

# Role of organic, medicinal & pharmaceutical chemistry in drug design: introduction

**Keywords:** organic molecule, medicinal, pharmaceutical, pharmacophore, nanomedicine, nanotechnology, drug discovery

## Introduction

Organic molecules perform key functions in nature, drug, and technology. It plays as the engine for understanding structure and reactivity. This science has found application in the production of molecules of commercial interest; in the construction of newer pharmacological active therapeutic agents derived from rational drug design, into synthesize complex natural molecules, in the finding innovative approaches to render this chemical science more efficient.<sup>1</sup> The role played by organic chemist in pharmaceutical industry continues to be one of the main drivers in the drug discovery process. However, the precise nature of the role is undergoing a visible change, not only because of the new available to the synthetic and medicinal chemists, but also in several key areas, particularly in drug metabolism and chemical toxicology, as chemists deal with the ever more rapid turnaround of testing data that influences their day-to-day decision. Objective of medicinal chemistry is to design and production of compounds that can be used in medicine for prevention, treatment and cure of human or animal disease. Taken in retrospective sense medicinal chemistry includes study of already existing drugs, of their pharmacological properties and their structure activity relationship (SAR) along with above prospective sense. Pharmacology<sup>2</sup> is derived from pharmakone = drug and logos = discourse or treatise, and hence includes allied fields such as pharmacy, pharmacognosy, toxicology, posology, chemotherapy, therapeutic and materia medica. "Pharmacy" is the study of the formulation of an active chemical entity, in the form of tablets, capsules, powders, aerosols, injections etc. The physiological activity of drugs has been found to depend upon the presence of particular functionality or structural unit.<sup>2</sup> Part of drug which causes actual curing effect is known as "pharmacophores". There are two major considerations that have to be discussed in any drug design project. First, drugs interact with molecular targets in the body and so it is important to choose the correct target for the desired pharmaceutical effect.<sup>3</sup> In other words a drug that will interact is powerfully and selectively as possible for that target is known as "pharmacodynamics". Second, a drug after administration has an ability to travel through the body in order to reach its targets is known as "pharmacokinetics". Nowadays, nanomedicine research played significant role in drug discovery. Generally, nanomedicine is a field of medicine to facilitate the information tools of nanotechnology to the prevention and cure against several lethal diseases viz.<sup>4</sup> microbial, malaria, HIV, TB, cancer etc. The development of newer pharmaceuticals is currently a critical and challenging task to the pharmaceutical industry. The vital interest of the medicinal and agrochemical industries in organic synthesis is often related with their natural occurrence. Similarly, medicinal and pharmaceutical field, there has always been and continue to be a need for newer chemical entities with diverse biological properties.<sup>5</sup> Many works are still needed to minimize the time, expenditure, and attrition rate in the drug discovery process simultaneously addressing the huge unmet medical need across the world. Referencing the study report, poor pharmacokinetic and preclinical toxicity were the main reasons for the failure in the drug development, in addition to the lack of efficiency

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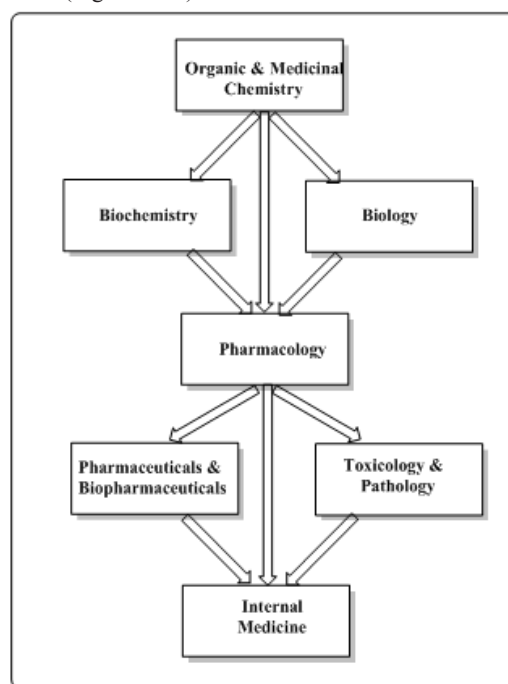
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and adverse effects.<sup>6</sup> New drugs are necessitated to cure new diseases, to find less hazardous drug and to cure diseases whose drugs have become ineffective due to resistant strains of microorganisms. Besides these causes, new drug discovery and researches are required to recognize pharmacophore present in the effective drugs.<sup>7,8</sup> We must always continue to search for drugs which exhibit clear advantages over the already existing respective drugs. Such advantages may be: improvement in bioactivity, partial or total absence of adverse effects, minor toxicity, more nutritive value, improved stability and decrease in production cost.<sup>9-12</sup> Nowadays, research development department (R&D) of many organic and pharmaceutical laboratories are working for synthesis of newer biophores/pharmacophores having improved their potential in drug activity and increasing yields of existing drugs. Finally, this chemistry has contributed to life processes and to the efforts to advance the quality of life as well as to the development of society from synthetic, medicinal, biopharmaceutical and industrial point of view (Figures 1–3).



**Figure 1** Ramifications of Organic, Medicinal & Pharmaceutical Chemistry.

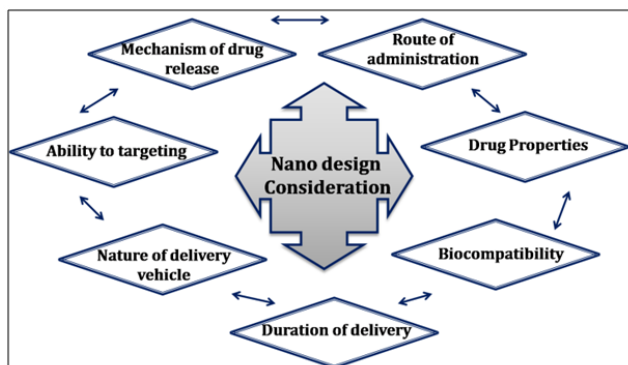


Figure 2 Nano design consideration of drug discovery

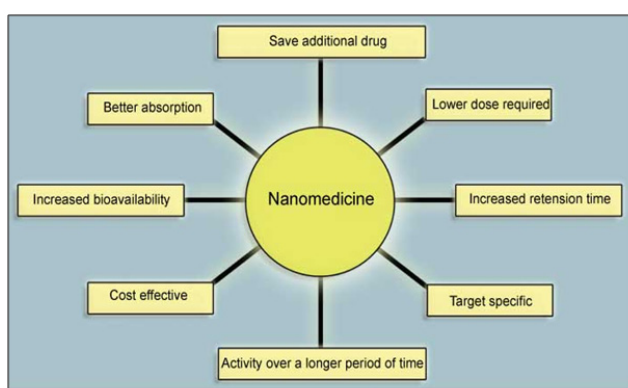


Figure 3 Importance of Nanomedicine

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## Conflict of interest

No conflict of interest.

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