



Importance of Medicinal Chemistry and the Role of Medical Chemists

Lina Zhang*

Department of Medicinal Chemistry, Shandong University, Jinan, China

DESCRIPTION

Medicinal chemistry or pharmaceutical chemistry is the scientific branch at the boundary between chemistry and pharmacology and deals with the design and development of pharmaceuticals. Medicinal chemistry involves the identification, synthesis, and development of new chemicals that serve therapeutic purposes. It also includes studies of existing drugs, their biological properties, and Quantitative Structure-Activity Relationships (QSAR).

Medical chemistry is a highly interdisciplinary science that combines organic chemistry with biochemistry, computational chemistry, pharmacology, molecular biology, statistics and physical chemistry.

Compounds used as drugs are mostly organic and often fall into a broad class of small organic molecules (e.g., atorvastatin, fluticasone, and clopidogrel) and "biologics" (infliximab, erythropoietin, insulin glargine), the latter being is the most common drug. Drugs can also be inorganic and organometallic compounds, commonly referred to as metallodrugs (eg, platinum-, lithium-, and gallium-based drugs such as cisplatin, lithium carbonate, and gallium nitrate, respectively). The field of biomedical inorganic chemistry studies the role of metals in medicine (metal therapeutics).

Medicinal chemistry in its simplest sense has been practiced for thousands of years. People have sought remedies for ailments by chewing herbs, berry roots and bark. Although some of these early clinical trials were highly successful, knowledge of the active ingredients of these natural sources was only known for the past 100 years. Early written records document the therapeutic effects of various herbal preparations. If the approach to medicine research had continued as it did in ancient times, few ailments

would be curable today. Natural products make up a small portion of the drugs currently on the market. If a natural product proves to be active, it is usually chemically modified to improve its properties. Since the late 1940s, as a result of advances in synthesis/separation methods and biochemical methods, it has become possible to develop rational drugs that incorporate elements of design.

Medicinal chemistry requires a solid foundation in organic chemistry. Other valuable coursework includes physical chemistry, molecular biology, toxicology, statistics, project management, and computational chemistry. Although there are doctoral programs in medical chemistry, most positions still aim for an organic chemistry degree. The reason is that bench work experience is often a job requirement. For example, applicants should have experience in biological assays, molecular modeling, X-ray crystallography, and NMR. Collaboration is expected as drug development, synthesis and characterization are teamwork. The team typically consists of organic chemists, biologists, toxicologists, pharmacists and theoretical chemists.

- Chemists have several options in this field. They include:
- Research on the effects of chemicals on biological systems (human or animal).
- New drug development and formulation definition for delivery of bioactive compounds.
- Laboratory experiments and testing of new drugs in patients.
- Identify other compounds that may interact with the drug and determine the nature of the interaction.
- Development of protocols for drug administration.
- Development of guidelines on how to manufacture medicines and recommendations for use of medicines, including recommendations for the United States, Food and Drug Administration (FDA)

Correspondence to: Lina Zhang, Department of Medicinal Chemistry, Shandong University, Jinan, China, E-mail: zhangli_na@edu.cn

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