an increased GRT with a sustain release for 12 h, thereby allowing a better window for absorption and consequently improving the drug's therapeutic effect.

Keywords: Gastroprotective, Valganciclovir hydrochloride, AIDS, DOE

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INTRODUCTION

Human cytomegalovirus (CMV) earns its name from the characteristic cytomegalic appearance of intranuclear inclusions in infected cells, an appearance first described in 1881. As a member of the Herpesviridae family, human herpes virus 5 (HHV 5), or CMV, is a double-stranded DNA virus capable of a wide spectrum of diseases in humans [1].

Among many anti-viral drugs, valganciclovir hydrochloride is a potent antiviral agent that has been approved for the treatment of cytomegalovirus diseases like CMV retinitis in patients with acquired immunodeficiency syndrome (AIDS) and for the prevention of cytomegalovirus (CMV) disease in kidney, heart, and kidney-pancreas transplantation. Valganciclovir hydrochloride is the L-monovaline ester of ganciclovir and is a stable prodrug of ganciclovir with improved absorption. Valganciclovir hydrochloride is described in detail in United States patent No. 6,083,953 [2].

Oral administration is the most versatile, convenient, and commonly employed route of drug delivery for systemic action. Indeed, for controlled release systems, the oral route of administration has received more attention and success because gastrointestinal physiology offers more flexibility in dosage form design than other routes [3]. There has been considerable research over the last decade on the possibility of controlled and site-specific delivery to the GIT by controlling the gastrointestinal transit of orally administered dosage forms using gastro retentive drug delivery system (GRDDS). Such GRDDS possess the ability to retain the dosage forms in the contents and remain in the stomach for a prolonged period. preferred as they are economical and have improved patie compliance and they are advantageous for drugs absorbed from t stomach [7]. To formulate a successful gastroprotective drug delive system various technologies developed until now, i.e., high dens (sinking), floating, bio-or mucoadhesive, expandable, super poro hydrogel, magnetic systems, etc [8]. Floating dosage forms may made as tablets or capsules by using appropriate excipients a including gas-generating agents, which give the dosage form buoyan in gastrointestinal fluids [9]. The present study aimed to formulate a evaluate the formulated sustained release floating matrix tablets valganciclovir hydrochloride to produce a stable and bioavailal dosage form.

MATERIALS AND METHODS

Materials

Valganciclovir HCl (99.98% purity), Magnesium stearate, and t were obtained as a gift sample from Strides pharma, Bangalo India. Microcrystalline cellulose, Ethyl cellulose, and Povidone-k were obtained from Stabicon Life Sciences, Bangalore India. Sodi bicarbonate and colloidal silicon dioxide are obtained from Shi Medicare, Dahuspete, India.

Methodology

Melting point evaluation

The melting point of an organic solid can be determin

DEPARTMENT ACTIVITIES

Guest Lecturers

Department of Pharmaceutics and Regulatory Affairs, organized Guest Lecture on **“ Regulatory Affairs - An Overview”** to the 1st M Pharm students 26th Feb 2024, from the eminent Speaker - **Dr Kaushik Devaraju** , Director, Veenaraj Technologies Pvt. Ltd., Bengaluru, Karnataka, India.

Delivered lecture on :

Basics concepts of Regulatory Affairs (Introduction, Objectives, Different Regulatory Authorities)

Guest Lecture on “Medical Devices - An Overview” to the I M Pharm students 27th Feb 2024, from the eminent Speaker - Dr M P Gowrav, Assistant Professor, Department of Pharmaceutics & Regulatory Affairs, JSS College of Pharmacy, JSSAHER, Mysuru, Karnataka, India.

Delivered lecture on

- Basics concepts of Medical Devices & IVDs in US, EU & India
- Approval Process for Medical Devices & IVDs in US, EU & India
- Use of Artificial Intelligence in Medical Devices: Pioneering Tomorrow's Healthcare Today
- Future of AI - Optimized Medical Devices

Guest Lecture on **“Regulatory Affairs - An Overview”** to the I M Pharm students on 1st Feb 2024, from the eminent Speaker - **Dr M P Venkatesh** , Associate Professor, Dept of Pharmaceutics and Regulatory Affairs, JSS College of Pharmacy, JSSAHER, Mysuru, Karnataka, India.

Delivered lecture on

- Basics concepts of Regulatory Affairs (Introduction, Objectives, Different Regulatory Authorities)
- Regarding the collaboration with Biocon Academy and courses under GRA