MARRI LAXMAN REDDY GROUP OF INSTITUTIONS

Marri Laxman Reddy Institute of Pharmacy

(Approved by AICTE & PCI, New Delhi, JNTUH Affiliated)
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Medchal Dt, Hyderabad
Telangana State - 500043

"The greatest medicine of all is teaching people how not to need it"

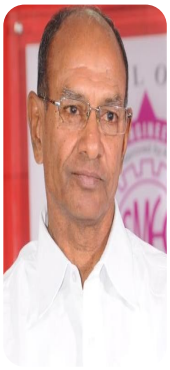
- Hippocrates

INSIDE THIS:

PharmaScout

MLRIP's official e-mag

Vol.6, 2023



Sri Marri Laxman Reddy

Chairman

MLR Group of Institutions

He has been in the field of education for more than three decades. He is an exemplary personality and extraordinary visionary and a constant inspiration to the younger generation. He is a veteran athlete of international repute. He emphasizes the importance of physical health for academics and overall personality development.

Sri Marri Rajshekar Reddy

Founder-Secretary

MLR Group of Institutions

He is a person of great acumen and remarkable abilities. He is a dynamic leader and strives hard to make every dream a reality. He is an initiator, innovator, and executor of novel plans for the progress of the institutions. He is the motivational and driving force of all the activities in the campus.

PRINCIPAL'S DESK

Dr. Nakka Jyothi
Professor & Principal

Dear Students, Faculty, and Staff,

It is with great pleasure that I welcome you to the latest edition of our college journal. As we delve into the diverse array of articles, essays, and creative works contained within these pages, I am reminded of the remarkable talent and dedication that permeates every corner of our institution.

Our college community is built upon the foundation of academic excellence, innovation, and inclusivity. It is through the collective efforts of our faculty, staff, and students that we continue to uphold these values and strive for excellence in all endeavors.

In the rapidly evolving landscape of higher education, it is imperative that we remain steadfast in our commitment to fostering a dynamic learning environment that equips students with the skills, knowledge, and adaptability necessary to thrive in an ever-changing world. As educators, it is our responsibility to empower students to think critically, communicate effectively, and embrace the challenges and opportunities that lie ahead.

Within these pages, you will find a reflection of the intellectual curiosity, creativity, and passion that define our college community. From insightful research papers to thought-provoking opinion pieces, each contribution serves as a testament to the depth and breadth of talent within our midst.

As we celebrate the achievements of our students and faculty, let us also reaffirm our dedication to the principles of equity, diversity, and inclusion. It is through the celebration of our differences and the cultivation of a supportive and inclusive community that we truly fulfill the promise of higher education.

I would like to extend my sincerest gratitude to the editorial team, contributors, and everyone involved in the production of this journal. Your hard work and dedication have made this publication possible, and I am continually impressed by the caliber of work showcased within its pages.

GUEST SPACE

Dr. Ashish Jain
M. Pharm, Ph.D.

Dr. Ashish Jain, Professor, School of Pharmacy, LNCT University, Bhopal, has over 11 years of teaching and research experiences.

He has received Felicitation by the Bhopal Collector Shri Nishant Warwade and Excellence Award 2012 for excellence in teaching by Bansal Group. Dr. Jain has serves as reviewer of various publishers like Pearson Education, Advance Pharma Bulletin, Indonesian Journal of Pharmacy, Pharmaceutical Biology etc.

Refer the guest article in Page No. 2

Guest Space

ANTICANCER POLYSACCHARIDES FROM NATURAL RESOURCES

Cancer is a leading cause of death worldwide and a diverse group of diseases characterized by the uncontrolled proliferation of anaplastic cells which tend to invade surrounding tissues and metastasize to other tissues and organs. Cancer results from a mutation in the chromosomal DNA of a normal cell, which can be triggered by both external factors (tobacco, alcohol, chemicals, infectious agents and radiation) and internal factors (hormones, immune conditions, inherited mutations, and mutations occurring in metabolism). A report released by the World Health Organization (WHO) showed that an estimated 12.7 million people were diagnosed with cancer globally and about 7.6 million people died of it in 2008. As estimated in this report, more than 21 million new cancer cases and 13 million deaths are expected by 2030.

Polysaccharides can be classified into two groups based on their source. Natural polysaccharides are obtained from various organisms, such as algae, plants, microorganisms, and animals. The polysaccharides possess various physicochemical properties including gelation, solubility, low osmotic effect, and surface properties depending on their composition and architecture.

Numerous studies have suggested that polysaccharides can inhibit tumor growth through the following common mechanisms: (1) the prevention of tumorigenesis by oral consumption of active preparations; (2) direct anti-cancer activity, such as the induction of tumor cell apoptosis; (3) immunopotentiation activity in combination with chemotherapy; and (4) the inhibition of tumor metastasis.

Polysaccharides from mushrooms

Mushrooms have an established history of use by many countries as an edible and medical resource, especially in traditional oriental therapies of some Asian countries. Even in modern clinical practice, mushroom-derived bioactive components are still utilized. Over the last half-century, studies in Japan, China, Korea, and, more recently, the United States have increasingly demonstrated the potential of mushroom-extracted compounds in the prevention and treatment of cancer.

Polysaccharide from Achyranthes bidentata

The A. bidentata polysaccharide (ABPS) isolated from its root is a graminans-type fructan with a molecular weight of 1400 Da (Zou et al., 2011). It consists of a β-d-fructofuranosyl backbone with (2 → 1)- and (2 → 6)-linked residues with branches and an α-d -glucopyranose residue on the non-reducing end of the fructan chain (Jin et al., 2007). ABPS showed opposite effects on tumor growth depending on its dose (Jin et al., 2007).

Fucoidan

Fucoidan is a general term for sulfated polysaccharides derived from brown seaweeds and some marine invertebrates, like sea urchins and sea cucumbers (Holtkamp, Kelly, Ulber, & Lang, 2009). Fucoidans are mainly composed of l-fucose and sulfate ester groups together with small numbers of other monosaccharides (mannose, galactose, glucose, xylose, etc.), uronic acids, acetyl groups and proteins.

Polysaccharides from Cyclina sinensis

CSPS-3 was a purified fraction obtained from the crude polysaccharides of C. sinensis (CSPS). It possessed a strong inhibitory effect on the growth of tumor cells in vitro.

Polysaccharide from Gekko swinhonis Guenther

G. swinhonis Guenther is a traditional Chinese medicine, and the dried whole body has been used as an anti-cancer drug in China for hundreds of years. A homogeneous sulfated polysaccharide–protein conjugate (GSPP) possessing anti-cancer activities was isolated from G. swinhonis Guenther.

Polysaccharide from Escherichia coli

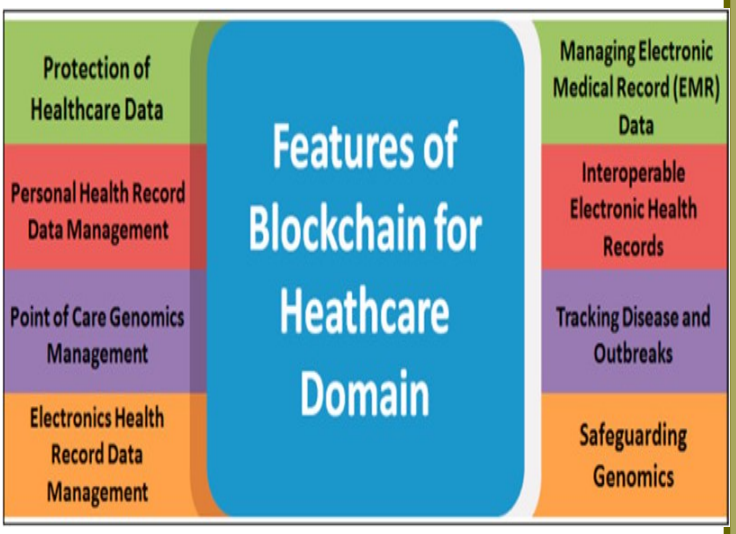
The O-sulfated polysaccharide from capsular of E. coli K5 (K5PS) is a heparin-like polysaccharide without any anticoagulant activity. O-sulfated K5PS has been shown to inhibit tumor metastasis in mice models as well as tumor cell invasion and adhesion in vitro.

BLOCK CHAIN TECHNOLOGY IN HEALTH CARE

Mrs. Samyuktha Metta, M. Pharm, Asst. Professor, Dep. of Pharmaceutics

M. Keerthana, B. Pharmacy III Year

Blockchain is an emerging technology being applied for creating innovative solutions in various sectors, including healthcare. A Blockchain network is used in the healthcare system to preserve and exchange patient data through hospitals, diagnostic laboratories, pharmacy firms, and physicians. Blockchain applications can accurately identify severe mistakes and even dangerous ones in the medical field. Thus, it can improve the performance, security, and transparency of sharing medical data in the health care system[1]. This technology is helpful to medical institutions to gain insight and enhance the analysis of medical records.



It can help avoid the fear of data manipulation in healthcare and supports a unique data storage pattern at the highest level of security. It provides versatility, interconnection, accountability, and authentication for data access.

Health and pharmaceuticals will get rid of counterfeit medications using Blockchain technologies, enabling tracing of all these medicines. It helps discover the cause of falsification. Blockchain can guarantee the confidentiality of patient records; when medical history is developed, Blockchain can also store it, and this record cannot be modified.

n healthcare, Blockchain has a wide range of applications and functions. The ledger technology helps healthcare researchers uncover genetic code by facilitating the secure transfer of patient medical records, managing the drug supply chain, and facilitating the safe transfer of patient medical records.

Applications:

Smooth, efficient data sharing and delivery across all the prominent network members and healthcare providers contribute to developing economical therapies and sophisticated treatments for many diseases.

It is used for following purposes:

- Store information of an individual patient.
- Analyse the effects of a particular procedure.
- Validation.
- Safety and transparency.
- Health record keeping.
- Clinical Trial.
- Identification of false content.
- Reduces needless overhead expenses.
- Patient monitoring.
- Create research initiatives.
- Maintain financial statements in hospitals.
- Minimise data transformation time and cost.

Limitations and future scope:

The big problem with the utilisation of this advanced technology for medical facilities is the lack of expertise. Blockchain applications are still in the early stages and must do more work for technology exploration and research. It, however, applies to medical associations and regulators' obligations. The time has come for the health sector to improve. Blockchain in the field of healthcare is very likely to expand in the future. Its applications in healthcare will improve with this technological innovation as it helps explain the outcomes and progress in the treatment process.

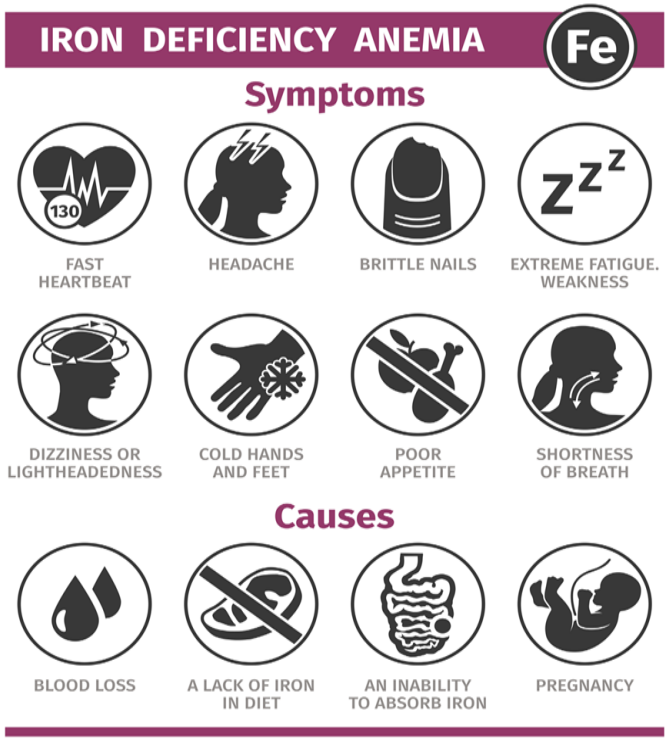
IRON DEFICIENCY ANEMIA

Dr. K. Lakshmi Surekha, Pharm. D, Asst. Professor, Dep. of Pharmacy Practice
Ms. Mudigonda Sowjanya , Pharm. D V Year

Iron deficiency anaemia is a common type of anaemia is a condition in which blood lacks adequate healthy red blood cells. Red blood cells carry oxygen to the body's tissues.

Iron deficiency anaemia can be so mild that it goes unnoticed. But as the body becomes more deficient in iron and anaemia worsens, the signs and symptoms intensify.

CAUSES & SYMPTOMS



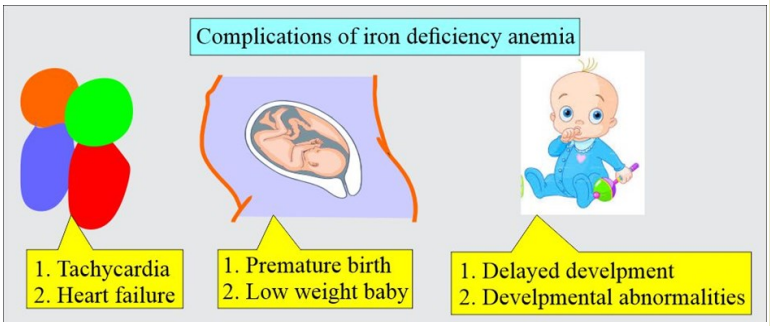
Complications:

Mild iron deficiency anemia usually doesn't cause complications. However, left untreated, iron deficiency anemia can become severe and lead to health problems, including the following:

Heart problems: Iron deficiency anaemia may lead to a rapid or irregular heartbeat.

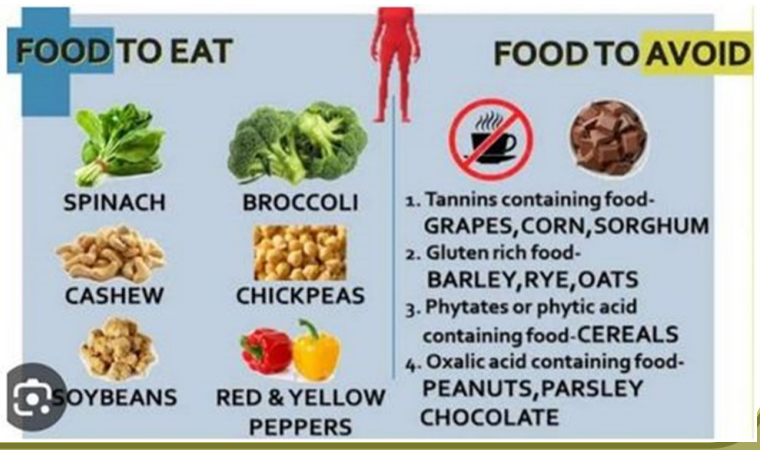
Problems during pregnancy: In pregnant women, severe iron deficiency anaemia has been linked to premature births and low birth weight babies.

Growth problems: In infants and children, severe iron deficiency can lead to anaemia as well as delayed growth and development.



How to prevent Iron Deficiency Anaemia?

- Eating a well-balanced diet that includes iron-rich foods may help you prevent iron-deficiency anaemia.
- Taking iron supplements also may lower the risk for the condition if you're not able to get enough iron from food. Large amounts of iron can be harmful, so take iron supplements only as per the doctor suggestions.



Pharma#Throwback

Edward Jenner and the Birth of Vaccination: A Historical Turning Point

Dr. P. Ramya, Pharm. D, Assistant Professor, Dep. of Pharmacy Practice
Ms. POLANA NAGA DURGA SAI GNAPIKA, Pharm. D V Year

Edward Jenner, a British physician, is widely regarded as the father of immunology and vaccination. His groundbreaking discovery in the late 18th century revolutionized the field of medicine and saved countless lives. Jenner's pioneering work in immunization not only revolutionized the approach to infectious diseases but also laid the foundation for the eventual eradication of smallpox, a global scourge that had plagued humanity for centuries.

With the rapid pace of vaccine development in recent decades, the historic origins of immunization are often forgotten. Unfortunately, since the attack on the World Trade Center on September 11, 2001, the threat of biological warfare and bioterrorism has reemerged. Smallpox has been identified as a possible agent of bioterrorism

The history of smallpox dates back thousands of years, with evidence of the disease found in Egyptian mummies from the 3rd century BCE. Smallpox spread rapidly among populations, causing severe illness and leaving survivors with disfiguring scars. The disease had a mortality rate of up to 30%, making it one of the deadliest infectious diseases in human history.

In the late 18th century, Jenner observed that milkmaids who had contracted cowpox, a much milder disease, seemed to be immune to smallpox. Intrigued by this observation, he conducted a series of experiments to test his hypothesis. On May 14, 1796, Jenner took a sample of fluid from a cowpox sore and injected it into a young boy named James Phipps. This act marked the birth of vaccination. Phipps developed a mild case of cowpox but did not contract smallpox when exposed to the disease later. This experiment proved Jenner's theory that cowpox could protect against smallpox. He coined the term "vaccination," derived from the Latin word "vacca," meaning cow.

Jenner's discovery faced initial skepticism from the medical community. However, as the results of his experiments became widely known, the effectiveness of the smallpox vaccine gained recognition. In 1802, the British government passed the Vaccine Act, making smallpox vaccination free for the public. This marked the world's first national vaccination program, and many countries followed suit.

The eradication of smallpox was a monumental achievement. The World Health Organization (WHO) declared the disease eradicated in 1980, making it the first human disease to be eliminated globally through vaccination. The success of smallpox eradication inspired scientists worldwide to develop vaccines for other infectious diseases.

Jenner's work also laid the foundation for the field of immunology. His breakthrough in understanding how the immune system could be harnessed to prevent disease paved the way for future advancements in vaccination. Vaccines have since been developed to protect against a range of diseases, including polio, measles, influenza, and COVID-19.

Today, vaccination is an essential tool in public health, preventing the spread of deadly infectious diseases and saving millions of lives annually. Edward Jenner's contributions to medicine and his role in the eradication of smallpox have left an enduring legacy that continues to benefit humanity. The success of Jenner's smallpox vaccine sparked a global movement towards vaccination. Governments and medical practitioners worldwide embraced the approach, leading to the establishment of vaccination programs and the incorporation of the smallpox vaccine into public health initiatives. This marked the beginning of organized efforts to combat infectious diseases through immunization.

PHARMACOGNOSY IN MODERN PHARMACY

Dr. KOTRESH YALIGAR, M. Pharm, Ph. D, Assoc. Professor, Dep. of Pharmacognosy
Mr. KOTHAPALLY NIRANJAN, B. Pharm IV Year

Pharmacognosy, derived from the Greek words "pharmakon" (drug) and "gnosis" (knowledge), is probably the oldest modern science, and generally the study of crude drugs of plant and animal origin (in the form of tinctures, teas, poultices, powders, and other herbal formulations), and it incorporates authentication and quality control of such drugs, based on macroscopic and microscopic examinations of crude drugs. The term Pharmacognosy was first introduced by the Austrian physician Schmidt in 1811 and then in 1815 by Seydler in a work titled Analecta Pharmacognostica.

Like any other scientific area, since the introduction of Pharmacognosy some 200 years ago, it has evolved over the years, and now Pharmacognosy can be defined as the science of biogenic or naturally derived drugs, pharmaceuticals, and poisons, and it incorporates various modern analytical techniques to authenticate and quality control of crude drugs as well as purified active extracts, fractions, and components, and even medicinal foods. Drug use from medicinal plants has advanced from the formulation of crude drugs to the isolation, identification, and assessment of bioactivity of active compounds in drug discovery, and so has the subject of Pharmacognosy. The American Society of Pharmacognosy defines Pharmacognosy as "the study of the physical, chemical, biochemical and biological properties of drugs, drug substances, or potential drugs or drug substances of natural origin as well as the search for new drugs from natural sources." Modern Pharmacognosy involves the broad study of natural products from various sources including plants, bacteria, fungi, and marine organisms.

Pharmacognosy has always been a translational or multidisciplinary science, and during the evolution of the scope of this subject area, phytochemistry and phytochemical analysis have become integral parts of Pharmacognosy. Molecular biology has become essential to medicinal plant drug discovery through the determination and implementation of appropriate screening assays directed toward physiologically relevant molecular targets, and modern Pharmacognosy also encapsulates all these relevant new areas into a distinct interdisciplinary science.

While the word Pharmacognosy may not be that visible in the Pharmacy curricula in the UK and USA, some of its contents are still present in various forms and names, e.g., drug discovery from natural products/medicinal plants, herbal therapy, phytotherapy, natural medicines, and phytopharmaceuticals. Despite all odds, the popularity and applications of Pharmacognosy are ever increasing in countries like Brazil, China, and India, the emerging giant economies where Pharmacognosy research has gained new momentum because of its proven potential in contributing billions of dollars to their economy. Despite the challenges facing drug discovery from medicinal plants, natural products isolated from medicinal plants will remain an essential component in the search for new drug candidates.

Whether we like it or not, Pharmacognosy is not a subject of the past, but it has evolved and developed over the years to adapt itself with the changing environment, and is now fit to meet the challenges of the present and the future of drug discovery and development.

Tzield: A Breakthrough in Type 1 Diabetes Management

Dr. S. Bala Murali Mohan, Pharm. D, Assistant Professor, Dep. of Pharmacy Practice
Ms. Ch. Harsha Sree, Pharm. D VI Year

Generic name: Teplizumab-mzwv
Dosage form: Injection
Drug class: Anti-CD3 monoclonal antibody, a type of biologic drug.

Tzield (teplizumab-mzwv) is FDA-approved as treatment to delay the onset of Stage 3 type 1 diabetes in adults and paediatric patients 8 years of age and older with Stage 2 type 1 diabetes. Tzield is an intravenously (IV) administered anti-CD3-directed antibody designed to bind to certain immune system cells and delay progression to stage 3 T1D.

Tzield is administered by intravenous infusion once daily for 14 consecutive days.

INDICATIONS:

TZIELD is a CD3-directed monoclonal antibody indicated to delay the onset of Stage 3 type 1 diabetes (T1D) in adults and paediatric patients aged 8 years and older with Stage 2 T1D.

MECHANISM OF ACTION:

Teplizumab-mzwv binds to CD3 (a cell surface antigen present on T lymphocytes) and delays the onset of Stage 3 type 1 diabetes in adults and pediatric patients aged 8 years and older with Stage 2 type 1 diabetes. The mechanism may involve partial agonistic signaling and deactivation of pancreatic beta cell autoreactive T lymphocytes. Teplizumab-mzwv leads to an increase in the proportion of regulatory T cells and of exhausted CD8+ T cells in peripheral blood.

DOSAGE FORMS AND STRENGTHS:

Injection: 2 mg per 2 mL (1 mg/mL) clear and colorless solution in a single-dose vial.

Recommended Dosage and Administration:

Administer TZIELD by intravenous infusion (over a minimum of 30 minutes), using a body surface area-based dosing, once daily for 14 consecutive days as follows:

- Day 1: 65 mcg/m2
- Day 2: 125 mcg/m2
- Day 3: 250 mcg/m2
- Day 4: 500 mcg/m2
- Days 5 through 14: 1,030 mcg/m2

ADVERSE REACTIONS:

Most common adverse reactions (>10%) were lymphopenia, rash, leukopenia, and headache.

USE IN SPECIFIC POPULATIONS:

- Pregnancy: May cause fetal harm.
- Lactation: A lactating woman may consider pumping and discarding breast milk during and for 20 days after TZIELD administration.

WARNINGS AND PRECAUTIONS:

Cytokine Release Syndrome (CRS), Serious Infections, Lymphopenia, Hypersensitivity Reactions.

VACCINATIONS:

The safety of immunization with live-attenuated (live) vaccines with TZIELD-treated patients has not been studied. TZIELD may interfere with immune response to vaccination and decrease vaccine efficacy. Administer all age-appropriate vaccinations prior to starting TZIELD. Administer live vaccines at least 8 weeks prior to treatment.

Advances in Pharmacy Practice: A Look Towards

Dr. Suvendu Saha, M. Pharm, Ph. D., Assoc. Professor, Dep. of Pharmacology
L. Gnana Prasanna, S. Prathyusha, Shainaaz, S. Sai kiran, B. Pharm IV Year

The Emergence of Pharmacy:

Throughout the 19th century, pharmacy emerged as an identifiable profession emanating from a nebulous background in which various actors delved in medicinal science and other aspects of healthcare .At the beginning of the 19th century in the United Kingdom, parliament passed an act (1815) stating "*There were four degrees in the medical profession, physicians, surgeons, apothecaries, and chymists and druggists*". The chemists and druggists developed into pharmacists in the mid-19th century with the foundation of the Royal Pharmaceutical Society in 1841 in the United Kingdom.

The Traditional Role of the Pharmacist as a Dispenser of Medicines:

Pharmacists assumed a pivotal role in the treatment stage of the healthcare process with the provision and dispensing of medicines and medical devices, checking of medical prescriptions for safety and interactions, and advising patients. This role can be divided into substance-oriented and patient-oriented competences . These competences are associated with legal responsibilities.

At the end of the 20th century, the profession started to evolve further as authorities became aware that the knowledge and skills of the pharmacist could be applied to the prevention of disease, prolongation of life and general improvement of health throughout society.

Evolution of the Traditional Role of the Pharmacist in the Provision and Dispensing of Medicines

Changes in Medicines—Low M.Wt. Chemicals to High M.Wt. Biologics

There is an ongoing change from therapy with low M.Wt. chemical substances to that with high M.Wt. biologics. The latter are often nucleic acids, antibodies, enzymes, and other types of protein. Initially, this will affect specialized, hospital pharmacy then fundamental, community practice.

Nowadays, large M.Wt. biomolecules or biologics are starting to replace these medicines [6]. Although biologics are researched using receptor theory as before, they are developed by biomolecular sciences, immunology, and genetic engineering, and produced with biotechnological processes. Biologics harbor the promise of better targeted therapy for diseases therebefore lacking in suitable remedies.

In the immediate future, most prescription drugs will remain (relatively) cheap, small M.Wt., chemical molecules. Between 2006 and 2009 British academics and National Health Service specialists developed a core list of the one hundred most prescribed medicines. This was revised in 2018. In the future pharmacists will have to adapt to the use of large M.Wt. biologics with complex pharmacotherapy, unique formulation and pharmacokinetics of substances often administered parenterally. As many are heat-labile they may require specific transport and storage facilities. Pharmacists may also have to adapt to a changing economic situation in which therapies are more expensive.

Pharmacogenomics:

A major change in medicinal therapy is the development of pharmacogenomics. Pharmacogenomics is the study of how an individual's genetic make-up can affect a person's response to medicines. The use of genetic testing and pharmacogenomics optimizes medicine selection and dosage. It holds the promise of individually tailored therapy

providing greater efficacy with fewer side effects . It also may allow for the reintegration of medicines with actionable pharmacogenomic data. Classic pharmacogenomic markers were associated with metabolizing enzymes. Potential exists for the use of such data in the treatment with oncology-related medicines and also in psychiatry, infectious, and cardiovascular diseases.

For this specialized practice, pharmacists will need the required competencies. Pharmacogenomics can provide valuable pharmacodynamic and pharmacokinetic information that can be used by pharmacists in the assessment and choice of drug therapy .

IT (Informational Technology) and AI (Artificial Intelligence):

Advances in IT are having a major impact on practice. One example is the development of electronic prescriptions .This ensures greater reliability and safety in repeated prescriptions in chronic illness and ameliorates the sharing of dispensing information between community and hospital pharmacists and between pharmacists and medical doctors.

Progress in IT combined with AI is opening new areas in tele-medicine and tele-dispensing. Tele-medicine is not only driven by such developments but also by decisions on policy and healthcare governance based on the relative responsibilities and cost effectiveness of different professionals.

IT and AI have been used in the creation of treatment algorithms for the monitoring of chronic treatment. For instance, pharmacist-managed warfarin protocols with computerized systems are being used to calculate the anticoagulant dose based on algorithms incorporating clinical factors and the International Normalized Ratio (INR).

Prescribing:

- Rectification of Prescriptions and Care Transfer
- Dispensing without Prescription and Prescription by Pharmacists
- Antimicrobial Resistance

Other Roles of Pharmacists in Healthcare:

- Public Health
- Vaccination

Climate Change and the Pharmacist

There are two aspects of climate change for pharmacists: how can pharmacists fight climate change and how can they fight the healthcare effects of climate change [66]. Examples of the first are the production of greenhouse gases by pharmaceuticals in manufacturing, transportation, and disposal through incineration, the hydroxyfluoroalkane propellants used in metered-dose inhalers, and the contamination of water systems through effluent from the manufacturing of medicines, and human excretion

Caveats and Conclusions:

This review describes the factors determining the future development of pharmacy and the responsibilities of the pharmacist. Wide-ranging changes are occurring for instance in the biotechnological revolution in medicines, the switch to more patient-based practice, dispensing, and zoonoses provoked by climate change.

About MLRIP

VISION To be an educational institute of par excellence and produce competent pharmacy professionals to serve the community through research and the ever-increasing needs of Industry.

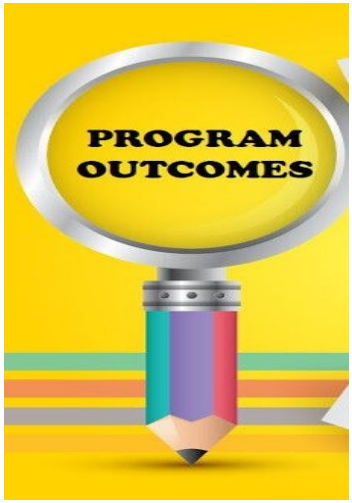
MISSION

1. Imparting quality education and innovative research for various career opportunities.
2. Creating conducive academic environment to produce competent pharmacy professionals.
3. Indoctrination of students adorned with high human values and make them aware of their responsibility as health care professionals.

Program Educational Objectives (PEO)

PEO 1: To produce graduates with sound theoretical knowledge and technical skills required for their career opportunities in various domains.
PEO 2: To incite the students towards research and to address the challenges with their innovative contributions for the benefit of the mankind.
PEO 3: To instill the essence of professionalism, ethical commitment to become a health care professional with sound integrity and adherence to the core human values in the service of the society.

1. **Pharmacy Knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.



2. **Planning Abilities:** Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

3. **Problem analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.

4. **Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

5. **Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well-being.

6. Professional Identity: Understand, analyze and communicate the value of their professional roles in society (e.g., health care professionals, promoters of health, educators, managers, employers, employees).

7. **Pharmaceutical Ethics:** Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

8. **Communication:** Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.

9. **The Pharmacist and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

10. **Environment and sustainability:** Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

11. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.