

Medicinal Chemistry

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ABSTRACT

Medicinal chemistry in its most common practice focusing on small organic molecules encompasses synthetic organic chemistry and aspects of natural products and computational chemistry in close combination with chemical biology, enzymology and structural biology, together aiming at the discovery and development of new therapeutic agents. Medicinal chemistry is a specialised science that has evolved to encompass a broad range of disciplines concerned with the identification, synthesis and development of drug-like compounds for therapeutic use.

Keywords : Medicinal Chemistry, Structural Biology, ADME, Drug Design, Drug Discovery, Drug Targeting, Enzyme Inhibitor, Ligand Efficiency, Mechanism Of Action, Pharmacophore, Pharmacology, Pharmacokinetics

I. INTRODUCTION

Chemistry is the base for the branches of medicinal chemistry, biological chemistry and pharmaceutical chemistry. Chemistry is a basic broad science, embracing the concepts of creation of molecules and the manipulation of atoms. The role of chemistry in present day life is vast. It helps in the science of medicine. Chemical research goes hand in hand with medical research. Chemistry is an aid to agriculture. It covers interactions with plants, animals and humans through agriculture, biology and medicine and with the physical world through electronics, new building materials and new sources of energy.

Medicinal chemistry deals with the design, optimization and development of chemical compounds for use as drugs. It is inherently a multidisciplinary topic beginning with the synthesis of potential drugs followed by studies investigating their interactions with biological targets to understand the medicinal effects of the drug, its metabolism and side-effects. It needs a wide range of expertise, developed through years of training, dedication and learning from best practices in order to produce drugs that are good enough to enter clinical trials in patients.

➤ Definition of medicinal chemistry:

“Medicinal chemistry concerns the discovery, the development, the identification and the interpretation of the mode of action of biologically active compounds at the molecular level. Emphasis is put on drugs, but the interest of the medicinal chemist is not restricted to drugs but include bioactive compounds in general. Medicinal chemistry is also concerned with the study, identification and synthesis of the metabolic products of these drugs and related compounds.”

➤ Areas covered under medicinal chemistry:

- ✓ ADME("absorption, distribution, metabolism, and excretion,)
- ✓ Bioavailability
- ✓ Chemogenomics
- ✓ Drug class
- ✓ Drug delivery
- ✓ Drug design
- ✓ Drug discovery
- ✓ Drug targeting
- ✓ Enzyme inhibitor
- ✓ Ligand efficiency
- ✓ Mechanism of action
- ✓ Mode of action
- ✓ New chemical entity
- ✓ Pharmacodynamics
- ✓ Pharmacokinetics

- ✓ Pharmacology
- ✓ Pharmacophore
- ✓ Quantitative structure-activity relationship.

Medicinal chemists have an ever changing role in modern drug discovery. No longer are the days of simple synthesis; instead, complex synthetic methods and technologies such as combinatorial chemistry (combiChem), microwave assisted organic synthesis (MAOS) and high-throughput (HTS) biological screening methods have evolved the daily life of a chemist. These new technologies are helping him to attain his goal much faster in the discovery process. Drugs must be designed, synthesized and purified successfully in order to aid in the first step of development. Medicinal chemist combines comprehensive knowledge of the synthetic chemistry, medicinal chemistry, and biology literature with the ability to drive the project forward. They are scientifically broad innovators who propose and work on all available drug targets.

➤ **Advances in Medicinal chemistry:**

Medicinal chemistry is by nature an interdisciplinary science, and practitioners have a strong background in organic chemistry, which must eventually be coupled with a broad understanding of biological concepts related to cellular drug target. In recent decades are increasing enormously due to pathogenesis of diseases. [1] Medicinal Chemistry helps in collaboration with scientific people in researching and developing new drugs. As a result drug discovery and drug research became predominant in role of controlling diseases with the discovery of powerful medicines like cytotoxic drugs, hypertensive drugs, antipyretic, anti-analgesic, anti HIV drugs, etc. Synthetic organic chemistry especially is involved in design, synthesis and development of drugs which are bio-active molecules. Synthesis and development is only the part of drug discovery, but the efficacy of that drug and target to the particular site is important for the treatment of diseases like cancer, Cardiovascular, pulmonary diseases, and these involve many factors.

[2] The world is getting better due to pharmaceutical industry. Today's life expectancy is the highest in human history. The quality of life is better than it was hundred

years ago. In western countries, people no longer die of measles at the age of five, nor do we run of succumbing to pneumonia at age of 28. All these came along as a result of tremendous progress in medical sciences and pharmacology. Medicinal chemistry is the interdisciplinary science, with one having strong background in Organic chemistry coupled with the knowledge of biological concepts to deliver the required cellular targets. Medicinal chemistry in combating the diseases starts from preclinical studies, i.e., identification, drug design and development till the appropriate drug formulation is obtained. Then comes to clinical studies tested for efficacy of the compound and then comes into the treatment for combating the particular disease. Phytochemicals which are natural bioactive compounds found in various parts of plant vegetables, fruits possess wide range of potential chemical entities such as flavonoids, organo-sulphurs, polyphenols, catechin, isoflavones, carotenoids.

[3] Some of them were proved to reduce the risk of cardiovascular disease and considered as the lead structures for the cardiovascular drug design. Drugs were classified based on their antagonist properties of that particular disease. Serendipitous discovery sometimes led to the discovery of various prophylactic and therapeutic agents to combat diseases.

Applications:

Chemical sciences have contributed significantly to the advancement of human civilization. With a growing understanding and ability to manipulate chemical molecules, the chemist is considered a societal problem solver. They play a significant role in the eradication of deadly diseases by developing life-saving pharmaceuticals and chemical pesticides. The chemical industry has been a vital sector of the modern industrialized economy and for the development in the Medicinal chemistry. Development of chemistry has revolutionized the basis of modern medicine. Application of chemistry from dyes to therapeutics has brought about incalculable benefits to humanity. Chemist is the magician who can turn waste products into things both beautiful and useful. Waste products like saw dust can be made to yield oil and acids. Marvelous indeed are the achievements of modern chemistry.

Medicinal chemists, especially in academia, are now increasingly involved in drug discovery and development process; they have become tremendously important in the innovation and discovery of drugs. Therefore, many industries are realizing this potentiality from academia and they are approaching for possible collaboration. In medical research the industry-academia cooperation often pair university (medicinal chemistry research) with industry (resources) for technology transfer to bring new medicines from bench to bedside. Such collaborations have and will continue to improve human health by facilitating novel and innovative drug molecules and treatments.

II. CONCLUSION

From all the above, Medicinal chemistry is concerned with the chemistry together the design, discovery and development of new pharmaceuticals. The discovery of new drugs is one of the most exciting and rapidly developing fields in science, and there is a growing need for safer, more effective pharmaceuticals against old diseases (like cancer), new ones (such as HIV/AIDS) and diseases that are becoming more widespread (such as malaria and tuberculosis). Medicinal chemistry looks at how to find drugs to combat these diseases, and how to make those drugs.

III. REFERENCES

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