NCRD'S

STERLING
INSTITUTE OF PHARMACY

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looking to the view ahead brightens

REFLECTION

2024-25

Vission

To be one of the leading institutions in the field of pharmaceutical sciences to cater for the needs of Pharmacy professionals, through excellence in teaching, learning, research and leadership.

Mission

To provide domain-based education and training to be competent healthcare professionals for global citizenship, employment and lifelong learning through value based, professional centric education system and humanistic approach.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Students graduating from NCRD's Sterling Institute of Pharmacy shall be able to:

1.Establish themselves as competent Pharmacy professionals .

2.Be an earnest caretaker of the community.

3.Adapt to dynamics in the field of employement and self-business through sustained learning.

OUR INSPIRATION

Hon. Shri. Dilip Walse Patil

Founder Chairman

National Centre for Rural Development.

Ex-Home Minister,Government of Maharashtra.

TREASURER'S MESSAGE

I hope this message finds you all well and in great spirits. As the College Treasurer, I want to express my heartfelt gratitude for your continued support and enthusiasm for our college magazine.

It is a privilege for me to witness the dedication and effort that each of you has contributed to the success of our magazine. Your creativity, passion, and commitment have made it a true representation of the vibrant, diverse community we have at our college.

I would also like to acknowledge the talented writers, photographers, and artists who have shared their work with us. Your unique perspectives and creative expressions have brought depth and beauty to our publication, showcasing the remarkable talent within our college.

Thank you once again for your unwavering commitment. Let us continue working together to ensure that our college magazine remains a shining example of creativity, knowledge, and inspiration.

Hon. Shri. Avinash Shinde
Treasurer, NCRD

CHIEF ADMINISTRATIVE OFFICER'S MESSAGE

It is with great pleasure that I present a brief overview of NCRD's SIP in this edition of our institutional magazine, "REFLECTION 2023-24."

Extracurricular, co-curricular, and academic activities play a vital role in the overall development of students. This magazine serves as a platform for students to engage in a holistic experience, showcasing their creativity and literary abilities.

I am truly thankful to our dynamic and inspiring management, whose unwavering support, encouragement, and motivation have been instrumental in helping us achieve our goals.

I extend my congratulations to the editorial board for their outstanding efforts in making this endeavor a success.

Hon. Shri. Amarjit Kharade
CAO, NCRD

FROM PRINCIPAL'S DESK

Dear Students, Faculty, and Readers,

It is with great pride and joy that I extend my warmest greetings to you all as we unveil this year's edition of Reflection, our esteemed annual college magazine. This publication stands as a testament to the creativity, intellect, and dedication that define our institution, showcasing the diverse talents and perspectives of our students and faculty.

A college magazine is more than just a collection of articles and images—it is a vibrant platform that captures the spirit of our academic and cultural endeavors. It reflects the aspirations, achievements, and unique voices that make our college community truly exceptional. I am delighted to see how Reflection continues to evolve as a space for meaningful expression, fostering a culture of learning, innovation, and artistic excellence.

I extend my heartfelt appreciation to the editorial team, contributors, and everyone involved in bringing this publication to life. Your hard work, passion, and commitment to excellence have resulted in a magazine that not only informs and inspires but also leaves a lasting impact.

Wishing you all a wonderful reading experience!

Dr. Rupesh Pingale
Principal,
NCRD's Sterling Institute of Pharmacy

FROM EDITORIAL HEAD

It is with great pride and excitement that I present to you this year's edition of Reflection, our annual college magazine. This publication is more than just a collection of words and images—it is a testament to the creativity, intellect, and passion that define our college community.

Behind these pages lies months of dedication, collaboration, and relentless effort from a talented team of writers, editors, designers, and photographers. Each of them has poured their expertise and enthusiasm into crafting a magazine that not only informs and entertains but also inspires. I extend my deepest gratitude to every contributor whose hard work has made this edition possible.

A special thanks goes to our incredible editorial team, whose meticulous attention to detail and commitment to excellence have shaped Reflection into a publication we can all be proud of. Your efforts in curating content, refining narratives, and upholding the highest standards of storytelling have been truly invaluable.

This year's edition of Reflection celebrates the diverse perspectives, experiences, and achievements within our college. It captures the essence of who we are—our aspirations, our challenges, and our triumphs. I hope that as you turn these pages, you find stories that resonate with you, spark new ideas, and deepen your connection to our vibrant community.

As we continue this journey of creativity and expression, let us strive to push the boundaries of thought, innovation, and storytelling. May Reflection serve as a source of inspiration for years to come.

Happy reading!

Dr. Archana Gorle Ingle
Professor, Department of Pharmacognosy
Magazine I/C

FROM CO-EDITOR

As the co-editor of our esteemed college magazine, I am thrilled to announce the upcoming release of our annual publication, Reflection. This edition is a testament to the diverse and remarkable talents within our community, and I am deeply grateful to each of you for your invaluable contributions.

Our magazine serves as a vibrant platform to showcase the creativity, intellect, and achievements of our students, faculty, and staff. It captures the dynamic spirit that defines our institution.

This year's edition promises to be even more engaging and thought-provoking, with a special emphasis on celebrating the unique perspectives and experiences that make our college truly exceptional.

Thank you for being a part of this journey. Your voices, stories, and ideas continue to shape Reflection into something truly meaningful. We look forward to sharing this edition with you and celebrating the essence of our community together.

Dr. Sonali Sonulkar
Associate Professor,
Dept.of P'cal Chemistry

Students editorial

On behalf of the Student Editorial Committee, it is with great pleasure that we present this edition of our college magazine. This magazine is a reflection of the creativity, talent, and diverse perspectives that define our vibrant community. We are incredibly proud of the collaborative effort that has gone into its creation, and it is a testament to the hard work, dedication, and passion of all those involved.

Throughout the pages of this magazine, you will find contributions from students, faculty, and staff that showcase the unique spirit of our institution. Each article, artwork, and photograph highlights the wide range of experiences, talents, and ideas that make our college such a special place. From thought-provoking essays to creative expressions, our magazine is a celebration of the diverse voices and artistic abilities that thrive here.

The process of putting this publication together has been a truly rewarding experience for our editorial team. It has been a journey of collaboration, creativity, and discovery, and we are grateful for the opportunity to bring together the various aspects of our college life in one cohesive publication. We believe this edition will inspire, engage, and connect members of our community, sparking conversations and deepening our shared sense of belonging.

We would like to extend our sincere thanks to everyone who contributed to this magazine. Your efforts, whether through writing, designing, or providing feedback, have made this publication possible. It is your creativity and passion that continue to make this magazine a platform for self-expression and a valuable part of our college's legacy.

We hope you enjoy reading this edition as much as we enjoyed creating it. Together, let us continue to celebrate the exceptional talent, creativity, and spirit that define our college community.

Thank you.

Behind the magazine

Suchitra Elangovan
(Final Year B Pharm)

Sanjana Deshmukh
(Final Year B Pharm)

Vedika Dagadkhair
(TY B Pharm)

Sakshi Tembare
(TY B Pharm)

Parigha Gharat
(TY B Pharm)

Arya Kadam
(SY B Pharm)

Manasvi Gurav
(FY B Pharm)

Samruddhi Kadam
(FY B Pharm)

Inside the Magazine

01. SIP at glance

NCRD's SIP Team
Achievements of SIP
College Activities & Events

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Scientific corner
Creative Corner
College Council Committee
IPA Council Committee

03. Student representatives

Student council
IPA-MSB-SF Representatives

04. Gallery

Art Gallery
Photo Gallery

NCRD's SIP TEAM

Teaching staff

Supporting staff

Our students our Assets

Final Year B. Pharm

Third Year B. Pharm

Our students our Assets

Second Year B Pharm

First Year B Pharm

Our students our Assets

Second Year M Pharm

First Year M Pharm

Our students our Assets

Second Year D Pharm

First Year D Pharm

NCRD's SIP TEAM

Editorial Committee

Council Committee 23-24

NCRD's SIP TEAM

Council Committee 24-25

Teacher's Achievement

- **Dr. Rupesh Pingale and Dr. Archana Ingle received consultancy project titled "Formulation of a Light-Cured Topical Anaesthetic Gel." The project is funded by D Y Patil University, School of Dentistry, Navi Mumbai, with a total funding amount of ₹55,000/-**
- **Dr. Archana Ingle presented the research poster on evaluation of polyherbal Antiacne gel and secured 3rd position at one day National Conference on Role of Interdisciplinary research towards the New development in Pharmaceutical Sciences, held on 27th March 2024 Organized by Ishwar Deshmukh Institute of pharmacy, Digras, Amravati University.**
- **Dr.Archana Ingle guided M.Pharm students for Pharma Avinya 2025, 3rd National level research poster/ oral presentation competition & secured 2nd prize for AMR based herbal gel Formulation.**
- **NCRD's Sterling Institute of Pharmacy (NSS Unit SD-68) Nerul, Navi Mumbai was felicitated by University of Mumbai in association with HDFC Bank for collecting 312 Blood Bags at Thane Railway station (Highest Count During the Blood shortage period- 21st October to 18th November) under Dr.Deepak Pokharkar**

Teacher's Achievement

Patent filed/Published/ Granted

1. **Dr. Archana Gorle Ingle**
   - Herbal Cream for Skin Care
   - Polyherbal Antifungal Nail Lacquer

2. **Dr. Deepak Pokharkar**
   - Analytical HPLC Method For the Estimation of Cyclobenzaprine Hydrochloride in Pure Form
   - Patent granted for Design to Bloom viscosity tester

3. **Dr Gouri Paloskar**
   - Metformin Hydrochloride Transdermal Patch and Method of Preparation Thereof
   - Ex-vivo Study of Formulated Transdermal Patch of Metformin HCl
   - Franz Diffusion Cell for Permeation Studies of Transdermal Dosage Forms
   - Novel formulation for diabetes management through dietary proteins.

4. **Dr. Preeti Chaudhary**
   - Indian Design Patent of Steam Inhaler

5. **Dr. Gitika Dhingra**
   - Device to Discharge Ferrite Nanoparticle Medication

6. **Dr. Pritam Khandave**
   - RP-HPLC Analytical Method for Fixed Dose Combination of Tenelegliptine and Dopagliflozin
   - UK Design patent of organ bath to predict animal tissue activity

Teacher's Achievement

Patent filed/Published/ Granted

7. Dr. Sonali Sonulkar

- An ophthalmic pharmaceutical composition containing Bepotastine
- Herbal Hair Mask Formulation Comprising Rosemarry Oil and Preparation Thereof.

8. Mrs. Neethu R

- Herbal composition comprising *Aristolochia grandiflora* and method of preparation thereof

9. Mrs. Seema Gadge

- Modified Extraction Equipment
- Microreactor for Nanoparticles Synthesis

10. Mrs. Seema Gadge & Mr. Sachin Jadhav

- Polyherbal Powder Drink Formulation Comprising Bramhi, Ashwagandha, Curcumin: Preparation Method

11. Mrs. Kshama Nimse &Mr. Sachin Jadhav

- Antiseptic Phytagel Formulation and Preparation Method Thereof

12. Ms. Pranali B. Bhore

- Reverse Phase-High Performance Liquid Chromatography (HPLC) Method Development and Validation of Thymol

13.Mrs.Vaishali Sorte

- Herbal Peel off mask formulation and preparation method there of

14. Mrs.Iniya Madhan

- Poly Herbal film forming spray formulation and preparation method threre of
- Poly Herbal antifungal gel Formulation and preparation there of

Toppers list

(A.Y. 2023-24)

Sr.no.	Name of student	CGPA
	F.Y.B. PHARMACY	
1.	Miss. Bhagat Tanvi Laxman	9.22
2.	Miss.Patro Ankita Arunkumar	8.96
3	Mr.Patil Sanchit Suresh	8.93
	S.Y.B. PHARMACY	
1.	Mr.Ambekar Suyash Vishwanath	9.41
2	Miss.Chikhale Vaishnavi Sanjay	9.03
3.	Miss. Dhuri Devi Anil	8.95
	T.Y.B. PHARMACY	
1.	Miss. Deshmuka Sanjana Prasad	9.18
2	Miss.Suchitra Elangovan	9.14
3.	Mr.Bodas Darshan Rajendra	8.92
4.	Mr.Kumavat Akash Manojkumar	8.92
	Final Year B.PHARMACY	
1.	Mr.Falak Darpan Rajendra	8.59
2	Miss.Gardi Pranali Sharad	8.51
3.	Miss.Naik Aaliya Mohd.Rafik	8.46

G-PAT Qualifiers

Name of students	All India Rank
Niyatee Thakur	432
Zhill Jain	1004
Aaliya Naik	1152
Palak Behra	1305
Khushbu Pardeshi	2941

F.Y. M.Pharm A.Y. 2023-24
Topper Students

Ms.Pragati Ranmale
SGPA: 9.08

Ms. Harshada Patil
SGPA: 9.08

Our Top Recruiters

TATA CONSULTANCY SERVICES

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Cognizan

MEDLIFE

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ADITYA BIRLA GROUP

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SSV PHYTOPHARMACEUTICALS

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Healthcare

Student's Achievements

Annual Sports day 2023-2024

WINNERS

Box Cricket (Girls)
Riya Shende
Darshana Shinde
Apeksha Chavan
Mahek Momin
Shraddha Ghule
Harsha Thakur
Sanjeevani Mhatre

Throwball (Girls)
Ankita Bagmare
Riya Shende
Darshana Shinde
Siddhi Vaidya
Akshada Gavde
Harsha Thakur
Bhumika Koli

Running Race
(Girls)
Bhumika Koli
(Boys)
Amey Naik

Football (Boys)
Samson Ghamre
Nishant Chopade
Vivek Savalwade
Anant Dhuri
Harsh Mehta
Krishna Singh
Mihir Patil
Bhargav Parmar
Sukaran Khairnar
Akash Solanki

Tennis
(Girls)
Riya Shende
(Boys)
Akash Solanki

Chess
(Girls)
Sanika Anmane
(Boys)
Ruturaj Chavan

Cricket (Boys)
Pratik Kudale
Arham Ansari
Harsh Mehta
Bhavesh Rathod
Vivek Savalwade
Shubham Dabhane
Soham Mhatre
Darshan Bodas
Raviraj Shewale
Amir Ahmed

Volleyball (Boys)
Pranav Dhumal
Pratik Kudale
Vivek Savalwade
Ruturaj Chavan
Soham Mhatre
Suyash Ambekar

Relay Race
(Girls)
Bhumika Koli
Sanika Kadam
Harsha Thakur
Sanika Anmane
(Boys)
Arham Ansari
Lokesh Mahajan
Akash Solanki
Omkar Dudhal

Badminton
(Girls)
Prachi Walkunde
(Boys)
Anant Dhuri

Carrom
(Girls)
Zhill Jain
(Boys)
Pratik Kudale

Shotput
(Girls)
Ankita Bagmare
(Boys)
Soham Mhatre

College Activities

Co-Curricular Activities

National Level Research Poster Presentation and Model Making Competition

NCRD's Sterling Institute of Pharmacy, Nerul, Navi Mumbai has organized 2nd National Level Research Poster presentation on Saturday 3rd February 2024 in association with ASSOCHAM IP Facilitation center and Pharma Litearti. Dr. Mandar Kodgule, Chairman, IQGenexPharma Ltd. Was the Chief Guest for the event along with Hon. Shri. Avinash Shinde Sir (Treasurer, NCRD), Hon. Shri. Ashok Patil Sir (Member, NCRD), Hon. Shri. Amarjit Kharade Sir (CAO, NCRD), Mr. Vijay Shivpuje (Chairman, Patlex Business solution), Dr. Rupesh Pingale (Principal, NCRDSIP).

Winners of Poster Presentation Competition

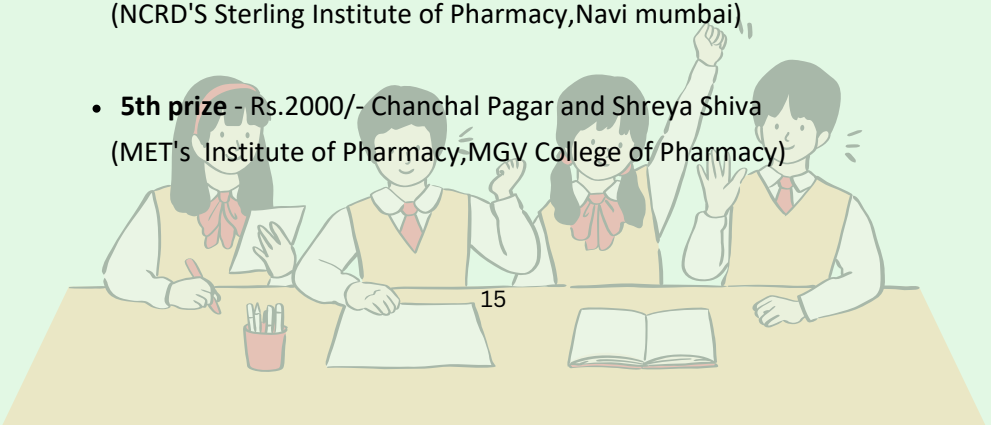
- **1st prize** - Rs 10000/- Thakare Bhavana Ratnakar
  (BVDU Poona College Of Pharmacy)

- **2nd prize** - Rs 7000/- Disha SomnathDighe
  (CU Shah college of Pharmacy SNDT Women's University, Mumbai)

- **3rd prize** - Rs 5000/- Pranita Lodha and Dhanashri Kadam
  (SVKM's Dr,Bhanuben Nanavati College Of Pharmacy,Mumbai)

- **4th prize -** Rs.3000/- Mayuri Gosavi and Pratham Gurav
  (NCRD'S Sterling Institute of Pharmacy,Navi mumbai)

- **5th prize** - Rs.2000/- Chanchal Pagar and Shreya Shiva
  (MET's Institute of Pharmacy,MGV College of Pharmacy)



College Activities

Co-Curricular Activities

8 Consolation Prices Of 1000/- each

- Akanksha Mallesh Soman : VES College of Pharmacy
- Tanvi Arun Pardhi , Kashmira Wagh: Dr. L.H Hiranandani College of Pharmacy, Ulhasnagar
- Nischay Santosh Jangam, Isha Rakesh Jain : Department of Pharmaceutical sciences.
- School of Health Sciences and Technology, Dr.Vishwanath karad MIT World Peace University, Pune.
- Kunde Vishvam, Lokhande Apurva :Dr.D.Y.Patil institute of pharmaceutical sciences and Research.
- Madhuri Sunil Dhure: Yashwantrao Bhonsale College of Pharmacy.
- Vedant Balasaheb Bhor, Snehal Sambhaji Misal Bharati Vidyapeeth's College of pharmacy CBD Belapur.
- Ms. Tanvi Nitish Warde Bombay College of Pharmacy.
- Shweta Rajaram Jadhav and Ashwini Sharad Bhange: Bharati Vidyapeeth College of Pharmacy, Belapur, Navi Mumbai.

College Activities

Co-Curricular Activities

Glipmse of National Level Research Poster Presentation and Model Making Competition

College Activities

Co-Curricular Activities

Glipmse of National Level Research Poster Presentation and Model Making Competition

College Activities

World Environment Day
5th June 2023

Workshop on operation and maintenance of laboratory equipments
24 to 28 July 2023

Seminar on Entrepreneurship skills
2 August 2023

Innovation in pharmaceutics event
7th September 2023

College Activities

Pharmacovigilance awareness week campaign 16th and 18th September 2023

Orientation program: F.Y B. Pharm and F.Y M. Pharm 30th September 2023

Investor awareness program 11th October 2023

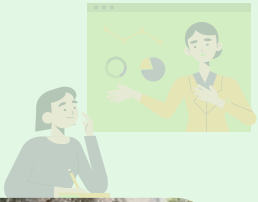
Organ donation awareness program 20th October 2023

College Activities

National Youth Debate competition
12th January 2024

Lecture on personality development, menstrual hygiene and mental health
12th January 2024

Guest lecture on HPV and cervical cancer
11th March 2023



Annual sports meet meet
9th and 10th February 2024

College Activities

Annual day
17 February 2024

Marathi bhasha Divas
2nd March 2024

Teachers Day celebration
5th September 2023

Polio vaccination drive
28 may 2023

College Activities

Dandiya raas
19th October 2023

NSS Special 07 Days Residential Camp 2023-24
at Bhangar Village, Panvel
18th-24th January, 2024

Mangrove cleaning drive at Sarsole jetty and Karave jetty
17th August 2023 and 3rd September 2023

College Activities

Blood Donation Camp at Thane Railway Station 30th October 2023

Ganesh chaturthi celebration 19th September 2023 and 20th September 2023

World pharmacist day celebration

College Activities

Disease awareness on malaria, Dengue Diabetes and Hypertension at Nerul and seawoods railway station
6th March 2024

Volunteering for Annual day at BTF Divyang Center
17th-18th January 2025

The scientific corner

Wound Healing Potential of Traditional Herbal Plants

ABSTRACT

Wounds are inescapable events in life. Wounds may arise due to physical, chemical or microbial agents. Wound healing is a dynamic and normal biological process involving fibroblast activation and migration, re-epithelization, proliferation of endothelial cells, and angiogenesis, which are accompanied by inflammatory response and oxidative reactions in the damaged area. Preparations from traditional medicinal plants are often used for wound healing purposes covering a broad area of different skin related diseases. The enduring popularity of herbal medicines may be explained by the perception that herbs cause minimal unwanted side effects. Herbal medicines in wound management involve disinfection, debridement, and provision of a suitable environment for aiding the natural course of healing. The popularity and evidence of continued use clearly indicates that there are still lessons to be learned from traditional practices. In this review we have tried to give an insight into the different herbal plants having potential wound healing properties which could be beneficial in therapeutic practice.

Keywords: Wounds, Wound healing, Herbal drugs.

INTRODUCTION

Herbal medicines have been the basis of treatment and cure for various diseases and physiological conditions in traditional methods practiced such as Ayurveda, Unani and Siddha. Medicinal components from plants play an important role in conventional as well as western medicine. Plant derived drugs have been a part of the evolution of human, healthcare for thousands of years. A wound may be defined as a break in the epithelial integrity of the skin or may also be defined as a loss or breaking of cellular and anatomic or functional continuity of living tissue (1). Our skin is the key to our survival, sensing the environment, maintaining physicochemical and thermal homeostasis, acting as a reservoir of essential nutrients, providing passive and active defence, and responding to trauma and injury (2).

Wound healing is a complex process, which includes coordination between diverse immunological and biological systems. Normally in an acute wound the process of healing is predictable. It includes the initial inflammation, deposition of collagen and fibroblast, formation of new blood vessels or angiogenesis, contraction of the wound area, and scar remodelling (3). The inflammatory process has direct effects on wound healing. Lipid mediators of inflammation involving wound healing are transforming growth factor-ß and prostaglandin E2 (4). Collagen is the major component that supports the extracellular tissue in wound healing process(5). Research has shown that NO (nitric oxide) has a positive effect on wound healing by accelerating fibroblast migration and collagen deposition in wound tissue (6). Promotion of

antioxidant defense proteins such as heme oxygenase-I and keratinocyte growth factor could have a positive effect on wound healing by protecting the regenerating tissue against oxidant damage (7).

Classification of wounds :

Wounds are classified as open and closed wound on the underlying cause of wound creation and acute and chronic wounds on the basis of physiology of wound healing.

Open wounds: In this case blood escapes the body and bleeding is clearly visible. It is further classified as: Incised wound, Laceration or tear wound, Abrasions or superficial wounds, Puncture wounds, Penetration wounds and gunshot wounds. (8)

Closed wounds: In closed wounds blood escapes the circulatory system but remains in the body. It includes Contusion or bruises, haematomas or blood tumour, Crush injury etc.

Acute wounds: Acute wound is a tissue injury that normally precedes through an orderly and timely reparative process that result in sustained restoration of anatomic and functional integrity.

Acute wounds are usually caused by cuts or surgical incisions and complete the wound healing process within the expected time frame. Chronic wounds: chronic wounds are wounds that have failed to progress through the normal stages of healing and therefore enter a state of pathologic inflammation chronic wounds either require a prolonged time to heal or recur frequently. Local infection, hypoxia, trauma, foreign bodies and systemic problems such as diabetes mellitus, malnutrition, immunodeficiency or medications are the most frequent causes of chronic wounds.(9)

Mechanism of wound healing

The mechanism includes the three phases:
The inflammatory phase
The fibroblastic phase
The remodelling phase

Inflammatory phase starts immediately after the injury that usually last between 24 and 48 hrs and may persist for up to 2 weeks in some cases The inflammatory phase launches the haemostatic mechanisms to immediately stop blood loss from the wound site. Clinically recognizable cardinal sign of inflammation, rubor, calor, tumor, dolor and function-laesa appear as the consequence. This phase is characterized by vasoconstriction and platelet aggregation to induce blood clotting and subsequently vasodilatation and phagocytosis to produce inflammation at the wound site.

The fibroplastic phase The second phase of wound healing is the fibroplastic phase that lasts upto 2 days to 3 weeks after the inflammatory phase. This phase comprises of three steps viz., granulation, contraction and epithelialisation. In the granulation step fibroblasts form a bed of collagen and new capillaries are produced. Fibroblast produces a variety of substances essential for wound repair including glycosaminoglycans and collagen. Under the step of contraction wound edges pull together to reduces the defects in the third step epithelial tissues are formed over the wound site.

The Remodelling phase this phase last for 3 weeks to 2 years. New collagen is formed in this phase. Tissue tensile strength is increased due to intermolecular cross-linking of collagen via vitamin-C dependent hydroxylation. The scar flattens and scar tissues become 80% as strong as the original17, 18. The wound healing activities of plants have since been explored in folklore. Many Ayurvedic herbal plants have a very important role in the process of wound healing. Plants are more potent healers because they promote the repair mechanisms in the natural way. Extensive research has been carried out in the area of wound healing management through medicinal plants. Herbal medicines in wound management involve disinfection, debridement and providing a moist environment to encourage the establishment of the suitable environment for natural healing process.(11)

Wound healing plants

Wound healing is a complex and dynamic process, that depends a lot on the wound-bearing person's immunity, Synthetic medicine may give rise to side effects of allergy and resistance and it is a higher cost of treatment. Whereas alternative and complementary medicine such as Ayurveda, Siddha, Unani, Chinese medicine, and ozone therapy, Ethnomedicinal root drugs can lessen these side effects considerably and offer treatment at lower costs.

1. Herbal plants for wounds healing

Many Herbal plants have a very important role in the process of healing wounds (Vrana). According to Ayurveda, Vrana (wounds or ulcers) is the discontinuation of the lining membrane that after healing leaves a scar for a life closely resembling the modern definition. Herbal drugs are aimed to accelerate the healing process and also to maintain the quality and aesthetics of the healing. Some of the herbal drugs that are mentioned in Herbal texts which have been specifically studied for their wound healing properties are mentioned below.

Series No.	Name of plant	Family	Part Used	Other Information
1	*Aloevera* (Ghritkumari)	Aloaceae	Leaves, latex	It is use for minor wound healing and minor burns.Aloe vera gel can not only increase the amount of collagen in wounds but also change the composition of collagen, increase collagen cross-linking and thereby promote wound healing. The effect produced by aloe vera gel with reference to wound contraction,wound closure, decrease in surface area of wound, tissue regeneration at the wound site, and histopathological characteristic were significant in treated rats. (12)
2	*Azardiracta indica* (Neem)	Meliaceae	Whole plant	Neem oil is collected from ripe fruits of Neem plants mixed with its leaves.This keeps any wounds or lesson free from secondary infections bymicroorganism.The role of these herbal plants extract may have an importance influence on metabolic process and can be reflected in healing.(13)

Series No	Name of plant	Part Used	Family	Other Information
3	*Hyptis suaveolens Linn.* (curry leaf)	Root powder	Lamiaceae	The plant, Hyptis suaveolens Linn. belongs to family Lamiaceae. The extract of Hyptis suaveolens contains steroids, alkaloids, carbohydrates, proteins, flavonoids, tannins, glycosides, leaves of this plant used as stimulant, carminative, sudorific, galactogogue, parasitic cutaneous disease, leaf extracts used as a relief to colic and stomachaches leaves and twigs are acts as anti-rheumatic and anti-suporific bats, anti-inflammatory anti-fertility.The plant continues to use in the treatment of wound (14)
4	*Ocimum kilimandscharicum* (Hoary basil and Camphor basil)	Whole plant	Laminaceae	Ocimum kilimandscharicum, belonging to family Laminaceae. It is an aromatic undershrub with pubscent quadrangular branchlets. It is an indigenous medicine for a variety of ailments like cough, bronchitis, viral infections, anorexia, and also wounds. It contains tannins, flavonoids, proteins and other important constituents. Flavonoids possess antioxidant and free radical scavenging effect, wound healing, antibacterial Property (14)

Series No	Name of plant	Family	Part Used	Other Information
5	*Thespesia populnea Soland* (Bhendi Tree)	Malvaceae	Fruit	T. populnea is a species of flowering plant belonging to themallow family,Malvaceae, which is one of the traditionally used medicines. Several metabolites were found to be present in the alcoholic extract of T. populnea, i.e., saponins, tannins, and phenols. The prepared gel containing T. populnea extract showed antibacterial activity against both E. coli and S. aureus. (14)

CONCLUSION :

We have surveyed and presented an overview of evidence that explains why many medicinal plants are used as traditional treatments for cutaneous wounds and clinical skin disorders. Medicinal plants have been the first line of treatment for trauma, infection, disease, and injury from prehistory. Over millennia, humans have learned to identify and transform the botanical resources from the immediate environment, and with the development of trade, as food and medicine.

In the present comprehensive review, we focused on the herbs as their wound healing potentials. The healing process can be physically monitored byassessing the rateof contraction ofthe wound, periodof epithelisation, tensile strength, histopathology, and weightof granuloma in different wound models. The demand of herbal drugs is increasing day by day in developed as well as developing countries because they are safer and well tolerated as compared to those allopathic drugs. The combination of traditional and modern knowledge can produce novel drugs for wound healing with significantly lowered unwanted side effects.

REFERENCES:

1. Wound healing potential of some medicine plants ,volume -9,issue 1 ,july - august 2011, article -026 , researchgate

2.Wound Healing and the Use of Medicinal Plants ,volume 2019, Article ID 2684108, Evidence based complementary and alternative medicine, Hindawi journal

3.Dat AD, Poon F, Pham KB, Doust J. Aloe Vera for Treating Acute and Chronic Wounds. The Cochrane Library; 2012. [PubMed] [Google Scholar]

4.Su S, Hua Y, Wang Y, et al. Evaluation of the anti-inflammatory and analgesic properties of individual and combined extracts from Commiphora myrrha and Boswellia carterii . J Ethnopharmacol. 2012;139:649–656. [PubMed] [Google Scholar]

5.Doillon CJ, Silver FH. Collagen-based wound dressing: effects of hyaluronic acid and firponectin on wound healing. Biomaterials. 1986; 7:3–8. [PubMed] [Google Scholar]

Dr. Archana Gorle
Professor

TELEMEDICINE-A Digital Paradigm

ABSTRACT:

Attempts are made in understanding drug action and its molecular interaction with multiple target in living cell using computational power as a tool leading to the emergence in Telemedicine (TM).

TM is utilization of communication as a tool to disseminate all types of Pathological and Pharmacological aid to the costumer. This new advancement has made it possible to cut down geographical barriers, need for travel, and managing and improving disease treatment in remote and urban areas through teleconsultancy, teleradiology, telepathology and teledermatology.

Telemedicine not only opens up new therapeutic options but also aims in improving safety, efficacy of drugs along with effective diagnosis and treatment of diseases by creating awareness thus likely to become the core methodology of healthcare delivering in the future. This article highlights the applications of NP and Telemedicine in medical field.

INTRODUCTION:

Telemedicine is “a service that seeks to improve a patient’s health by allowing two-way, real-time interactive communication between the patient and the physician at a remote site,” according to the Centres for Medicare and Medicaid Services (CMS). Though they have similarities, telehealth differ from telemedicine in that the former is defined as “the use of information technology (IT) and communications to enable remote access to health assessment, diagnosis, intervention, consultation, supervision, and information”. Subsequently, telehealth can be seen of as a broader interpretation of telemedicine that encompasses any technology that is used to assemble and send patient health information, including telephones, email, and remote patient monitoring (RPM) devices for the delivery of health tutoring or supplementary healthcare amenity. The quality and accessibility of heed that is offered virtually have remarkably expanded because of technological development over the past few ages. Despite this, the shortage of supportive payment framework and stringent regulatory orders have averted the widespread endorsement of telemedicine

Applications of Network Pharmacology in Pharma Industry and Health Care Systems:

Network uses the combination of basic building blocks like nodes and edges as their connecting linkage which is distinguished by a countable topology characters aiding in defining the relationship with the network tools. Due to the non-random structure of biological networks, network theory refers to them as "scale-free". The idea lies in targeting numerous interconnected systems instead of individual molecules which would result in greater efficacy and fewer side effects. Network pharmacology uses the mixture of Informatics, Data Analysis, Information Technology, online databases, and other media’s to investigate how diseases emerge, develop, and are treated from a biological network perspective

Need of Telemedicine in Healthcare: Due to the need for better care and rising healthcare costs, more hospitals are considering the benefits of telemedicine. They desire improved appraise to healthcare facilities as well as improved interactions between far-off patients and their doctors. Here, telemedicine also promotes better connectivity, which has reduced readmissions to hospitals and increased adherence to treatment programmes by patients. Increased interaction resulting from telemedicine is advantageous for doctor-to-doctor communication. Telemedicine may be used by doctors to establish support networks in order to trade talents and provide better medical care. Online medical care delivery utilizing video chat is known as telemedicine. This technology has numerous advantages for both patients and medical professionals. Despite some technical challenges, telemedicine can enhance and improve the overall patient experience.

Newest India Telemedical Trends: Digital pathology is increasingly being used for standard diagnostics. Faster full-slide picture scanning makes this enhancement possible, but from a high-tech, practical, and budgetary standpoint, it is challenging to deploy on a large scale 23. Telemedicine still occasionally has a direct impact on the medical industry. The two key benefits that this innovation has are medical benefits and value benefits. Telemedicine may be a logical extension of the rise in technical and technological components of community care. Effective telemedicine programmes provide medicinal advantages that are tied to how professionals use the technology. An altered version of a well-known comparison from instructional analysis that was applied to telemedicine, summarises the medical impact of telemedicine. Teleconsultations have increased in frequency despite evidence showing a large decline in the utilisation of primary care for illnesses that are neither COVID-19 or urgent such as long-lasting diseases, during the epidemic. This shows that the main objective of telemedicine has been to manage emergencies. Telehealth interventions enhanced primary care healthcare in sovereign states with already existing legislative structure and favourable national eHealth structures, while also bolstering the citizens health response to COVID-19.

A**pplications of Telehealth:**

Tele-Education: Utilising telecommunications technologies allows for the possibility of distance learning. Additionally, it is very adaptable and interactive. A flexible and interesting lifetime education course that provides additional practical instruction and updates on the latest research for more effective and precise treatment techniques 25.

Distant Consultation: Far away medical service delivery, promotion, and prohibition are all possible with telehealth care. A consultation or follow-up could be used as the format. In order to address the issue of delivering healthcare at sizable Indian conclave, telemedicine has been useful. For instance, the Uttar Pradesh government makes use of mobile telemedicine vans that are outfitted with teleconferencing devices for paralinguistic communication during Maha Kumbhamelas. This makes it possible for medical professionals in far-off places to link to any medical institution that provides telemedicine facility, especially highly specialised ones.

Disaster Management: Both man-made crises like war and rioting as well as natural disasters like earthquakes, tsunamis, and tornadoes may be considerably helped via telemedicine. As the majority of earthbound communication links either do not work well or fail during catastrophe, a mobile, transportable telemedicine device with satellite communication and specialised telemedicine software is suited for relief from calamity.

Tele-Home Healthcare: Using telemedicine technology, patients who are elderly or underprivileged and confined to their homes as a result of chronic diseases may receive in-home treatment. Instead of travelling to remote locations to check on recovering or chronically ill patients, it enables home healthcare practitioners to monitor patients from a central location. Remote patient monitoring is a more affordable and quick replacement.

Assisting People who are Impaired: Telemedicine makes it simpler for patients with disabilities to access services. Other groups now have easier access, including the elderly, the culturally detached, and the incarcerated. Treatment using telemedicine is advantageous for many medical conditions. It is effective when a patient obtains medical attention from a licenced practitioner who fully describes their symptoms. According to certain research, those who use telemedicine supposedly spend little time in the hospital and less money as a result. Additionally, fewer miles travelled could mean less money spent on expenses like petrol 27, 28.

Treatments of School-going Children: treating our rapidly ageing population, telemedicine can be incredibly important. When a student is unwell, they can visit the school infirmary or be picked up by their parents to an emergency care centre, but both options are generally uncomfortable and possibly unnecessary. Innovative schools can work with medical professionals to conduct video tours from the classroom. The person in-charge may choose what has to be done and give parents instructions or assurances. It has also been demonstrated that patients in assisted living homes who have access to doctors on call overnight and on weekends will avoid hospitalization.

Teledentistry: By enabling dentists to acquire images of teeth, dentures, and other dentistry components to assess and transfer to another practitioner for assessment, this technology improves dental treatment. In order to determine whether a certain therapy is necessary, dentists and dental specialists can share records via telemedicine in dentistry. Specialists can help dentists detect problem areas and advise patients on preventative measures to avoid costly and complex procedures. This collaboration helps those in rural or underprivileged locations who might not often have access to medical specialists, just like previous telemedicine apps.

Advantages and Drawbacks of Telemedicine: Telemedicine has many benefits, including reducing geographical barriers and providing healthcare services to rural and remote places; this benefits the populace who stays in remote areas. Additionally, it lowers hurdles imposed on by gap and increases access to first-rate medical treatment. It is especially helpful in emergency and critical care situations, where moving a patient would be undesirable or unfeasible. Thanks to telemedicine, patients and far-off medical professionals can more easily receive expert care and support. Furthermore, it cuts down on needless travelling time for medical staff as well as the cost and/or complexity of patient transfers.

It also narrows the segregation of countryside practitioners by boosting their knowledge through teleeducation or telecontinuing medical tutoring. Age, race, dwelling place, payer, and telehealth use are all extensively varied in the initial phase of the COVID-19 Public Health Emergency. There is requirment of more analysis to better acknowledge the basal reasons of these variances and how they may affect decisions made about policy both during and after the COVID-19 emergency.

Telemedicine consultations have been improved by the “tools” of telemedicine by making them more model-based and factual. Automated otoscopes, stethoscopes, oxygen saturation probes, and blood pressure monitors are some of the examples. In a large country like India, where majority of population lack access to doctors, telemedicine has the ability to truly alter lives since it enables doctors to travel to previously unreachable places. Telemedicine has its problems as well. Many would agree with this but there are still those people who like to visit their doctor. Some reluctance is shown by doctors themselves. Doctors in the state sector usually perceive telemedicine as an additional duty or overloaded. Telemedicine therefore must be incorporated into doctors’ routine tasks. Sometimes doctors are concerned that telemedicine will interfere with their capacity to practise. They must be aware that this advancement increases their onlookers and perceptibility and very certainly will result in future business growth.

Changes Required: The Indian administration modified its telemedicine usage laws in March 2020. The goal of this new public policy is to give the Indian telemedicine sector more direction. As a result of COVID-19, telemedicine is being utilised by more patients and in more medical settings. Before telemedicine is widely adopted in India, access and infrastructural issues must be resolved. Additionally, it is necessary to ensure that there is comprehensive and legally valid law that sets unambiguous substructure for doctor-patient communication to handle concerns of permission, privacy, and utilisation 33. Even if the use of telemedicine is growing, substantial evidence about how telehealth could enhance primary care must be developed, implemented, analysed, and produced in order to expand it and assure its feasibility over the long term34. Embracing integrated information systems, involving shareholders, boosting ability, and closely observing the transition should all increase the implementation of telemedicine. This could assist telemedicine in setting a new standard for the provision of comprehensive medical care 35.

CONCLUSION: There are advantages and disadvantages to everything in our world, and it is important to emphasise those advantages and disadvantages for ongoing development. The goal of network pharmacology is to comprehend diseases on a systemic level and to understand how drugs interact with the body based on the equilibrium theory of biological networks. The restriction of this, on the other hand, is that because of this approach’s linearity, complex disorders cannot be addressed. The main purpose of telemedicine is to give attention and care to the patients same as in-person treatment. Telemedicine on the other hand, can experience significant limitations due to technical issues. Poor internet connectivity or other technological problems can obstruct the flow of medical consultations and keep patients from getting the care they require. Working to close the gaps and doing ongoing research will undoubtedly help Network Pharmacology and Telemedicine establish itself as a new paradigm in the pharmaceutical industry

Dr. Deepak Pokharkar
(Associate Professor)

ANTIBIOTIC RESISTANCE: A Global Challenge In Pharmacology

Introduction:

Antibiotics have been one of the most revolutionary discoveries in modern medicine, saving millions of lives by effectively treating bacterial infections. However, their widespread misuse and overuse have led to a serious global health crisis-antibiotic resistance (ABR). This phenomenon occurs when bacteria evolve mechanisms to resist the effects of antibiotics, making infections harder to treat and increasing the risk of severe illness, prolonged hospital stays, and mortality. The World Health Organization (WHO) has declared antibiotic resistance as one of the top ten global public health threats. Addressing this crisis requires urgent action from healthcare professionals, policymakers, researchers, and the general public.

Understanding Antibiotic Resistance:

Antibiotic resistance develops through natural selection, where bacteria that survive antibiotic exposure pass their resistance genes to future generations. This can occur in two main ways:

1. **Genetic Mutation:** Spontaneous changes in bacterial DNA can render antibiotics ineffective.
2. **Horizontal Gene Transfer**: Bacteria can acquire resistance genes from other bacteria through plasmids, allowing resistance to spread rapidly.

Some well-known antibiotic-resistant bacteria include Methicillin-resistant Staphylococcus aureus (MRSA), Multidrug-resistant Tuberculosis (MDR-TB), and Carbapenem-resistant Enterobacteriaceae (CRE), which pose serious treatment challenges worldwide.

Major Causes of Antibiotic Resistance:

1. Overuse and Misuse of Antibiotics:

Antibiotics are often prescribed unnecessarily for viral infections like the common cold and flu, where they have no effect. Additionally, patients sometimes fail to complete their prescribed course, allowing bacteria to survive and develop resistance.

2. Self-Medication:

In many countries, antibiotics are available over the counter without a prescription. This leads to incorrect dosages, incomplete treatment, and the selection of resistant bacterial strains.

3. Use in Agriculture and Livestock:

The agricultural industry extensively uses antibiotics to promote growth and prevent infections in animals. These resistant bacteria can enter the food chain and infect humans, contributing to the spread of resistance.

4. Poor Infection Control in Healthcare Settings:

Hospitals and clinics serve as breeding grounds for antibiotic-resistant bacteria due to inadequate hygiene practices, overcrowding, and lack of proper sanitation measures.

5. Lack of New Antibiotics:

The development of new antibiotics has significantly slowed in recent years due to high research costs and regulatory hurdles. Many pharmaceutical companies have reduced investment in antibiotic research, worsening the crisis.

Consequences of Antibiotic Resistance:

The impact of antibiotic resistance is profound and far-reaching:

- **Increased Mortality Rates:** Resistant infections are more difficult to treat, leading to higher death rates.
- **Prolonged Illness and Hospital Stays:** Patients with resistant infections require longer hospital stays and more intensive treatments.
- **Higher Medical Costs**: Treating antibiotic-resistant infections involves expensive second-line or third-line drugs, increasing the financial burden on healthcare systems.
- **Failure of Medical Procedures:** Many medical procedures, such as surgeries, chemotherapy, and organ transplants, rely on effective antibiotics. Resistance threatens the success of these treatments.

Strategies to Combat Antibiotic Resistance:

1. Rational Use of Antibiotics: Healthcare providers should prescribe antibiotics only when necessary and ensure that patients complete their prescribed course. Public awareness campaigns can educate people about the dangers of self-medication.

2. Development of New Antibiotics and Alternative Therapies: Investment in research and development (R&D) is crucial for discovering new antibiotics and alternative treatments, such as bacteriophage therapy, antimicrobial peptides, and vaccines.

3. Strengthening Infection Control Measures: Hospitals and clinics must implement strict hygiene protocols, including hand hygiene, sterilization, and isolation of infected patients, to prevent the spread of resistant bacteria.

4. Reducing Agricultural Antibiotic Use: Regulations should be enforced to limit the use of antibiotics in livestock, and alternative strategies like probiotics and vaccines should be explored to maintain animal health.

5. Global Surveillance and Policy Implementation: International cooperation is essential to monitor resistance patterns, share data, and implement policies that control the overuse of antibiotics. Organizations like WHO and the Centers for Disease Control and Prevention (CDC) play a crucial role in coordinating efforts to combat ABR.

Conclusion:

Antibiotic resistance is a growing global health threat that requires immediate action. If left unchecked, we risk entering a post-antibiotic era where common infections become deadly. By promoting rational antibiotic use, investing in new treatments, and enforcing infection control measures, we can slow the spread of resistance and protect future generations. Pharmacologists, researchers, and healthcare professionals must work together to combat this crisis and preserve the effectiveness of antibiotics for years to come.

Dr. Preeti Chaudhary
(Associate Professor)

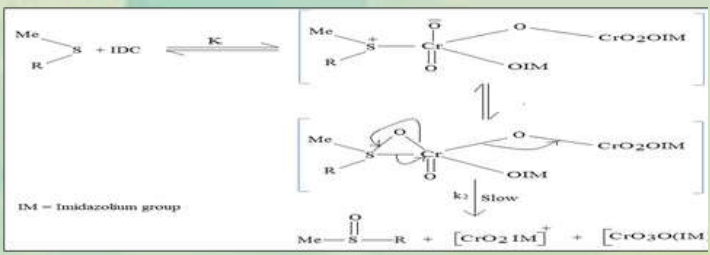
Kinetics and Mechanism of the Oxidation of DL-Methionine by Imidazolium Dichromate

Introduction:

Selective oxidation of organic compounds under non-aqueous conditions is an important reaction in synthetic organic chemistry. For that purpose, anumber of different chromium (VI) derivatives have been reported. One of such compounds is Imidazolium Dichromate (IDC)4. We have been interested in the kinetic and mechanistic aspects of the oxidation by Cr (VI) species and several reports by halochromates and dichromates have already been reported. Itis, known however, that mode of oxidation depends upon the nature of counter-ion attached to the chromium anion. Methionine (Met), a sulphur- containing essential amino acid, is reported to behave differently from other amino acids, towards many oxidants, due to electron-rich sulphur center which is easily oxidisable. There seems to be no report available on the oxidation of methionine by IDC. We report here the kinetics of oxidation of DL-methionine by IDC in dimethylsulphoxide (DMSO) as solvent. A suitable mechanism has also been proposed.

Mechanism:

In view of the absence of any effect of radical scavenger, acrylonitrile, on the reaction rate and recovery of unchanged BHT, it is unlikely that a one-electron oxidation giving riseto free radicals, is operative in this oxidation reaction. The observed Michaelis-Menten type of kinetics observed with respect to methionine, suggests that, there is formation of 1:1 complex of imidazolium dichromate and methionine in a rapid pre-equilibrium asper below Scheme. With present set of data, it is difficult to state the definite nature of the intermediate complex. The experimental results can be accounted for in terms of electrophilic attack of methionine-sulphur at the metal via an intermediate complex. The transfer of unshared pair of electrons to an empty d-orbital of the metal resulted in the formation of a coordinate bond. The formation of intermediate is likely to undergo a further rapid reaction in which the incipient.It is of interest to compare here the mode of oxidation of methionine by pyridinium bromochromate (PBC), morpholinium chlorochromate (MCC), tetrakis(pyridine)silver dichromate (TPSD) and IDC. The oxidation by PBC and MCC presented a similar kinetic picture, i.e. the reactions are of first order with respect to the reductants. While in the oxidation by TPSD and IDC, Michaelis-Menten type kinetics was observed with respect to the reductants.



It is possible that the values of the formation constants for the reductant-PFC/PBC complexes are very low. This resulted in the observation of second-order kinetics. No explanation of the difference is available presently. Solvent effects and the dependence of the hydrogen ions are of similar nature in all these reactions, for which essentially similar mechanisms have been proposed.

Conclusion:

The oxidation of DL-methionine involves a rate-determining electrophilic attack of methionine sulfur at the metal via an intermediate complex. Both deprotonated and protonated forms of IDC are reactive oxidizing species.

Dr.Pritam Prashant Khandave
(Associate Professor)

Effervescent Technology: An Overview on Effervescent Product Benefits and Product Categories in Solid Dosage Forms

Introduction:

Effervescent technology has gained popularity in the pharmaceutical and nutraceutical industries due to its unique advantages over conventional solid dosage forms. Effervescent technology is widely used to create solid dosage forms that rapidly dissolve in water, releasing carbon dioxide and resulting in a fizzy solution. This approach enhances the palatability and absorption of active pharmaceutical ingredients (APIs). This document explores the benefits of effervescent products and their key categories within solid dosage forms.

Key Components:

1. A**cidic Agents**: Commonly used acids include citric acid and tartaric acid. Citric acid is favoured for its high solubility and pleasant taste, while tartaric acid offers a more pronounced tartness.
2. **Alkaline Agents:** Sodium bicarbonate is the primary base used, reacting with the acid to produce carbon dioxide, which facilitates tablet disintegration and creates the characteristic effervescence.

Manufacturing Processes:

Producing effervescent tablets requires careful control of environmental conditions, particularly humidity, to prevent premature reactions between acidic and alkaline components. Maintaining relative humidity below 25% is crucial during production.

Several granulation methods are employed to ensure uniformity and stability:

- **Fluid Bed Spray Granulation:** This technique combines granulation and drying, maintaining low moisture levels to minimize premature effervescence. It allows for efficient drying, resulting in stable granules suitable for compression into tablets.
- **Steam Granulation:** Utilizing steam as a granulating agent, this method offers higher diffusion rates into powders, forming a thin film of water on particles. This film evaporates quickly, yielding dry granules without excessive moisture exposure.
- **TOPO Vacuum Granulation**: Designed for moisture-sensitive components, this patented process involves adding a minimal amount of water during granulation. The reaction between acid and base generates additional water, which is removed by applying vacuum intermittently, ensuring the stability of the effervescent mixture.

Benefits of Effervescent Products :

Effervescent dosage forms offer several advantages that make them a preferred choice for consumers and healthcare professionals. These benefits include:

- Enhanced Absorption and Bioavailability: The dissolution of effervescent tablets or powders in water creates a homogenous solution, leading to faster and more efficient absorption in the gastrointestinal tract.
- Improved Patient Compliance: Effervescent formulations provide a palatable alternative to traditional pills and capsules, making them especially beneficial for individuals who have difficulty swallowing.
- Rapid Onset of Action: Since the active ingredients are already in solution before ingestion, they tend to be absorbed more quickly, resulting in faster therapeutic effects.
- Gastrointestinal Comfort: Effervescent formulations reduce the likelihood of gastric irritation compared to conventional tablets, as they are pre-dissolved before consumption.
- Accurate Dosing and Customization: Effervescent products allow for precise dosing and easy modification of concentrations based on individual needs.
- Enhanced Hydration: Since effervescent products require dissolution in water, they naturally promote hydration, which is particularly beneficial for sports nutrition and electrolyte replacement therapies.

Product Categories in Solid Dosage Forms :

Effervescent technology is incorporated into various pharmaceutical and nutraceutical products, categorized as follows:

1. **Pharmaceutical Effervescent Tablets**: These include medications such as analgesics (e.g., aspirin, paracetamol), antacids, and cold and flu treatments, which leverage rapid dissolution for faster symptom relief.
2. **Nutraceutical and Dietary Supplements:** Effervescent formulations are widely used for vitamins (e.g., Vitamin C, B-complex), minerals (e.g., calcium, magnesium), and herbal extracts to improve taste and absorption.
3. **Electrolyte and Sports Nutrition Products:** Rehydration salts, electrolyte boosters, and sports nutrition supplements use effervescent technology to ensure quick and efficient replenishment of lost fluids and minerals.
4. **Gastrointestinal Health Products**: Effervescent probiotics and digestive enzymes aid in gut health by delivering active ingredients in a form that enhances their survival and effectiveness.
5. **Medical and Functional Beverages**: Some effervescent formulations include functional ingredients such as collagen, antioxidants, and amino acids, which cater to wellness and anti-aging trends.

Conclusion :

Effervescent technology presents a versatile and user-friendly approach to delivering active ingredients in solid dosage forms. With its benefits of improved absorption, better compliance, and rapid action, effervescent products continue to be a preferred choice across pharmaceuticals, nutraceuticals, and sports nutrition industries. As consumer demand for convenient and effective health solutions grows, the application of effervescent formulations is expected to expand further.

Dr. Shweta S. Suman
(Associate Professor)

“Pharmacy Profession in India and my contribution in Future”

Pharmacy is an important profession throughout the globe. It is one of the promising sector which is focused towards benefit of the community. Today India stands third in drug export and there are huge numbers of pharmaceutical industries contributing to it. Our future in pharma sector has tremendous opportunity to bring it to the top most position by 2020, but looking at the other Pharmacy Professions like pharmacy practise, there has not been development to the required extent.

There is a council called PHARMAEXCIL (Pharmaceuticals Export Promotion Council) which is established by Ministry of Commerce and Industry in 2004 . It works mainly for Pharma industry business. This is the reason for such a tremendous development in Pharmaceutical industries but what about the other allied areas of pharmacy profession? We have to first understand that Pharmacy is not only about drug exports and business related to it. There has been a very little progress in the allied areas of this profession. Pharmacy profession was started in US and India in same era but in India it did not progress as rapidly as US. The reason being US got a hold on all the allied areas related to Pharmacy and pharmaceutical sciences which India did not think of.

In India majority of people do not know who a pharmacist is. What are his roles and responsibilities? This situation has arrived because of the system of handling patients, the education pattern and the pharmacist himself.

In reality, role of Pharmacist is not just limited to manufacturing and dispensing medicines but serve as an important part of health care team. Pharmacist is an important link between Doctor and Patient. The responsibilities of pharmacist include dispensing medicine, maintaining Patient history, Patient Counselling, advising Patient regarding their health but unfortunately in India Pharmacist only deals with the prescription and dispensing medications and rest of his responsibilities are taken up by the Physician.

This concludes that there are loop holes in our Pharmacy education system. The content of Pharmacy education is more theoretical. The students are exposed to the practicality only after completing the Pharmacy course. The theoretical knowledge that they get during their course makes them unaware of the work ethics and know-how that are followed when they get into profession. Also lot of people from rural areas of India are totally unaware of pharmacy profession.

I as a budding pharmacist would first work on understanding the loop holes that are to be focused on for bringing up awareness regarding the pharmacy profession.

In this context , I have initiated writing articles in vernacular language about Pharmacy profession. This would definitely help the people understand the ‘pharmacist’ in a better way. It has been two years and I have written and published around thirty five articles regarding Pharmacy profession in BOOKSTRUCK website. There is ample of knowledge regarding Pharmacy available in English which urges us to bring it to the community in regional language making it more understandable. The collection of these articles is now available as application in e book format on Google Play Store under the name “Pharmacy and Your Health” Now I am aiming to publish it as a hard copy to reach every single person. (web.bookstruck.in/book/showid=1258https://play.google.com/store/apps/detailsid=com.marathi.health.arogya)

As a pharmacist I have three goals set up in my mind. As a pharmacy practioner, I would like to bring some important changes in the way the medicines are given to the patients. Currently the classic labels for different formulations do not have space for the instructions to be given by Pharmacist to the patient. Introducing this concept would help in decreasing misuse, self medication and also help to expand the role and significance of Pharmacy Profession. The booming online medication sector has directly affected the retail sales in the Pharmacy and also affected the role of Pharmacist. In case of medication ordered online there is no control over the handling of prescription by registered Pharmacist. To bridge this gap between online sellers and actual Pharmacist, I have developed Software which would help in controlling the distribution of medicines. This will prevent errors in dispensing and will also overcome problems in current online medicine services helping the Pharmacist, Patients, Doctor and online service providers.Regarding my second goal, I have a keen interest in establishing a Non Government Organization (NGO). This NGO will work to make awareness in community regarding diseases and medication. It will bring awareness in people for safe use of medicine and the ways to maintain good health, I would like to take the help from various experts in medical field, Law, Pharmaceutical field and build a very strong team who could work on the set objectives. This particular concept came to my mind when me and my friends created demo videos on harsh effect of smoking, met people and advised them regarding bad effect of smoking. These videos are still available on You tube. (URL Link: https://youtu.be/YGMKLqf1zpE)

Coming to my third and final goal, I wish to contribute to academics by improving the standard of Pharmacy education in India. I strongly feel the need to reconstruction of the syllabus exposing students with more emphasis on Practical aspects of Pharmacy. The syllabus should help students cope up with problems they face when they work as Pharmacist. I will also bring changes in teaching methodologies, I would work to involve use of software, 3D animations simulation models and interactive session for better understanding of concepts, interactive sessions with experts to develop case solving abilities. This would establish a good professional and friendly relation between Pharmacist, Industrial professionals and Doctors. To achieve this I intend to enter into academics and act as interface between Government of India Ministry of Health and family welfare, AICTE (All India Council for Technical Education) and education regulating bodies like PCI (Pharmacy Council of India) and University.

I always believe in ‘BIG MINDS AND BIG IDEAS’ which I feel is a positive way to achieve my goals. Success is achieved when it is well planned and I will definitely put my determined and dedicated effort to fulfil the goals for a better future to my beloved profession of PHARMACY.

Mr.Ashish Karle
(Associate Professor)

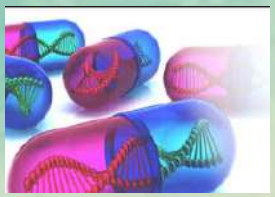
The Future Of Biotechnology Therapies

WHAT DOES THE FUTURE OF BIOTECHNOLOGY THERAPIES LOOK LIKE?

Biotechnology is still a relatively new field with great potential for driving medical progress. Much of that progress is likely to result from advances in personalized medicine. This new treatment paradigm aims to ensure that patients get the therapies best suited to their specific conditions, genetic makeups, and other health characteristics.

For example, a new discipline called pharmacogenomics seeks to determine how a patient's genetic profile affects his/her responses to particular medicines. The goal is to develop tests that will predict which patient genetic profiles are mostly likely to benefit from a given medicine. This model is sometimes called personalized medicine.

Pharmacogenomics has already changed the way clinical trials are conducted: Genetic data is routinely collected so that researchers can determine whether different responses to a test medicine might be explained by genetic factors. The data is kept anonymous to protect patients' privacy. The report explains your diet plan and lifestyle modifications, which are followed by counselling by our experts.

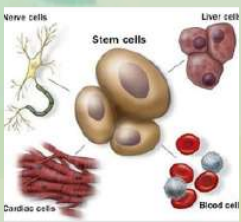


Pharmacogenomics -How Does It Work?

Biotechnology is also revolutionizing the diagnosis of diseases caused by genetic factors. New tests can detect changes in the DNA sequence of genes associated with disease risk and can predict the likelihood that a patient will develop a disease. Early diagnosis is often the key to either preventing disease or slowing disease progress through early treatment.

EMERGING TREATMENTS

1. Gene therapy involves inserting genes into the cells of patients to replace defective genes with new, functional genes. Gene therapy is a biomedical technique that can help treat genetic disorders, which are diseases caused by problems in our DNA. These diseases happen when a gene mutation permanently changes the DNA sequence, resulting in missing or faulty proteins. By restoring the proper function of these proteins, gene therapy can help alleviate the effects of the mutations.



There are several different approaches to gene therapy:

- Replacing a disease-causing gene with a healthy copy of the gene
- Turning off a disease-causing gene that is not functioning properly
- Introducing a new or modified gene into the body to help treat a disease

2. Stem cells are unspecialized cells that can mature into different types of functional cells. Stem cells can be grown in a lab and guided toward the desired cell type and then surgically implanted into patients. The goal is to replace diseased tissue with new,healthy tissue.

Stem cells are the body's raw materials — cells from which all other cells with specialized functions are generated.

Under the right conditions in the body or a laboratory, stem cells divide to form more cells called daughter cells.

These daughter cells become either new stem cells or specialized cells (differentiation) with a more specific function, such as blood cells, brain cells, heart muscle cells or bone cells.

Stem cells: The body's master cells

3. Nanomedicine aims to manipulate molecules and structures on an atomic scale. One example is the experimental use of nanoshells, or metallic lenses, which convert infrared light into heat energy to destroy cancer cells.

In medicine, most interest is in the use of nanoparticles to enhance drug delivery with interest also in in vitro diagnostics, novel biomaterial design, bioimaging, therapies and active implants .

Nano Shells

4. New drug delivery systems include microscopic particles called microspheres with holes just large enough to dispense drugs to their targets. Microsphere therapies are available and being investigated for the treatment of various cancers and diseases.

Microspheres for targeted drug delivery

Microspheres are one of the most explored drug carriers for site-specific delivery of cargoes in a controlled and sustained manner. They are biocompatible, biodegradable, and are capable of surface modifications. A variety of polymers have been explored which can encapsulate drugs with different physicochemical properties. All these properties, together with the different strategies makes them a deserving candidate for targeting to various sites of the body, including lungs, liver, bone, brain, colon, eye, and other malignant tissues in different parts of the body. They are also capable of targeting the macrophages and to cellular organelles like mitochondria.

Looking ahead

The practice of medicine has changed dramatically over the years through pioneering advances in biotechnology research and innovation; and millions of patients worldwide continue to benefit from therapeutics developed by companies that are discovering, developing, and delivering innovative medicines to treat grievous illnesses. As companies continue to develop medicines that address significant unmet needs, future innovations in biotechnology research will bring exciting new advances to help millions more people worldwide.

We will have life-changing, game-changing drugs ... getting to the right patient at the right time'

Mrs Iniya Madhan Kumaar
(Asst professor)

GAMP 5: An Overview of Good Automated Manufacturing Practice

To ensure the safety, quality, and reliability of manufacturing processes, life sciences organizations must adhere to industry-specific regulations and guidelines. This blog explores the key aspects of Good Automated Manufacturing Practice (GAMP 5) and its significance to compliance and automation in the pharmaceutical and life sciences sectors.

Understanding GAMP

GAMP, developed by the International Society for Pharmaceutical Engineering (ISPE), provides guidelines for regulated industries to ensure the proper use of automation and computerized systems in manufacturing processes. GAMP 5 is the latest version of these guidelines, superseding GAMP 4.

Scope and Objectives of GAMP 5

GAMP 5 provides a standardized approach to the qualification and validation of automated systems. Its primary objective is to ensure that computerized systems used in the manufacturing process meet regulatory requirements, maintain data integrity, and consistently produce high-quality products. It covers a wide range of systems, including manufacturing equipment, control systems, laboratory instruments, and software applications.

Key Principles of GAMP 5

The five key principles of GAMP 5 are:

Risk Management: GAMP 5 emphasizes a science based risk management approach to system validation and qualification. It encourages organizations to identify and assess potential risks associated with automated systems, allowing them to effectively allocate resources and prioritize validation activities.

Lifecycle Approach: The framework promotes a lifecycle approach to system development and maintenance. It recognizes that systems evolve over time and advocates for validation activities to be conducted throughout the system's lifecycle, from concept to retirement.

Supplier and Internal Audits: GAMP 5 emphasizes the importance of auditing suppliers and internal processes to ensure compliance and quality. Regular audits help identify gaps and areas for improvement in system development, implementation, and maintenance.

Documentation and Traceability: The guidelines stress the need for comprehensive documentation and traceability throughout the system's lifecycle. Detailed records enable transparency, facilitate audits, and demonstrate compliance with regulatory requirements.

Implementation Challenges of GAMP 5

Implementing GAMP 5 has its challenges. Organizations need to strike a balance between compliance and operational efficiency. The complexity of computerized systems, the need for cross-functional collaboration, and the constant evolution of technology present additional hurdles. However, organizations that embrace GAMP 5 benefit from increased process efficiency, reduced risks, and enhanced regulatory compliance.

Benefits of GAMP 5

Adhering to GAMP 5 guidelines offers several benefits to organizations:

Regulatory Compliance: GAMP 5 aligns with regulatory expectations and helps organizations demonstrate compliance with various regulatory authorities, such as the U.S. Food and Drug Administration (FDA) and the European Medicines Agency (EMA).

Quality and Data Integrity: GAMP 5 ensures that automated systems consistently produce high-quality products while maintaining data integrity, fostering patient safety and trust in the industry.

Risk Mitigation: By adopting a risk-based approach, GAMP 5 helps organizations identify and mitigate potential risks associated with automated systems, minimizing the likelihood of product recalls, safety issues, and regulatory penalties.

Improved Efficiency: The lifecycle approach and emphasis on change management in GAMP 5 lead to more efficient system development, implementation, and maintenance. This result in reduced downtime, enhanced productivity, and decreased costs.

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Advancement in AI-Driven Drug Discovery and Personalized Medicine

The intersection of artificial intelligence (AI) and drug discovery has rapidly transformed pharmaceutical research in recent years. AI-driven tools, such as machine learning (ML) and deep learning (DL), are enabling scientists to analyze vast amounts of data, identify drug candidates, predict their effectiveness, and personalize treatment strategies. This trend holds significant promise for improving the efficiency, cost-effectiveness, and precision of drug development and healthcare.

Artificial intelligence (AI) is revolutionizing drug discovery by enabling researchers to analyze vast datasets, identify potential drug candidates, predict their effectiveness, and personalize treatment strategies. AI-driven tools, such as
machine learning (ML) and deep learning (DL), have significantly improved the efficiency, cost-effectiveness, and precision of drug development and healthcare. In recent years, AI models have been applied to screen massive chemical libraries, identifying drug candidates faster than traditional methods. For example, AI systems are trained on various types of biological data, including genetic, proteomic, and clinical data, to predict how specific compounds will interact with targets involved in disease pathways. One notable breakthrough in this area is DeepMind's AlphaFold, an AI system that predicts protein folding, thereby enhancing drug design by providing a more accurate understanding of how proteins function and how diseases are triggered at the molecular level. AI also plays a crucial role in predicting adverse drug reactions (ADRs) and drug-drug interactions, which has important implications for improving the safety
profile of newly developed drugs before they enter clinical trials. Researchers utilize AI to identify patterns in large clinical datasets that would be difficult to uncover through traditional research methods, thus enhancing drug safety and
efficacy. Personalized medicine and targeted therapies are another
significant area where AI is making a substantial impact. By analyzing an individual's genetic profile, health data, and lifestyle, AI systems can recommend customized therapeutic strategies that are more likely to be effective, thereby
minimizing side effects.

AI tools are also employed in pharmacogenomics, where genetic testing predicts how a patient will respond to specific drugs, leading to more effective and individualized treatment plans. In clinical trials, AI is optimizing the process by helping researchers identify suitable candidates, reduce the time required for trials, and predict patient outcomes. AI-powered analytics improve the design of
clinical trials, ensuring they are more efficient and reflective of real-world patient populations. Additionally, the integration of AI with other cutting-edge technologies, such as gene editing tools (e.g., CRISPR-Cas9), 3D bioprinting,
and nanotechnology, is amplifying its impact on drug discovery. AI optimizes gene-editing targets, predicts the effects of genetic modifications, and assists in designing precision-based 3D models for tissue regeneration and testing.

Recent breakthroughs in AI-driven drug discovery further llustrate its potential. For instance, Exscientia, a UK-based AI-driven drug discovery company, recently designed the world's first AI-created drug to enter human clinical trials, targeting an enzyme involved in cancer. This drug was developed in a record time of 12 months, demonstrating the immense potential of AI in accelerating the drug discovery process. During the COVID-19 pandemic, AI research platforms like BenevolentAI played a crucial role in identifying potential existing drugs that could be repurposed for COVID-19 treatment. AI systems analyzed thousands of compounds and found promising candidates in an expedited manner, showcasing the adaptability of AI in addressing urgent public health crises. Additionally, AI is being used to predict cancer treatment responses by analyzing medical imaging and genomic data, allowing oncologists to recommend more personalized and effective treatments for cancer patients.However, the transformative potential of AI in drug discovery and personalized medicine comes with several challenges. Ensuring patient data privacy is critical when using large datasets, particularly in personalized
medicine. AI systems must avoid biases that could be perpetuated if they are trained on non-representative data, which is a significant concern in medicine, where healthcare disparities could be amplified. Developing regulatory frameworks to govern the use of AI in healthcare is essential to ensure safety, efficacy, and ethical standards are maintained. Ethical considerations, such as data ownership, informed consent, and transparency in AI decision-making
processes, must also be addressed. Successful implementation of AI in drug discovery requires interdisciplinary collaboration between AI experts,
biologists, chemists, and clinicians to ensure that AI solutions are scientifically sound and clinically relevant. Overall, AI-driven advancements in drug discovery and personalized medicine are revolutionizing the pharmaceutical industry. By significantly shortening drug development timelines, optimizing clinical trials, and tailoring treatments to individual patients, AI is enhancing
the precision and effectiveness of healthcare. Overcoming challenges related to data privacy, model bias, and regulatory frameworks will be crucial in realizing the full potential of these technologies in clinical settings. This
trend underscores the growing importance of interdisciplinary research between AI, medicine, and biology
Recent breakthroughs in AI-driven drug discovery further illustrate its potential. For instance, Exscientia, a UK-based AI-driven drug discovery company, recently designed the world's first AI-created drug to enter human clinical trials, targeting an enzyme involved in cancer. This drug was developed in a record time of 12 months, demonstrating the immense potential of AI in accelerating the drug discovery process. During the COVID-19 pandemic, AI research platforms like BenevolentAI played a crucial role in identifying potential existing drugs that could be repurposed
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AI systems must avoid biases that could be perpetuated if they are trained on non-representative data, which is a significant concern in medicine, where healthcare disparities could be amplified. Developing regulatory frameworks to govern the use of AI in healthcare is essential to ensure safety, efficacy, and ethical standards are maintained. Ethical considerations, such as data ownership, informed consent, and transparency in AI decision-making processes, must also be addressed. Successful implementation of AI in drug discovery requires interdisciplinary collaboration between AI experts, biologists, chemists, and clinicians to ensure that AI solutions are scientifically sound and clinically relevant. Overall, AI-driven advancements in drug discovery and personalized medicine are revolutionizing the pharmaceutical industry. By significantly shortening drug development timelines, optimizing clinical trials, and tailoring treatments

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Nano Formulation :New Way To Improve Formulation Nano Formulation ,New Way To Improve Formulation

Nano-formulations of medicinal drugs have gained significant interest for targeted drug delivery, enhancing conventional drugs' properties. Key nano-
formulations include dendrimers, polymeric nanoparticles, liposomes, nano-emulsions, and micelles. Various synthesis methods are available, with the choice
depending on factors such as particle size, drug properties, and target site.

INTRODUCTION

Nanotechnology enables targeted drug delivery with enhanced efficacy, reduced doses, and minimized side effects.

Nanoparticles, ranging from 1 to 1000 nanometers, are optimal for altering drug properties like reactivity, strength, and in vivo behavior .

Applications includes cancer therapy and other fields requiring precise drug delivery.

DRUG DELIVERY SYSTEMS

1. Liposomes

Composed of phospholipid bilayers, they can encapsulate both hydrophilic and lipophilic drugs.Types include multilamellar vesicles, small unilamellar
vesicles, and large unilamellar vesicles

2. Dendrimers

This are highly branched polymeric structures used to encapsulate or attach drugs. Suitable for drug and gene delivery due to their customizable size and
functionality.

3.Solid Lipid Nanoparticles (SLN) SLN formed from solid lipids stabilized by surfactants or polymers and offers physical integrity, controlled drug release, and chemical stability.

4.Polymeric Micelles: Polymeric micelles are self-assembling structures
with hydrophobic cores and hydrophilic shells. And useful for delivering poorly soluble drugs with high stability.

How do they work?

Nanocarriers: Drugs are incorporated nano carriers, such as liposomes, micelles, or nanoparticles.

Targeted delivery: Nanocarriers can deliver drugs to specific sites in the body.

Controlled release: Nanocarriers can control the rate at which drugs are released

Advantages of Nanotechnology in Drug Delivery

1) Improved drug targeting to the specific cells, such as cancer cells and controlled release at specific sites.

2) Reduction in unwanted side effects.

3) It has enhanced stability and bioavailability of drugs.

4) Nanoparticles can be stable for long time means it has long shelf life.

Challenges and Future Perspectives

1. The collaborative research acrossdisciplines is essential for advancing clinical applications.
2. The technology is dynamic and evolving.
3. Developing and scaling up nanotechnology is expensive and complex.
4. The regulatory framework for nanotechnology is still developing, and regulations need to be updated as the industry grows.
5. Nanotechnology can be used to create green products and processes.
6. Nanotechnology can be combined with biotechnology to manipulate matter at the nanoscale for biological applications. For example, nano biotechnology could be used to create organs, deliver cancer drugs, and detect metabolites.

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Emerging Technologies in Medicine Production: Transforming Pharmaceutical Manufacturing and Drug Delivery

Abstract:
Advancements in pharmaceutical manufacturing and drug delivery systems are revolutionizing medicine production, making it more efficient, scalable, and tailored to patient needs. Emerging technologies, such as 3D printing, nanotechnology, gene therapy, bioprinting, and continuous manufacturing, are reshaping the way medicines are developed, produced, and delivered. These innovations not only improve drug efficacy, safety, and precision but also address the challenges of conventional drug manufacturing processes. This article reviews the impact of these emerging technologies on the pharmaceutical industry, their applications in drug production, and the future potential they hold in transforming medicine manufacturing and delivery.

Introduction:
The pharmaceutical industry has long relied on traditional manufacturing methods, including batch production and tablet compression techniques, to produce medications. While these methods have been effective, they face significant limitations in terms of scalability, flexibility, and the ability to meet the growing demand for personalized treatments. As the complexity of modern medicine increases, there is an increasing need for innovative approaches to pharmaceutical manufacturing and drug delivery. Emerging technologies are playing a pivotal role in addressing these challenges, enabling the production of medicines that are not only more effective but also tailored to the unique needs of individual patients.

Emerging Technologies in Pharmaceutical Manufacturing :

- **3D Printing (Additive Manufacturing) :** 3D printing, also known as additive manufacturing, has gained significant traction in pharmaceutical manufacturing due to its ability to produce highly customized drug formulations with precise control over dosage, release profiles, and shape. With 3D printing, manufacturers can create tablets, capsules, and drug delivery devices that are designed to release drugs in specific locations within the body, improve patient adherence, and enhance therapeutic outcomes.

  Applications of 3D printing in medicine production include:

1. **Personalized Drug Dosing:** 3D printing allows for the production of individualized drug doses tailored to a patient's specific medical needs, such as children or geriatric patients, where traditional dosage forms may not be appropriate.
2. **Controlled Release Systems:** 3D-printed tablets can incorporate multiple drug layers to provide controlled or sustained release, reducing the need for frequent dosing.
3. **Polypill Design:** Complex multi-drug formulations, known as polypills, can be printed with multiple drugs in a single dosage form, simplifying treatment regimens for chronic disease management.

- **Nanotechnology**: Nanotechnology involves the manipulation of materials at the nanoscale to create novel drug delivery systems with enhanced bioavailability, stability, and targeted delivery. Nanoparticles, liposomes, and nanocarriers can be engineered to transport drugs to specific sites within the body, thereby improving drug efficacy while minimizing side effects.

  Key applications of nanotechnology in medicine production include:

1. **Targeted Drug Delivery:** Nanoparticles can be designed to target specific tissues or cells, such as cancer cells, using surface modifications or ligand-receptor interactions. This targeted delivery enhances the drug's therapeutic effect and reduces damage to healthy tissues.
2. **Nanoparticle-based Vaccines:** Nanotechnology plays a significant role in the development of nanoparticle-based vaccines, enhancing the stability, immunogenicity, and delivery of antigens to the immune system.

- **Continuous Manufacturing:** Continuous manufacturing (CM) represents a shift from traditional batch processing to a continuous, flow-based production process. CM offers significant advantages over batch production, including increased efficiency, lower production costs, and better product quality control.

Advantages of continuous manufacturing include:

1. **Faster Production Times:** Continuous production reduces manufacturing time, leading to quicker drug availability and supply.
2. **Enhanced Quality Control:** Continuous monitoring and control of the production process allow for real-time adjustments, ensuring consistent quality and minimizing defects in the final product.
3. **Scalability:** CM is highly scalable, making it suitable for both small-batch and large-scale production without compromising efficiency or quality.

- **Bioprinting**: Bioprinting is an emerging field that combines 3D printing with biological materials to create tissues, organs, and drug delivery systems. While still in its early stages, bioprinting holds the potential to revolutionize both pharmaceutical production and personalized medicine.

Applications of bioprinting in medicine production include:

1. **Organ and Tissue Engineering:** Bioprinting could enable the creation of complex tissues or even whole organs for transplantation, reducing dependence on organ donors and offering new possibilities for regenerative medicine.
2. **Personalized Drug Testing:** By bioprinting patient-specific tissues, researchers can create more accurate in vitro models for drug testing, allowing for personalized drug development and the evaluation of drug responses before clinical trials.
3. **Targeted Drug Delivery:** Bioprinted drug delivery systems could be used to release therapeutics directly to specific areas of the body, improving treatment outcomes and reducing systemic side effects.

Innovations in Drug Delivery Systems :

- Smart Drug Delivery Systems: Smart drug delivery systems are engineered to respond to specific biological stimuli, such as pH, temperature, or enzyme activity, ensuring the controlled release of a drug at the right time and place. These systems offer significant advantages in terms of precision and efficiency, particularly for chronic conditions that require long-term treatment.
- pH-sensitive Delivery: Drugs can be encapsulated in materials that release the drug when exposed to a specific pH, such as the acidic environment of the stomach or the neutral pH of the intestine.
- Thermo-sensitive Delivery: Smart drug delivery systems can be designed to release drugs when the temperature changes, which could be useful for localized treatments, such as during inflammation or infections.
- Enzyme-responsive Delivery: Enzyme-sensitive drug delivery systems are being developed to release therapeutic agents in response to specific enzymes found in disease tissues, such as cancerous tumors.

- **Gene and Cell Therapy:** Gene therapy involves the delivery of genetic material to correct defective genes or introduce new genetic information into cells. Cell therapy uses live cells as a therapeutic tool, such as stem cells or engineered immune cells. Both approaches are at the forefront of personalized medicine and have the potential to treat genetic disorders, cancers, and other diseases that are difficult to treat with conventional drugs.

1. **Gene Editing Technologies:** Technologies like CRISPR-Cas9 enable precise genetic modifications, offering the possibility of treating hereditary diseases at their genetic root.
2. **CAR-T Cell Therapy:** Chimeric Antigen Receptor T-cell (CAR-T) therapy has shown promise in cancer treatment, where T-cells are genetically engineered to target and attack cancer cells.
3. **Exosome-Based Drug Delivery**: Exosomes are naturally occurring nanoparticles that can be engineered to deliver therapeutic genes or drugs to specific cells, providing a less invasive alternative to traditional drug delivery methods.

Challenges and Future Outlook:

Despite the significant potential of these emerging technologies, several challenges remain, including regulatory hurdles, production scalability, and safety concerns. The integration of novel drug delivery systems into clinical practice requires extensive testing, clinical trials, and approval from regulatory bodies such as the FDA and EMA.

In the future, the convergence of multiple technologies—such as nanotechnology, 3D printing, and gene therapy—could lead to even more advanced, personalized, and effective treatments. The continuous evolution of these technologies will likely lead to more affordable and accessible medicines, improving patient outcomes and transforming the pharmaceutical landscape.

Conclusion :

Emerging technologies in pharmaceutical manufacturing and drug delivery are reshaping the way medicines are produced and administered. With innovations such as 3D printing, nanotechnology, continuous manufacturing, and gene therapy, the pharmaceutical industry is moving toward more efficient, personalized, and targeted therapies. While challenges remain, the continued development and integration of these technologies hold the potential to significantly transform the landscape of medicine production, leading to more effective and tailored treatments for patients worldwide.

References:

- Bártolo, P. J., & Santos, D. (2021). 3D printing in the pharmaceutical field: A review. Pharmaceutical Research, 38(10), 1421–1437.
- Zhang, L., & Zhang, F. (2018). Nanotechnology in drug delivery. Nature Reviews Drug Discovery, 17(8), 480–497.
- Blanck, T. J., & van der Stelt, M. (2020). Continuous pharmaceutical manufacturing: A review of opportunities and challenges. International Journal of Pharmaceutics, 584, 119430.
- Singh, A., & Sharma, V. (2020). Gene and cell therapy: Current status and future directions. Pharmacological Reports, 72(4), 888-896.

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Innovation in Pharmacogenomics: Shaping the Future of Personalized Medicine

Abstract:
Pharmacogenomics, the study of how genetic variations influence individual responses to drugs, is a rapidly advancing field that promises to revolutionize personalized medicine. By integrating genomic data with pharmacological knowledge, pharmacogenomics allows for the optimization of drug therapies, enhancing efficacy, minimizing adverse drug reactions, and promoting better patient outcomes. This article reviews recent innovations in pharmacogenomics, including the development of next-generation sequencing (NGS), the incorporation of pharmacogenomic data into clinical practice, and the emerging role of artificial intelligence (AI) and big data in predicting drug responses. The article also highlights the challenges in implementing pharmacogenomics on a broad scale, with a focus on ethical, clinical, and technological barriers. Ultimately, the article discusses the transformative potential of pharmacogenomics in shaping the future of individualized drug therapy.

Introduction:
Pharmacogenomics represents a convergence of pharmacology and genomics aimed at understanding how genetic variations affect drug efficacy and toxicity. The ultimate goal is to tailor drug treatments to the individual genetic profile of each patient, thereby maximizing therapeutic benefits while minimizing harmful side effects. With the advent of high-throughput genomic technologies and the increased understanding of genetic variation, pharmacogenomics has become an essential component of personalized medicine. Recent innovations have advanced pharmacogenomics, offering new opportunities for optimizing drug therapy, enhancing patient care, and improving health outcomes.

Key Innovations in Pharmacogenomics:

- **Next-Generation Sequencing (NGS):** One of the most significant innovations in pharmacogenomics is the advent of next-generation sequencing (NGS). NGS technologies have dramatically increased the speed and reduced the cost of sequencing the human genome, allowing for a more comprehensive understanding of genetic variations that affect drug metabolism, efficacy, and toxicity. The large-scale identification of genetic variants has facilitated the creation of pharmacogenomic databases that link specific genetic markers to drug responses, laying the groundwork for precision medicine.

1. **Whole Genome Sequencing (WGS):** WGS enables the identification of a wide array of genetic variations, including single nucleotide polymorphisms (SNPs), insertions, deletions, and copy number variations, that may influence drug metabolism. This data can be used to predict drug responses and guide treatment decisions.
2. **Targeted Sequencing:** Targeted sequencing technologies focus on specific genes or pathways involved in drug response, such as cytochrome P450 enzymes (CYP450) involved in drug metabolism. This approach offers a more cost-effective way of obtaining clinically relevant genetic information.

Integration of Pharmacogenomic Data into Clinical Practice: The integration of pharmacogenomics into clinical practice has been a transformative development in the field of medicine. By incorporating genetic testing into routine clinical care, healthcare providers can make more informed decisions about drug prescriptions, minimizing the trial-and-error approach that has traditionally been used to find the most effective treatment for patients

Clinical Decision Support Systems (CDSS): These systems integrate pharmacogenomic data with patient-specific clinical data to provide real-time, actionable insights for clinicians. For example, a CDSS may alert a healthcare provider when a prescribed drug interacts with a patient's genetic profile, potentially leading to adverse effects or reduced efficacy.

1. **Pharmacogenomic Testing Panels:** Commercially available pharmacogenomic testing panels, such as those for cancer therapies or cardiovascular drugs, help clinicians quickly assess a patient's genetic makeup and guide drug selection based on genotype. For example, the FDA-approved gene panel for warfarin dosing enables clinicians to adjust doses based on variations in genes like VKORC1 and CYP2C9, improving safety and efficacy.

- **Artificial Intelligence (AI) and Machine Learning (ML) in Pharmacogenomics:** AI and machine learning (ML) are poised to revolutionize the field of pharmacogenomics by analyzing vast datasets of genomic, clinical, and pharmacological information to predict drug responses more accurately. These technologies can identify complex patterns in large datasets that may be difficult for human researchers to detect, enhancing the ability to predict adverse drug reactions and therapeutic outcomes.

1. **AI-Driven Drug Response Prediction:** Machine learning models are being trained to predict how different genetic variations will affect an individual's response to specific drugs. By incorporating data from genomic studies, clinical trials, and electronic health records, AI can provide insights into optimal drug choices and dosing for individual patients.
2. **Personalized Drug Development:** AI is also being used to aid in the design of new drugs tailored to genetic profiles. By analyzing genomic data, AI can predict which drug candidates are most likely to be effective in specific populations, potentially accelerating the drug development process and reducing costs.

- **Pharmacogenomic Databases and Big Data Analytics:** The development of pharmacogenomic databases has been a critical advancement in the field, providing a comprehensive repository of genetic variants linked to drug responses. These databases, including publicly available resources such as PharmGKB and ClinVar, allow researchers and clinicians to identify genetic markers associated with drug efficacy and toxicity.

1. **PharmGKB:** The Pharmacogenomics Knowledge Base (PharmGKB) is one of the largest public resources for pharmacogenomic data, containing information on the relationships between genetic variation and drug responses. The integration of PharmGKB into clinical decision support tools has helped to standardize pharmacogenomic testing and promote its use in clinical practice.
2. Big Data in Pharmacogenomics: Big data analytics enable the integration of large- scale genomic data with clinical and environmental information to better understand how genetics influence drug responses. By analyzing this data, researchers can identify new genetic variants and biomarkers that may influence drug efficacy, leading to the development of more personalized treatments.
3. Challenges in Pharmacogenomics Innovation:
4. Despite the remarkable progress in pharmacogenomics, several challenges remain in its widespread implementation:
5. Data Standardization and Interpretation: The interpretation of genetic variants is still an evolving science, and there is no universal standard for assessing the clinical significance of all genetic variants. Ensuring consistency in the interpretation of genetic test results is essential for their clinical use.
6. Regulatory and Ethical Issues: As pharmacogenomic data becomes integrated into routine clinical practice, issues related to data privacy, informed consent, and genetic discrimination need to be addressed. Furthermore, regulatory agencies such as the FDA must establish clear guidelines for the approval and use of pharmacogenomic tests.

- **Cost and Access:** While NGS and pharmacogenomic testing have become more affordable, they may still be out of reach for many patients, particularly in low-resource settings. Widespread adoption of pharmacogenomics will require addressing these barriers to ensure equitable access to personalized medicine.

Future Directions:

The future of pharmacogenomics is bright, with several promising developments on the horizon:

- **Pharmacogenomics in Oncology:** Cancer therapies are increasingly being tailored based on the genetic profiles of both the patient and the tumor. Precision oncology, driven by pharmacogenomics, is expected to provide more effective, individualized treatment options with fewer side effects.
- **Gene Editing and Pharmacogenomics:** With the advent of CRISPR and other gene-editing technologies, it may be possible to correct genetic mutations that affect drug metabolism or response, providing a novel therapeutic approach for genetic disorders.
- **Global Pharmacogenomic Initiatives:** Efforts to create global pharmacogenomic databases that incorporate diverse populations are crucial for understanding how genetic variations impact drug responses across different ethnicities. Such databases will facilitate the development of more inclusive and effective pharmacogenomic strategies.

Conclusion: Pharmacogenomics is transforming the landscape of medicine by enabling the development of personalized treatments tailored to an individual's genetic makeup. Innovations in genomic technologies, clinical integration, AI, and big data analytics are rapidly advancing the field, bringing us closer to the realization of precision medicine. While challenges remain, the potential of pharmacogenomics to improve patient outcomes, reduce adverse drug reactions, and optimize drug efficacy holds immense promise for the future of healthcare.

References: Relling, M. V., & Evans, W. E. (2015). Pharmacogenomics in the clinic. Nature, 526(7573), 343-350. Johnson, J. A., & Cavallari, L. H. (2013). Pharmacogenetics and cardiovascular drugs. Circulation Research, 114(4), 538-553. Ruzzo, E. K., & Santoro, M. (2020). The role of pharmacogenomics in personalized medicine: Recent advances and future prospects. Pharmacogenomics, 21(6), 389-400. Tyndale, R. F., & Smith, M. R. (2018). Pharmacogenetics and precision medicine. Lancet, 391(10123), 1739-1745.

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Artificial Intelligence in Pharmacovigilance : Transforming Drug Safety Monitoring

Introduction

Pharmacovigilance (PV) is the science and activities related to the detection, assessment, understanding, and prevention of adverse effects or any other drug-related problems. Ensuring the safety of pharmaceutical products is paramount, and traditional PV methods often involve manual processes that can be time-consuming and prone to human error. The integration of Artificial Intelligence (AI) into PV is revolutionizing the field by enhancing the efficiency, accuracy, and scope of drug safety monitoring.

The Role of AI in Pharmacovigilance

AI encompasses a range of technologies, including machine learning (ML), natural language processing (NLP), and deep learning, which can be leveraged to improve various aspects of PV.

1. Adverse Event Detection

Traditionally, adverse drug reactions (ADRs) are identified through spontaneous reporting systems, which rely on healthcare professionals and patients to report any suspected adverse effects. This method can lead to underreporting and delays in signal detection. AI can augment this process by:

- Automated Data Extraction: Utilizing NLP to scan electronic health records (EHRs), scientific literature, and social media platforms to identify potential ADRs. For instance, AI algorithms can process vast amounts of unstructured data to detect mentions of adverse effects that may not be reported through traditional channels.
- Signal Detection: Implementing ML models to analyze large datasets to identify patterns and correlations indicative of new safety signals. This proactive approach allows for earlier detection of potential safety concerns.

2. Case Processing and Management

The processing of Individual Case Safety Reports (ICSRs) is a labor-intensive task in PV. AI can streamline this process by:

- Automated Triage: Classifying and prioritizing cases based on severity and relevance, ensuring that critical cases receive prompt attention.
- Data Entry and Validation: Extracting relevant information from various sources and populating databases accurately, reducing the risk of human error.
- Duplicate Detection: Identifying and merging duplicate reports to maintain data integrity.

3. Literature Monitoring

Regulatory agencies require continuous monitoring of medical literature to identify new safety information. AI facilitates this by:

- Automated Literature Review: Scanning and analyzing vast amounts of scientific publications to identify relevant safety information, significantly reducing the manual workload.
- Trend Analysis: Monitoring trends in the literature to identify emerging safety concerns.

4. Social Media Surveillance

Patients often share their experiences with medications on social media platforms. AI can harness this data by:

- Sentiment Analysis: Assessing patient sentiments to identify potential ADRs and gauge public perception of drug safety.
- Real-Time Monitoring: Providing timely insights into emerging safety issues that may not yet be reported through formal channels.

Future Perspectives

The future of AI in pharmacovigilance is promising, with ongoing research and development aimed at overcoming current challenges. Potential advancements include:

- Explainable AI: Developing models that provide transparent and understandable outputs to facilitate regulatory acceptance and trust among healthcare professionals.
- Predictive Analytics: Leveraging AI to predict potential safety issues before they arise, allowing for proactive risk management.
- Global Collaboration: Sharing AI tools and data across organizations and borders to enhance drug safety monitoring on a global scale.

Conclusion

Artificial Intelligence is transforming pharmacovigilance by enhancing the detection, assessment, and prevention of adverse drug reactions. While challenges remain, the continued integration of AI into PV processes holds the promise of more efficient and effective drug safety monitoring, ultimately leading to improved patient outcomes.

References:

- "The Use of Artificial Intelligence in Pharmacovigilance"- PubMed.
- "Editorial: AI/ML in Pharmacovigilance and Pharmacoepidemiology" Frontiers in Drug Safety and Regulation.
- "Algorithmovigilance, Lessons from Pharmacovigilance"-Nature.
- "Artificial Intelligence in Pharmacovigilance – Opportunities and Challenges"- Mira Kirankumar Desai.
- "Artificial Intelligence in Pharmacovigilance"- Bentham Science.
- "Governance of Artificial Intelligence and Machine Learning in Pharmacovigilance" -SAGE Journals.
- "Advanced Applications of Artificial Intelligence in Pharmacovigilance" -Journal of Pharmaceutical and Clinical Research.
- "Applying AI to Structured Real-World Data for Pharmacovigilance"- Journal of Medical Internet Research.

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Molecular Docking in Pharmaceutical Drug Discovery: A Powerful Tool for Rational Drug Design

Abstract:
Molecular docking has become a cornerstone technique in pharmaceutical drug discovery, enabling researchers to simulate and predict the interactions between drug candidates and their biological targets. By accurately modeling the binding affinity and conformation of small molecules to proteins, docking provides invaluable insights into the design of novel therapeutics. This article explores the fundamental principles, applications, and advancements of molecular docking in pharmaceutical sciences, highlighting its role in rational drug design, lead optimization, and virtual screening. Moreover, the challenges and limitations of the method are discussed, along with future perspectives for improving docking algorithms and integrating them into the drug development pipeline.

Introduction:
The discovery of new drugs is a complex, expensive, and time-consuming process. Traditional methods of drug discovery often rely on high-throughput screening (HTS) to identify potential drug candidates from large compound libraries. However, these methods are not always efficient in identifying the most promising compounds. Molecular docking has emerged as an essential computational technique in the pharmaceutical field, allowing researchers to predict how small molecules interact with biological targets at the atomic level. This approach significantly accelerates the drug discovery process by providing insights into molecular interactions, improving the selection of drug candidates, and aiding in the design of novel therapeutics.

Fundamentals of Molecular Docking: Molecular docking involves simulating the binding process of a ligand (usually a small molecule or drug candidate) to a target protein or receptor. The primary goal of docking is to predict the optimal binding mode and calculate the binding affinity of the ligand for the target protein. The process can be broken down into several key steps:

1. **Preparation of Ligands and Receptors:** Before docking, both the ligand and the receptor protein are prepared by removing water molecules, assigning atomic charges, and optimizing their structures. Ligands are usually small molecules, peptides, or fragments of larger molecules, while receptors are typically proteins or nucleic acids.
2. **Docking Simulation:** During docking, algorithms generate multiple conformations of the ligand and evaluate their binding modes by assessing various interactions, such as hydrogen bonding, hydrophobic interactions, and electrostatic forces. Several docking methods, such as rigid-body docking, flexible docking, and induced-fit docking, are used to accommodate the flexibility of the ligand and receptor.
3. . Binding Affinity Calculation: The binding energy is calculated based on the strength and type of interactions between the ligand and receptor. The lower the binding energy, the higher the likelihood that the ligand will bind to the receptor with high affinity.
4. 4. Post-Docking Analysis: After docking, the resulting structures are analyzed to identify the most favorable binding poses. Scoring functions are used to rank these poses based on their binding energies, helping to identify the most promising candidates for further experimental validation

Applications of Molecular Docking in Pharmaceutical Drug Discovery:
Molecular docking plays a crucial role in various stages of drug discovery:

- Virtual Screening: Virtual screening (VS) is one of the most common applications of molecular docking. By using docking to screen large compound libraries against a target protein, researchers can identify potential hits that may possess drug-like properties. This technique significantly reduces the number of compounds that need to be synthesized and tested experimentally, saving time and resources.

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- **Lead Discovery and Optimization:** Once a lead compound is identified, molecular docking helps to optimize its binding affinity and selectivity. Researchers can modify the lead structure to improve interactions with the target, enhance stability, and reduce off-target effects, all while maintaining or enhancing the compound's biological activity.
- **Target Identification and Drug Repurposing:** Molecular docking can be applied to identify potential targets for existing drugs, facilitating drug repurposing efforts. This method can also be used to predict new biological activities of known compounds, offering novel therapeutic opportunities for treating diseases beyond their original indications.
- **Allosteric Modulation and Protein-Protein Interactions:** Molecular docking has been extended to the study of protein-protein interactions (PPIs), which play a pivotal role in various diseases. Docking can help design molecules that modulate protein-protein interfaces, opening up new avenues for drug development in areas like cancer and neurodegenerative diseases.

Advancements and Challenges in Molecular Docking:

Over the years, molecular docking has evolved with advancements in computational power, algorithm development, and the availability of high-resolution structural data. However, several challenges remain:

- **Accuracy of Binding Affinity Predictions:** Although docking provides valuable predictions, the accuracy of binding affinity calculations remains a challenge. Factors such as protein flexibility, solvent effects, and conformational changes during ligand binding are often difficult to model accurately.
- **Computational Cost**: For large-scale virtual screening, the computational cost of docking can be prohibitively high, especially when screening millions of compounds. Developing more efficient algorithms and hardware acceleration techniques, such as GPU-based docking, is crucial to improving the scalability of docking simulations.
- **Structural Data Limitations:** The accuracy of docking predictions heavily depends on the quality of the target protein's 3D structure. In cases where the target structure is not available, homology modeling or molecular dynamics simulations may be used, but these approaches have their own limitations and uncertainties.

Future Directions:

The future of molecular docking in pharmaceutical drug discovery lies in overcoming its current limitations and integrating it with other computational techniques, such as molecular dynamics simulations, artificial intelligence (AI), and machine learning (ML). These approaches can provide more accurate predictions of ligand binding, enhance the understanding of protein flexibility, and enable better exploration of the chemical space for novel drug candidates. Additionally, the increasing availability of structural data from techniques like cryo-electron microscopy (cryo-EM) and X-ray crystallography will further improve docking accuracy.

AI and ML algorithms have shown great promise in automating the docking process, predicting ligand-receptor interactions, and optimizing compound libraries more efficiently than traditional methods. Coupled with advances in high-performance computing, these technologies may significantly shorten the drug discovery timeline and improve the success rate of bringing new drugs to market.

Conclusion:

Molecular docking has revolutionized pharmaceutical drug discovery by enabling the rational design of drug candidates, optimizing their binding affinity, and predicting their biological activity. Despite its challenges, including the accuracy of binding affinity predictions and computational costs, docking remains an indispensable tool in modern drug development. With ongoing advancements in computational methods and the integration of AI and machine learning, molecular docking is poised to become even more powerful, accelerating the discovery of innovative therapies for a wide range of diseases.

Darshan Bodas
Final Year B.Pharm

The Influence of Digital Marketing in the Pharmaceutical Industry: Transforming Patient Engagement, Brand Awareness, and Business Growth

Abstract:
The rise of digital technologies has revolutionized marketing strategies across various industries, and the pharmaceutical sector is no exception. Digital marketing in the pharmaceutical industry has emerged as a key driver of growth, offering a platform for enhanced communication between pharmaceutical companies, healthcare professionals, patients, and stakeholders. The use of online tools such as social media, search engine optimization (SEO), content marketing, and targeted advertisements has transformed how pharmaceutical companies promote their products and services. This article explores the impact of digital marketing on the pharmaceutical industry, focusing on its role in patient engagement, brand awareness, regulatory challenges, and overall business growth. Additionally, the article evaluates the future potential of digital marketing in the pharmaceutical industry and the ethical considerations surrounding its implementation.

Introduction:
Digital marketing has become a cornerstone for businesses in almost every sector, and the pharmaceutical industry is increasingly adopting this strategy. The traditional methods of pharmaceutical marketing, such as direct sales representatives and print advertising, are being complemented, and in many cases replaced, by digital tools that provide real-time engagement with healthcare professionals (HCPs) and patients. Digital marketing strategies in the pharmaceutical industry are being used not only to promote products but also to foster educational initiatives, engage in disease awareness campaigns, and manage relationships with healthcare professionals, all while adhering to regulatory guidelines.
The advent of the digital era has reshaped pharmaceutical marketing by making communication more interactive, targeted, and measurable. However, these advancements come with challenges, particularly around compliance with regulatory requirements such as the Health Insurance Portability and Accountability Act (HIPAA) in the United States and the General Data Protection Regulation (GDPR) in the European Union
Key Digital Marketing Strategies in the Pharmaceutical Industry:

- Social Media Marketing: Social media has become an integral component of digital marketing across industries, and the pharmaceutical sector is increasingly leveraging platforms such as Facebook, Twitter, LinkedIn, and Instagram to promote their brands and engage with patients and healthcare providers. Social media offers a unique opportunity for real-time communication and engagement with a wide audience.
- Patient Engagement: Pharmaceutical companies are using social media to directly connect with patients, providing information on disease management, new treatments, and patient support programs. Social media platforms allow pharmaceutical brands to humanize their image by offering educational content, live Q&A sessions with experts, and patient testimonials.
- Disease Awareness Campaigns: Social media has proven to be an effective channel for disease awareness campaigns. Through targeted content and viral marketing, pharmaceutical companies can raise awareness about specific health conditions, such as diabetes, cancer, and mental health issues, and encourage early diagnosis and treatment.
- Regulatory Compliance: While social media presents many opportunities, it also presents challenges in adhering to pharmaceutical marketing regulations. The FDA has issued specific guidelines regarding social media content, emphasizing that companies must ensure that information is accurate, balanced, and compliant with regulations. Moreover, maintaining transparency and safeguarding patient data on these platforms is crucial.

- **Search Engine Optimization (SEO) and Content Marketing:** Search engine optimization (SEO) and content marketing are powerful tools in digital marketing that can help pharmaceutical companies reach a targeted audience. With patients increasingly turning to the internet to search for medical information, SEO plays a crucial role in ensuring that relevant content is discoverable.

1. **SEO for Healthcare Websites:** Pharmaceutical companies optimize their websites to ensure that they rank higher on search engines when users search for medical conditions, treatments, or drugs. This not only improves visibility but also provides opportunities to educate patients and healthcare professionals about new therapies, clinical trials, and drug safety.
2. **Educational Content:** Providing high-quality, informative content is an essential component of digital marketing in the pharmaceutical industry. Pharmaceutical companies use blogs, articles, videos, and infographics to disseminate valuable information to both healthcare professionals and patients. Educational content can help build trust, promote informed decision-making, and position the brand as a thought leader in the field.

- **Paid Digital Advertising:** Paid advertising, including pay-per-click (PPC) campaigns, display ads, and social media advertisements, is increasingly used by pharmaceutical companies to drive awareness and conversions. These campaigns are highly targeted, allowing brands to reach specific segments of the population, such as healthcare professionals, patients with particular medical conditions, or caregivers.

1. **Targeted Advertising:** Pharmaceutical brands can target specific demographic groups or geographical regions with tailored messaging. For example, ads for a new cancer treatment can be targeted to oncologists or patients who have expressed interest in cancer-related topics.
2. **Retargeting and Personalized Campaigns**: Retargeting allows companies to follow up with users who have visited their website or interacted with their digital content, enhancing the likelihood of conversion. Personalized campaigns that deliver relevant ads based on previous searches or user behavior can also drive better results.

- **Mobile Marketing and Apps:** Mobile marketing has gained significant importance in the pharmaceutical industry due to the increasing use of smartphones by patients and healthcare professionals alike. Mobile apps are particularly effective for improving patient engagement and facilitating medication adherence.

1. **Medication Adherence Apps:** Pharmaceutical companies have developed apps that help patients manage their prescriptions, set medication reminders, track symptoms, and communicate with healthcare providers. These apps not only promote adherence but also help companies gather valuable data on patient behavior and outcomes.
2. **Mobile Advertising:** Pharmaceutical companies also use mobile platforms to deliver targeted advertisements, offer educational content, and engage with patients on the go. Mobile marketing provides a more personal and direct form of communication.

Influence of Digital Marketing on Patient Engagement and Brand Awareness:

- **Enhancing Patient Engagement:** Digital marketing has significantly transformed patient engagement by facilitating two-way communication between pharmaceutical brands and patients. Through interactive platforms such as social media and apps, patients can easily access support, ask questions, and share experiences with others. These digital tools have empowered patients to take a more active role in their healthcare journey.

1. **Patient Communities:** Pharmaceutical companies have started building online patient communities where individuals can share experiences, receive peer support, and access resources related to their conditions. These communities not only foster patient loyalty but also provide invaluable insights into patient needs and preferences.
2. **Telemedicine and Virtual Care:** The integration of digital marketing with telemedicine platforms allows pharmaceutical companies to promote digital healthcare services and virtual consultations with healthcare professionals. This is particularly useful in the wake of the COVID-19 pandemic, as patients increasingly seek remote medical advice.

- **Strengthening Brand Awareness:** In a highly competitive pharmaceutical market, digital marketing plays a crucial role in building and maintaining brand awareness. By using SEO, social media, and content marketing, pharmaceutical companies can position themselves as trusted sources of information, enhancing their brand image.

1. **Reputation Management:** Pharmaceutical companies use digital platforms to manage their reputations by addressing patient concerns, correcting misinformation, and engaging in transparent communication. Proactively managing online presence and responding to patient feedback can help strengthen brand trust.
2. **Building Thought Leadership:** Through informative content, webinars, and virtual events, pharmaceutical companies can position themselves as leaders in their respective fields. This not only improves brand visibility but also fosters trust among healthcare professionals and patients.

Regulatory Challenges and Ethical Considerations:

While digital marketing offers numerous opportunities for pharmaceutical companies, it also presents unique regulatory and ethical challenges. The pharmaceutical industry is heavily regulated to ensure patient safety and the accuracy of drug-related information.

- **Compliance with Regulatory Agencies:** The U.S. FDA and the European Medicines Agency (EMA) provide strict guidelines for pharmaceutical advertising, ensuring that marketing materials are not misleading, unbalanced, or non-compliant with product labeling. Adherence to these regulations is particularly challenging in the digital space, where content can be rapidly shared and may not always be closely monitored.
- Patient Privacy and Data Security: Protecting patient privacy is of paramount importance in pharmaceutical marketing. Companies must comply with data protection laws such as HIPAA and GDPR when collecting and using patient data. Ensuring secure communication channels and protecting sensitive patient information are key ethical considerations in digital marketing.
- Future of Digital Marketing in the Pharmaceutical Industry:
- As technology continues to evolve, the pharmaceutical industry is likely to see even more innovative digital marketing strategies. The integration of artificial intelligence (AI), big data analytics, and machine learning will further enhance the ability of pharmaceutical companies to target, personalize, and optimize their marketing campaigns.
- AI and Predictive Analytics: AI-driven analytics can help pharmaceutical companies predict patient behavior, personalize marketing content, and optimize digital advertising campaigns in real-time. Predictive analytics can also provide insights into market trends, helping companies stay ahead of competitors.
- Augmented Reality (AR) and Virtual Reality (VR): AR and VR technologies are being explored as ways to enhance patient education and engagement. For example, virtual reality simulations can help patients better understand how a drug works or how it interacts with the body.

Conclusion:

Digital marketing has become an indispensable tool for the pharmaceutical industry, enabling more personalized, interactive, and data-driven communication with patients and healthcare professionals. The integration of social media, SEO, content marketing, mobile apps, and targeted digital ads has transformed how pharmaceutical companies promote their products and engage with stakeholders. While challenges related to regulation, compliance, and ethics persist, the future of digital marketing in the pharmaceutical field holds immense potential for improving patient outcomes, fostering better communication, and driving business growth.

References:

- Kucher, J., & Seitz, E. (2017). Digital marketing in the pharmaceutical industry: Current challenges and future trends. Pharmaceutical Marketing & Communications, 22(3), 201-214.
- Allen, K. (2020). The impact of digital marketing strategies on pharmaceutical companies: The new era of patient engagement. Journal of Pharmaceutical Business & Management, 7(2), 47-53.
- Davis, R., & Ross, S. (2021). Ethical and regulatory considerations in digital marketing for pharmaceuticals. Journal of Medical Ethics, 47(9), 602-608.
- Morrow, S., & Williams, T. (2019). Mobile marketing in the pharmaceutical industry: Opportunities and challenges. International Journal of Digital Marketing, 13(4), 48-58.

Akash Solanki

Final Year B.Pharm

The Use of Green Chemistry in Drug Manufacturing: Advancing Sustainable Pharmaceutical Production

Abstract:
The pharmaceutical industry, while vital for global health, is often associated with significant environmental and economic impacts due to resource-intensive production processes, chemical waste, and high energy consumption. In response to growing concerns about sustainability, green chemistry offers an innovative approach to drug manufacturing by promoting environmentally friendly and efficient chemical processes. This article explores the principles of green chemistry and their application in pharmaceutical manufacturing. It discusses the potential benefits of green chemistry in reducing environmental harm, improving cost-effectiveness, and enhancing drug safety. Through examples of successful applications, challenges, and future directions, the article highlights how green chemistry is poised to reshape pharmaceutical production into a more sustainable and socially responsible industry.

Introduction:
The pharmaceutical industry plays a critical role in providing life-saving medications and improving public health globally. However, the traditional processes involved in drug manufacturing have been associated with significant environmental challenges. These include the use of toxic reagents, high levels of waste generation, excessive energy consumption, and the emission of greenhouse gases. Given the increasing pressure on industries to reduce their environmental footprint, there is an urgent need for sustainable solutions in pharmaceutical production.
Green chemistry, a concept pioneered by Paul Anastas and John C. Warner in 1998, focuses on designing chemical products and processes that minimize environmental impacts. By applying green chemistry principles to pharmaceutical manufacturing, companies can achieve cleaner, more sustainable production processes while maintaining high standards of drug efficacy and safety. This article examines the role of green chemistry in drug manufacturing, its potential advantages, and its application in the development of safer, more sustainable pharmaceutical products.

Principles of Green Chemistry in Pharmaceutical Manufacturing:
Green chemistry is based on 12 principles that aim to reduce the environmental and human health risks associated with chemical processes. These principles emphasize waste minimization, energy efficiency, the use of renewable feedstocks, and the development of safer chemicals. The following principles are particularly relevant to pharmaceutical manufacturing:

- **Waste Prevention and Atom Economy:** One of the central tenets of green chemistry is the prevention of waste at the source. In pharmaceutical manufacturing, this involves optimizing chemical reactions to ensure that most, if not all, of the reactants are incorporated into the final product. Atom economy refers to the efficiency of a chemical process in utilizing atoms from raw materials to form the desired product, minimizing waste and byproducts. Example: The use of flow chemistry, where reactions are performed in a continuous flow system rather than batch processing, has been shown to improve atom economy and reduce waste generation in pharmaceutical production.

- **Safer Solvents and Auxiliary Substances:** Solvents are often used in drug manufacturing processes for dissolution, extraction, and purification. However, many traditional solvents are toxic, volatile, and contribute to environmental pollution. Green chemistry encourages the use of safer, more sustainable solvents, such as water, supercritical fluids, and bio-based solvents, that reduce toxicity and environmental impact. Example: The replacement of organic solvents like dichloromethane with more environmentally benign solvents like ionic liquids or ethanol has been adopted in various pharmaceutical synthesis routes.

- **Energy Efficiency:** Pharmaceutical production can be energy-intensive, especially in processes that involve heating or the use of high pressures. Green chemistry promotes the development of energy-efficient chemical processes that minimize the use of high temperatures and pressures. By optimizing reaction conditions, energy consumption can be significantly reduced. Example: Microwave-assisted synthesis has emerged as a green chemistry innovation in pharmaceutical manufacturing, enabling faster reactions at lower temperatures and reducing the overall energy consumption in drug production.

- **Renewable Feedstocks:** Green chemistry advocates for the use of renewable raw materials instead of fossil-derived resources. In pharmaceutical manufacturing, this involves sourcing chemicals from renewable agricultural or biomass resources instead of petrochemicals. By using bio-based feedstocks, pharmaceutical companies can reduce their dependency on non-renewable resources and minimize the environmental footprint of their operations. **Example:** The synthesis of pharmaceutical intermediates from renewable sugars or plant-based oils, instead of petroleum derivatives, has gained attention as a more sustainable approach.

Applications of Green Chemistry in Drug Manufacturing:

The principles of green chemistry have been successfully applied to various stages of pharmaceutical manufacturing, from the synthesis of active pharmaceutical ingredients (APIs) to formulation and packaging.

- **Green Synthesis of Active Pharmaceutical Ingredients (APIs):** The synthesis of APIs is one of the most energy- and resource-intensive stages of drug production. Green chemistry methods have been used to optimize the synthesis of APIs by improving reaction efficiency, reducing the number of reaction steps, and using safer reagents.

1. **Example:** The use of enzymatic catalysis in the synthesis of chiral drugs has gained popularity in the pharmaceutical industry. Enzymes offer high selectivity, mild reaction conditions, and can be sourced sustainably, significantly reducing waste and environmental impact.
2. **Example:** In the synthesis of aspirin, a common pharmaceutical drug, green chemistry principles have been applied to reduce waste and improve atom economy. The traditional synthesis route has been modified to minimize solvent usage and byproduct formation.

- **Sustainable Formulation and Packaging:** Beyond the synthesis of APIs, the formulation and packaging of pharmaceutical products also contribute to the overall environmental footprint of the industry. Green chemistry encourages the development of formulations using natural, biodegradable excipients and the use of sustainable packaging materials.

1. **Example:** The development of biodegradable polymers for drug delivery systems reduces the reliance on petroleum-based plastics, contributing to more sustainable packaging solutions.
2. **Example:** In vaccine production, green chemistry has been applied to improve the formulation process by using natural stabilizers and reducing the environmental impact of the manufacturing process.

- **Green Chemistry in Drug Repurposing:** Green chemistry principles have also been applied in drug repurposing, which involves finding new therapeutic uses for existing drugs. This approach can significantly reduce the time and cost of drug development by repurposing drugs that have already undergone extensive testing. Example: The repurposing of existing drugs for the treatment of COVID-19 has seen the application of green chemistry in the optimization of synthetic routes, reducing the need for new raw materials and minimizing waste.

Challenges and Barriers to the Widespread Adoption of Green Chemistry in Drug Manufacturing:

While the potential benefits of green chemistry are clear, the adoption of these practices in pharmaceutical manufacturing faces several challenges:

- **Cost Considerations:** Green chemistry innovations, such as the use of alternative solvents or renewable feedstocks, may require significant investment in new technologies and infrastructure. Pharmaceutical companies may be hesitant to adopt these methods due to higher initial costs, even if they offer long-term savings.
- **Regulatory and Compliance Issues:** Regulatory agencies such as the U.S. Food and Drug Administration (FDA) and the European Medicines Agency (EMA) must evaluate the safety and efficacy of new green chemistry methods. The approval process for novel chemical processes can be lengthy, which may delay the widespread adoption of green chemistry in drug manufacturing.
- **Scale-Up Challenges**: While green chemistry principles have been successfully applied in laboratory settings, scaling up these processes to industrial production levels can present challenges. Issues such as reaction yields, solvent recovery, and equipment limitations must be addressed to ensure that green chemistry methods are feasible at large scale.

Future Directions in Green Chemistry for Pharmaceutical Manufacturing:

Despite these challenges, the future of green chemistry in pharmaceutical manufacturing looks promising. As the industry moves toward more sustainable practices, there are several key trends that are likely to shape the future of drug production:

- **Biocatalysis and Enzyme Engineering:** The continued development of biocatalysts and enzyme engineering holds great promise for the synthesis of pharmaceutical compounds. Biocatalysis offers high specificity, low energy consumption, and the ability to use renewable feedstocks, making it a key component of green chemistry in drug manufacturing.
- **Continuous Flow Processes:** Continuous flow chemistry, which enables real-time monitoring and control of chemical reactions, is an emerging technology that aligns with green chemistry principles. It offers the potential for more efficient, scalable, and sustainable drug manufacturing.
- **Circular Economy and Waste Valorization:** Pharmaceutical companies are increasingly exploring circular economy principles, which focus on the reuse and recycling of materials and waste. The integration of waste valorization technologies into drug manufacturing processes can help reduce environmental impacts and create more sustainable supply chains.

Conclusion:

Green chemistry offers a transformative approach to pharmaceutical manufacturing, focusing on sustainability, resource efficiency, and environmental protection. By adopting green chemistry principles, pharmaceutical companies can not only reduce their environmental footprint but also enhance the economic and social sustainability of drug production. While challenges remain in terms of cost, regulation, and scalability, the potential benefits of green chemistry for the pharmaceutical industry are undeniable. As the industry continues to embrace these innovations, green chemistry will play a pivotal role in shaping a more sustainable and responsible future for pharmaceutical manufacturing.

References:

Anastas, P. T., & Warner, J. C. (1998). Green Chemistry: Theory and Practice. Oxford University Press.

Sheldon, R. A. (2016). Green chemistry and the pharmaceutical industry. Green Chemistry, 18(4), 1062-1074.

Colberg, J. E., & Phillips, R. (2015). The role of green chemistry in pharmaceutical manufacturing. Pharmaceutical Technology, 39(11), 22-29.

Dunn, P. J., & Taylor, R. J. K. (2013). Green chemistry in pharmaceutical manufacturing. Organic Process Research & Development, 17(5), 841-857.

Kirtan Shah

Final Year B.Pharm

Role of medicinal plants in Disease Management in Pharmacy

Medicinal plants have been used for centuries in traditional medicine systems to prevent, manage, and treat a variety of diseases. In modern pharmacy, their role remains critical as they serve as sources of bioactive compounds, raw materials for drug development, and complementary therapies in disease management.

1. Historical Perspective

Medicinal plants have long been integral to healthcare systems like Ayurveda, Traditional Chinese Medicine (TCM), and Unani. These systems rely on plant-based formulations to treat diseases holistically. For example, willow bark was traditionally used for pain relief, which later led to the discovery of aspirin (acetylsalicylic acid).

2. Sources of Bioactive Compounds

Medicinal plants are rich in secondary metabolites, including alkaloids, flavonoids, terpenoids, glycosides, tannins, and polyphenols, which have therapeutic properties. These bioactive compounds form the basis of many pharmaceutical drugs.

Examples:

- Artemisinin (from Artemisia annua): Used in malaria treatment.
- Paclitaxel (from Pacific yew tree): Used in cancer therapy.
- Morphine (from opium poppy): Used as a potent analgesic.

3. Role in Disease Management

Medicinal plants are used in managing several diseases, including:

a. Infectious Diseases

Medicinal plants like neem (Azadirachta indica), garlic (Allium sativum), and turmeric (Curcuma longa) have antibacterial, antifungal, and antiviral properties. These plants are employed in the management of infections like skin diseases, respiratory infections, and even in combating antibiotic resistance.

b. Chronic Diseases

1. Diabetes Mellitus: Plants like bitter melon (Momordica charantia) and fenugreek (Trigonella foenum-graecum) help regulate blood sugar levels.

2. Hypertension: Garlic and hibiscus (Hibiscus sabdariffa) are known for their antihypertensive properties.

3. Cardiovascular Diseases: Green tea (Camellia sinensis) and grapes (Vitis vinifera) contain antioxidants that improve heart health.

c. Cancer

Medicinal plants such as green tea, turmeric (curcumin), and the vinca alkaloids from Catharanthus roseus (vincristine and vinblastine) play significant roles in chemotherapy and chemoprevention.

d. Neurodegenerative Diseases

Ginkgo biloba and brahmi (Bacopa monnieri) are used for their neuroprotective effects in managing conditions like Alzheimer's and Parkinson’s diseases.

e. Inflammatory Disorders

Plants like turmeric (curcumin) and ginger (Zingiber officinale) have potent anti-inflammatory effects and are used in managing arthritis, inflammatory bowel disease, and other chronic inflammatory conditions.

4.Role in Drug Discovery and Development

Many modern drugs are derived from medicinal plants, either directly or through synthetic analogs. Pharmacognosy, the study of medicinal plants, helps identify new drug candidates. For example, the anti-cancer drug camptothecin is derived from Camptotheca acuminata.

5. Advantages of Medicinal Plants

Safety: When used appropriately, medicinal plants often have fewer side effects compared to synthetic drugs.

Accessibility: They are readily available and affordable, particularly in developing countries.

Efficacy in Chronic Conditions: Medicinal plants provide long-term management options for chronic diseases.

Conclusion

Medicinal plants play a vital role in disease management and drug development in pharmacy. They provide natural, cost-effective, and accessible alternatives to synthetic drugs while offering solutions for chronic and emerging diseases. However, rigorous scientific research, standardization, and regulation are essential to ensure their safe and effective use in modern healthcare.

Tanvi Laxman Bhagat
S.Y. B.Pharm

Pharmaceutical Industry Response to Global Health Crises: Lessons from COVID-19

Introduction:

The COVID-19 pandemic reshaped the pharmaceutical industry's role in addressing global health crises. From the unprecedented speed of vaccine development to addressing supply chain disruptions and ensuring equitable access to treatments, the industry's response highlighted both strengths and areas for improvement. This article explores key lessons learned from the pandemic, with real-world examples of initiatives, collaborations, and innovations that defined the pharmaceutical industry's response.

1. Rapid Vaccine Development and Innovation

Example: Development of mRNA Vaccines (Pfizer-BioNTech and Moderna)

Before COVID-19, mRNA technology was primarily experimental. However, Pfizer-BioNTech and Moderna leveraged this platform to create vaccines in under a year—a process that typically takes 10-15 years. The Pfizer-BioNTech vaccine received emergency use authorization in December 2020, marking the fastest vaccine development in history.

Lesson Learned:

The pandemic demonstrated that with sufficient funding, collaboration, and regulatory support, vaccines can be developed and approved much faster than previously thought. This success can be replicated for other diseases like HIV, cancer, and influenza.

2. Scaling Up Production and Distribution

Example: Serum Institute of India's Role in Global Vaccine Supply

The Serum Institute of India (SII) became one of the largest producers of COVID-19 vaccines, manufacturing the AstraZeneca vaccine under the brand name Covishield. SII played a crucial role in supplying vaccines to low- and middle-income countries through the COVAX initiative.

Pharmaceutical companies must invest in scalable manufacturing capacity to meet global demand during health crises.

3. Increased Focus on Global Health Equity

Example: COVAX Initiative

COVAX, co-led by the WHO, GAVI, and CEPI, aimed to ensure equitable access to COVID-19 vaccines worldwide. While it faced challenges, it succeeded in delivering over 1.8 billion doses to 146 countries by early 2023.

Pharmaceutical companies must prioritize global access strategies, especially for underserved populations. In future crises, early planning for equitable distribution is essential to prevent vaccine nationalism and ensure global health security.

4. Supply Chain Resilience and Drug Shortages

Example: Pfizer's Cold Chain Logistics for mRNA Vaccines

Pfizer faced the challenge of distributing its mRNA vaccine, which required ultra-cold storage (-70°C). The company developed a specialized cold chain distribution system, including temperature-controlled boxes with GPS tracking to monitor conditions in real-time.

Example: AstraZeneca's Global Manufacturing Network

AstraZeneca built a global manufacturing network to ensure that its vaccine could be produced in multiple countries, reducing reliance on a single production

5.The Role of Technology and Digital Health

Example: Use of Digital Platforms for Clinical Trials

Pharmaceutical companies like Novartis and Roche implemented decentralized clinical trials during the pandemic, using digital platforms to recruit and monitor patients remotely. This approach reduced the need for in-person visits and increased patient participation.

Example: Vaccine Passport Apps

Apps like the EU Digital COVID Certificate and Clear's Health Pass helped governments and individuals track vaccination status, allowing safer travel and reopening of economies.

Digital health tools can enhance patient care, improve clinical trial efficiency, and support public health efforts. Integrating these technologies into future health responses will be essential.

Conclusion:

The pharmaceutical industry's response to the COVID-19 pandemic showcased its ability to innovate and collaborate under extreme pressure. Key lessons include the importance of rapid vaccine development, supply chain resilience, regulatory flexibility, and global health equity. These insights can help the industry and governments better prepare for future global health crises, ensuring that life-saving treatments are developed and distributed efficiently and equitably. By building on these lessons, the world can be better equipped to face the next pandemic.

Amit Kumawat
S.Y.B. Pharm

CRISPR and Gene Therapy: The Future of Pharmacology

Introduction

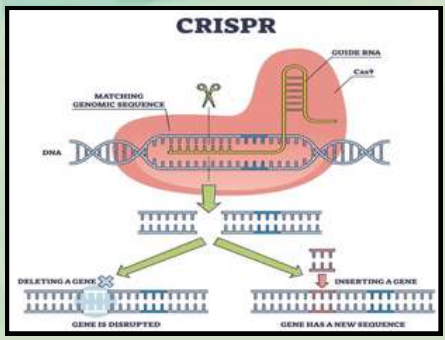
In recent years, the fields of genetic engineering and pharmacology have been revolutionized by the advent of CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) and gene therapy technologies. These innovations have the potential to transform the treatment landscape for numerous genetic disorders, offering hope for cures and personalized medicine. This article explores the mechanisms, applications, and case studies that illustrate the promising future of CRISPR and gene therapy in pharmacology.

The Mechanism of CRISPR

CRISPR is a powerful tool for editing genomes, allowing researchers to alter DNA sequences and modify gene function. Originally discovered as a natural defense mechanism in bacteria, CRISPR has been adapted for use in gene editing. The system primarily uses a protein called Cas9, which acts like molecular scissors to cut DNA at a specific location dictated by a guide RNA (gRNA) sequence. Once the DNA is cut, the cell's natural repair mechanisms can be harnessed to add or delete genetic material or to make changes to the DNA sequence.

Gene Therapy: A Brief Overview

Gene therapy involves the introduction, removal, or alteration of genetic material within a patient's cells to treat or prevent disease. This can be achieved using various techniques, including viral vectors to deliver therapeutic genes or CRISPR-based methods to edit the genome directly. The goal is to correct the underlying genetic defects that cause disease, providing a long-term solution rather than merely managing symptoms.



Applications in Pharmacology

The intersection of CRISPR and gene therapy with pharmacology offers several promising applications:

1. Treatment of Genetic Disorders: CRISPR has shown significant potential in treating monogenic disorders such as sickle cell anemia and cystic fibrosis. By directly correcting the mutations responsible for these conditions, CRISPR-based therapies offer the possibility of a permanent cure.

2. Oncology: Gene editing can be used to modify immune cells to better target cancer. For example, .

CAR-T cell therapy, which involves engineering a patient's T-cells to recognize and destroy cancer cells, can be enhanced with CRISPR to improve efficacy and reduce side effects.

3. Infectious Diseases: CRISPR has been explored as a tool to combat viral infections, such as HIV, by editing the genome of infected cells to remove viral DNA or by boosting the immune response.

4. Drug Development: CRISPR can accelerate drug discovery by enabling precise modeling of diseases in cell lines or animal models. This facilitates the identification of new drug targets and the testing of potential treatments

Case Studies

1. Sickle Cell Disease

One of the most promising applications of CRISPR in gene therapy is the treatment of sickle cell disease (SCD). In a groundbreaking clinical trial, researchers used CRISPR to edit the hematopoietic stem cells of patients with SCD. The edited cells were then reintroduced into the patient's body, leading to the production of healthy red blood cells. Preliminary results have shown that patients treated with this approach have experienced significant relief from symptoms and a marked improvement in quality of life.

2. Leber Congenital Amaurosis

Leber congenital amaurosis (LCA) is a genetic disorder that leads to blindness. A recent case study highlighted the use of CRISPR to treat a patient with LCA by editing the defective gene directly within the eye. This in vivo approach represents a significant advancement, as it demonstrates the potential of CRISPR to edit genes directly in the body, paving the way for treating a range of genetic disorders.

Challenges and Ethical Considerations

While the potential of CRISPR and gene therapy is immense, several challenges and ethical considerations must be addressed:

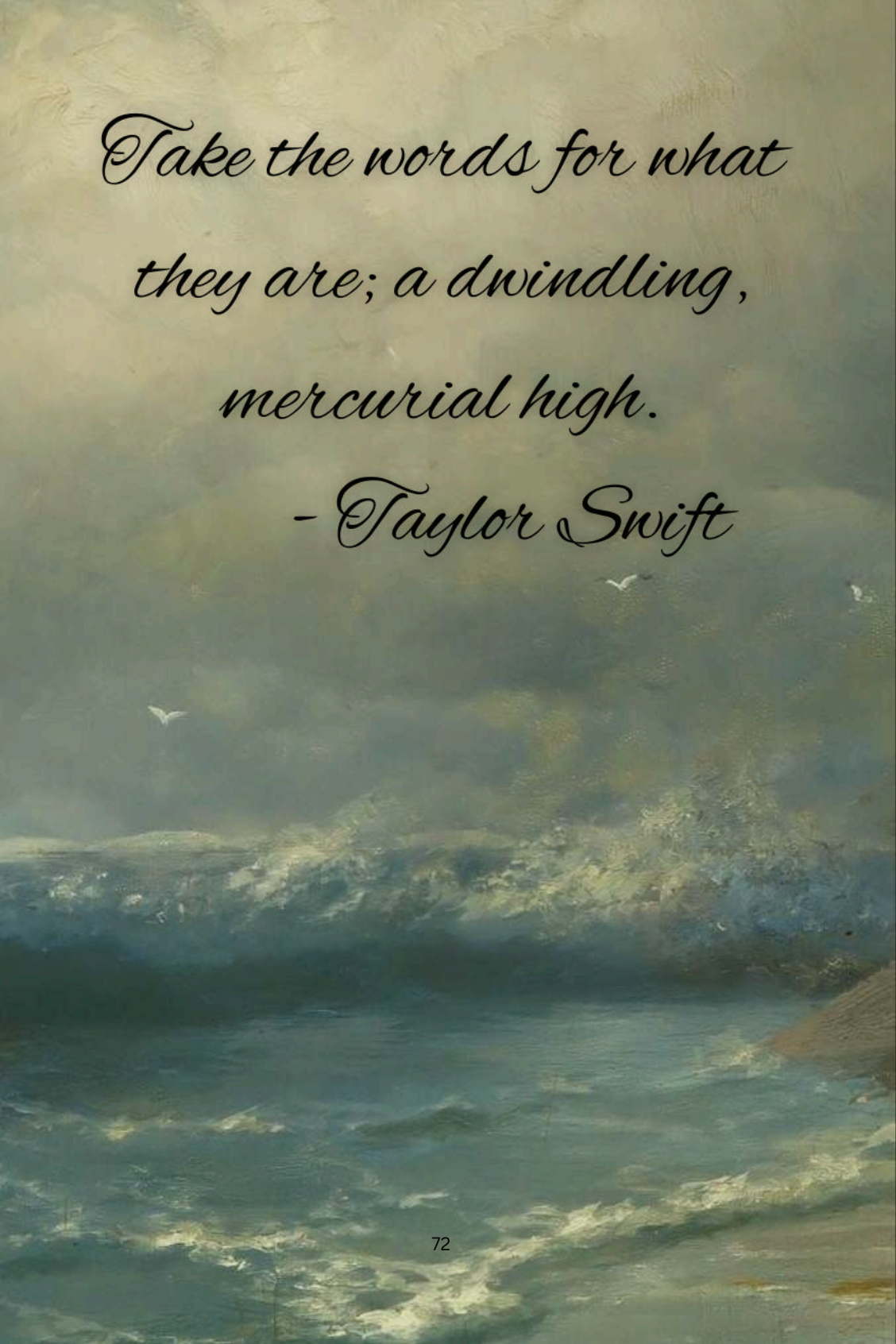
- Off-target Effects: Ensuring that CRISPR edits only the intended genomic locations without affecting other parts of the genome is crucial to avoid unintended consequences.
- Delivery Mechanisms: Efficiently delivering CRISPR components to the target cells in a safe and effective manner remains a significant hurdle.
- Ethical Concerns: The ability to edit human genes raises ethical questions about the potential for "designer babies," the implications of germline editing, and issues of consent and accessibility .

Conclusion:

CRISPR and gene therapy represent a paradigm shift in the treatment of genetic disorders and have broad implications for the future of pharmacology. As research progresses and clinical trials expand, these technologies hold the promise of transforming medicine by offering precise, personalized treatments for previously incurable diseases. However, careful consideration of the ethical and technical challenges will be essential to ensure that these powerful tools are used responsibly and equitably.

The future of pharmacology is bright with the potential of CRISPR and gene therapy, heralding a new era of medical breakthroughs that could change the lives of millions around the world.

Karthik Nadar
S.Y. B. Pharm


Take the words for what
they are; a dwindling,
mercurial high.
- Taylor Swift

The Unseen Storm

Beneath the smile, a quiet storm brews,
A battlefield hidden, with no outward clues.
Eyes that glimmer with laughter's disguise,
Mask the shadows where the struggle lies.

Books piled high, dreams weighing more,
A mind that feels like an endless war.
Deadlines chase like wolves in the night,
Stealing sleep, and dimming the light.

They say, "These are the best days of your life,"
But no one sees the internal strife.
The race to be perfect, to never fall,
Leaves no room to breathe, no space at all.

Silent screams echo in the heart,
A puzzle of pain, falling apart.
Tears unshed, they burn within,
Battles fought where no one has been.

Yet there’s strength in every tear unshed,
In the courage to rise from a heavy bed.
Each small step, though shaky and slow,
Is a triumph only the bearer will know.

To those who listen, to those who see,
Thank you for being the empathy.
For behind each smile, a story unfolds,
Of unspoken battles, and hearts of gold.

So let’s build a world with open doors,
Where minds can heal, and spirits soar.
Together we stand, to fight, to mend,
For every storm must come to an end.

- Diksha Patil, T.Y.B Pharm

What should I Choose?

What should I Choose?
The heart that wants to forgive
Or the vengeful heart that still grieves.
What should I Choose?
The voice, requesting it to let go,
Or the suppressed voice that craves to be free,
What should I Choose?
The hand that is always ready to help,
But being used over and over it yelps.
What should I Choose?
The mind that wants to be open,
But being controlled by deception is what it had been through often,
What should I Choose?
Between the versions of me,
One who desires to forget and move ahead,
Or the one that carries the burden of the past which is difficult to forget.

- Divya Dongare,
Final Year B Pharm

बालपण

कागदाची "नाव" होती
पाण्याचा "किनारा" होता
मित्रांचा "सहारा" होता
खेळण्याची "मस्ती" होती
मन है "वेडे" होते,
"कल्पनेच्या" दुनियेत जगत होते
कुठे आलो या "समजुतदारीच्या" जगात
या पेक्षा ते भोळे "बालपणचं" सुंदर होते!!!

-Sanjana Deshmukh ,
Final Year B Pharm

ए ज़िंदगी तुझे पाने निकल चुका हूं मैं

उम्मीदों का बस्ता लेके सपनो की चाहत में खो गया हूं मैं ए ज़िंदगी तुझे पाने निकल चुका हूं मैं।

क्यों ए अतीत नहीं भुला पा रहा तुझे, बस तुझ में फिर के जीके आयू कहता रहता यह दिल मुझे बस दो पल खुशी की तलाश में चल पड़ा हूं मैं ए ज़िंदगी तुझे पाने निकल चुका हूं मैं।

इन हवाओं सा बेहना चाहता हूं मैं सागर की लहरों को छूकर कुछ कहना चाहता हूं मैं, उन पहाड़ों की ऊंचाइयों को छुने चल पड़ा हूं मैं ए ज़िंदगी तुझे पाने निकल चुका हूं मैं।

नजाने क्यों जरा सा लगता है तुझ से डर कभी देती तू खुशी तो कभी मन आता है ये भर तू इतनी भी आसान नहीं है ज़िंदगी काश इंसान यह समझ पता तू देती हमेशा उन्ही का साथ है जो एक न एक दिन निकल जाते है, अपनी मंजिल की राह पर ।

तेरी चाहत में चल पड़ा हूं मैं ए ज़िंदगी तुझे पाने निकल चुका हूं मैं।

-Tanmay Tupe
SY B Pharm

कधी- कधी

कधी- कधी काही क्षण आठवावे वाटतात,
मनात माझ्या त्यांना साठवावे वाटतात.
डोळे मिटुन शांतपणे, विचारांत गुंतून,
हरवलेल्या आठवणी अश्रूंत दाटवाव्या वाटतात,
कधी- कधी काही क्षण आठवावे वाटतात.

ते क्षण जे पुन्हा अनुभवणार नाहीत,
मज स्मरणात सजवावे वाटतात,
खूप काळ झाला तरी
पुन्हा जगावे असे वाटतात.

नशिबाच्या पानावर प्रयत्नाचे धागे पुन्हा एकदा बांधावे वाटतात,
आज मज प्रिय क्षण आठवावे वाटतात.

पाखरांसवे अंबरी पंख पसरावे वाटतात,
हृदयातील सारे ओझे हलके व्हावे असे वाटतात.
चैतन्यातील भावना व्यक्त व्हाव्या जणू,
कधी- कधी काही क्षण आठवावे वाटतात,
मनात माझ्या त्यांना साठवावे वाटतात.

– Anjali Firke
SY B Pharm

Student's council

Council Committee 23-24

Student's Name	Year	Post
Sanjana Deshmukh	Third Year	General Secretary
Omkar Dudhal	Third Year	Associate General Secretary
PHO Committee:		
Jagruti Khose	Third Year	Public Health Officer
Pranav Dhumal	Third Year	Associate Public Health Officer
Prachi Kedare	Third Year	Associate Public Health Officer
Suyash Ambekar	Second Year	Joint Public Health Officer
Shifa Hussain	Second Year	Joint Public Health Officer
Cultural Committee :		
Sumit Kumkar	Third Year	Cultural Secretary
Apeksha Chavan	Third Year	Associate Cultural Secretary
Rajita Poojary	Second Year	Joint Cultural Secretary
Prajakta Aher	Second Year	Joint Cultural Secretary
Sports Committee:		
Arham Ansari	Third Year	Sports Secretary
Akash Solanki	Third Year	Associate Sports Secretary
Darshana Shinde	Third Year	Associate Sports Secretary
Siddhi Vaidya	Second Year	Joint Sports Secretary
Deepak Zaware	Second Year	Joint Sports Secretary
PRO Committee:		
Divya Dongare	Third Year	Public Relation Officer

Student's council

Council Committee 24-25

Student's Name	Year	Post
Siddhi Vaidya	Third Year	General Secretary
Pravin Prajapati	Third Year	Associate General Secretary
Suyash Ambekar	Third Year	NSS Student Leader
PHO Committee:		
Samiya Khan	Third Year	Public Health Officer
Shifa Hussain	Third Year	Assistant Public Health Officer
Sai Mulgi	Second Year	Joint Public Health Officer
Tanvi Bhagat	Second Year	Joint Public Health Officer
Cultural Committee :		
Deepali Chavan	Third Year	Cultural Secretary
Rajita Poojary	Third Year	Associate Cultural Secretary
Prajakta Aher	Third Year	Associate Cultural Secretary
Saanvi Gawde	Second Year	Joint Cultural Secretary
Prachi Walkunde	Second Year	Joint Cultural Secretary
Sports Committee:		
Devi Dhuri	Third Year	Sports Secretary
Om Shinde	Third Year	Associate Sports Secretary
Nishant Chopade	Third Year	Associate Sports Secretary
Bhavesh Kale	Second Year	Joint Sports Secretary
Karthik Nadar	Second Year	Joint Sports Secretary
Treasurer:		
Aaditi Ghugare	Second Year	Treasure
Gayatri Apale	Second Year	Treasure

IPA Council Committee

2023-2024

Student's Name	Year	Post
Siddhi Phadke	Final Year	Associate Pharmacy Health Officer
Anant Dhuri	Final Year	Associate Sports Committee
Yuvraj Pawar	Third Year	Cell member-Public Relations
Jayesh Ghorpade	Second Year	Cell member- Chief Executive Officer
Maseera Chowgule	Second Year	Cell member- Public Education Officer
Krisha Parmar	Second Year	Cell member- Editorial Committee
Kaushika Sodha	Second Year	Cell member- Finance Committee
Siddhi Vaidya	Second Year	Cell member- Cultural Committee

2024-2025

Student's Name	Year	Post
Yuvraj Pawar	Final Year	Public Relations Officer
Maseera Chowgule	Third Year	Cell member- Public Education Officer
Jayesh Ghorpade	Third Year	Cell member- Executive Officer
Kaushika Sodha	Third Year	Cell member- Finance Committee
Krisha Parmar	Third Year	Cell member- Editorial Committee
Sakshi Tembare	Third Year	Cell member- Sports Committee
Siddhi Vaidya	Third Year	Cell member- Cultural Committee

ART CORNER

RIYA GHADAGE - F.Y.B PHARM

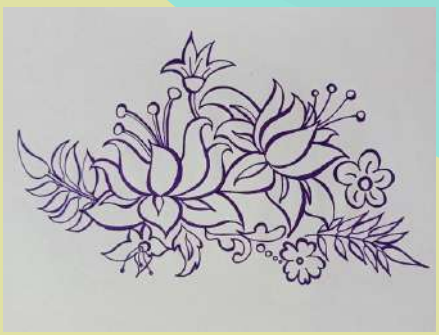
DIKSHA PATIL - T.Y.B PHARM

PALAK NIRBHAVANE
F.Y.B PHARM

VAISHANAVI GHATAGE
F.Y.B PHARM

ART CORNER

VEDIKA DANGE
F.Y. B PHARM



PRAJAKTA AHER
T.Y.B PHARM

ARYA KADAM
S.Y.B PHARM

BHAVNA WALLAKATTI
T.Y.B PHARM

ART CORNER

PAYAL GUPTA - FY M PHARM

DEVI DHURI - T.Y.B PHARM

PAYAL GUPTA - FY M PHARM

APEKSHA CHAVAN - FINAL YEAR B PHARM

ART CORNER

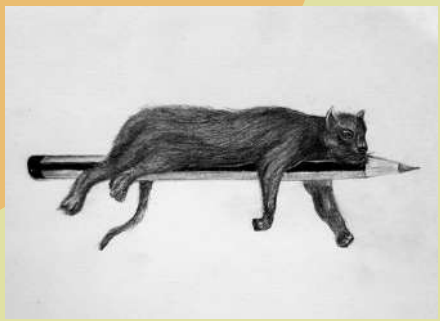
PRATIK KADAM- S.Y. B. PHARM

APEKSHA CHAVAN - FINAL YEAR B PHARM

SIDDHI POYREKAR- S.Y. B. PHARM

BHAVNA WALLAKATTI - T.Y.B PHARM

ART CORNER



PARIGHA GHARAT
T.Y.B PHARM

BHAVNA WALLAKATTI
T.Y.B PHARM

SWARANGI GANDHAT
S.Y.B. PHARM

BHAVNA WALLAKATTI
T.Y.B PHARM

The Photo Gallery

Suchitra Elangovan
Final Year B Pharm

Sanjana Deshmukh
Final Year B Pharm

Samruddhi Kadam
F.Y B Pharm

Sejal Haldankar
S.Y B Pharm

The Photo Gallery

Sumit Kumkar
FINAL YEAR B PHARM

Akash Solanki
FINAL YEAR B PHARM

Jayesh Vaishnav
FINAL YEAR B PHARM

Jayesh Vaishnav
FINAL YEAR B PHARM

The Photo Gallery

Suyash Ambekar
TY B Pharm

Suchitra Elangovan
Final Year B Pharm

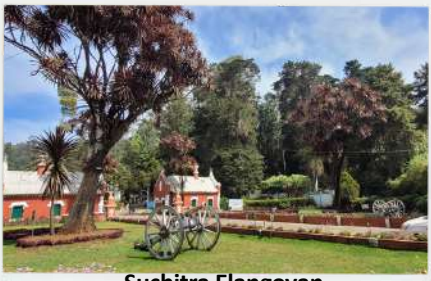
Jayesh Choudhary
Final Year B Pharma

Darsham Bodas
Final Year B Pharm

The Photo Gallery

Diksha Patil
TY B Pharm

Sanchit Patil
SY B PHARM



Suchitra Elangovan
FINAL YEAR B PHARM

Jayesh Choudhary
Final Year M Pharm

The Photo Gallery

Jayesh Choudhary
Final Year M Pharm

Darshan Bodas
Final Year B Pharm

Sanjana Deshmukh
Final Year B Pharm

Samruddhi Kadam
FY B Pharm

The Photo Gallery

Jayesh Choudhary
Final Year M Pharm

Apeksha Chavan
Final year B Pharm

Jayesh Vaishnav
Final Year B Pharma

Sanjana Deshmukh
Final Year B Pharma

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