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ROLE OF ALL TYPE CHEMISTRY IN DRUG DISCOVERY AND DRUG DESIGN: A REVIEW

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ABSTRACT

As we all aware about chemistry, there is lots of use of chemistry in research, development, and new drug discovery. In this review paper we are trying to explain all thing related to drug discovery and drug development with the help of chemistry. Directly or indirectly chemistry plays a most important role. Every Pharmaceutical drug has its own structure with its chemical and structural formula, if a single molecule or any attached component will change then there is change in its functional ability and this is Science all about the drug discovery and drug development. Some are the basic things which are most important to study are studied in this paper with there application's.

KEYWORDS: Chemotherapy, Discovery, Development, Analytical.

INTRODUCTION

The process of drug discovery, which principles to identify the compound medicinally useful in treating and curing of disease. The drug discovery process involves following factors:

1.Identification

2.Synthesis

3.Characterization

4.Screening

5.Assay

The firstly compound show value of tests, begin the process of drug development to clinical trials. The drug discovery and development process is high cost of R and D and human clinical test. The total costs of per drug development from IND 400 Crore to IND 1Kharab. The all time of drug development is 10 - 15 Years. The cost of all process estimated

US$ 1.4 billion for single new drug discovery, all support of research come from income private pharmaceutical company that sponsors the work. The new Approach to understand, how disease and infection are controlled in physiological level and target the specific group on this knowledge. The process of drug discovery and drug design are mainly two parts, firstly preclinical studies and secondly is clinical studies . The research team formed and set the objectives than synthesized the chemical. The chemical tested for efficiency and safety in test tubes and animals. The result used to choice drug candidates. Than the formulation,stability scale - up synthesis and chronic safely in animals. The company fields investigational new drug (IND) application with FDA. Than the human trials are continue in Phase I: selection of healthy human and study (toleration). Phase ll: study of efficacy and dose range in patients, followed by trials of thousands Patient to develop broad database of efficacy and safety for (4-7%)drug candidates patient for service of development trials. New drug application (NDA) contain all research data is field for experts at FDA. Than approval of new drug and marketed and the supply for doctors and patients to treat the disease. The success required of drug discovery resources are scientific and logical minds, high advance laboratory and technology and project management. This process of drug discovery brings trust and relief to billions of patients. Drug discovery in organic medicinal and pharmaceutical chemistry in drug design. Organic molecules performed mainly three functions; Nature, Drug and Technology. The roll play by organic chemistry in pharmaceutical industry in drug discovery process. The nature of roll is visible change not only because new available of synthetic and medicinal chemist(4). The medicinal chemistry include study of existing drug and their pharmacological properties of structure activity relationship (SAR).

"Pharmacology "is derived from Pharmacon means Drug and logos means Discourse and include for various fields such Pharmacy, Toxicology, Chemotherapy, Posology, Therapeutic and materia medica.[1,2,56,10,11,12,13]

Type of Chemistry[2,4,5]

In Pharmaceutical field there are lots of varieties of medicine used for human being and animal also to treat diseases and for other purposes. Every Drug has its own structural and chemical composition. Every drug has its own chemistry behind its synthetic nature.

As above chart there are mainly 5 types of chemistry used in Pharmaceutical

Organic chemistry

Analytical chemistry

Computational chemistry

Physical chemistry

Inorganic and Biochemistry.

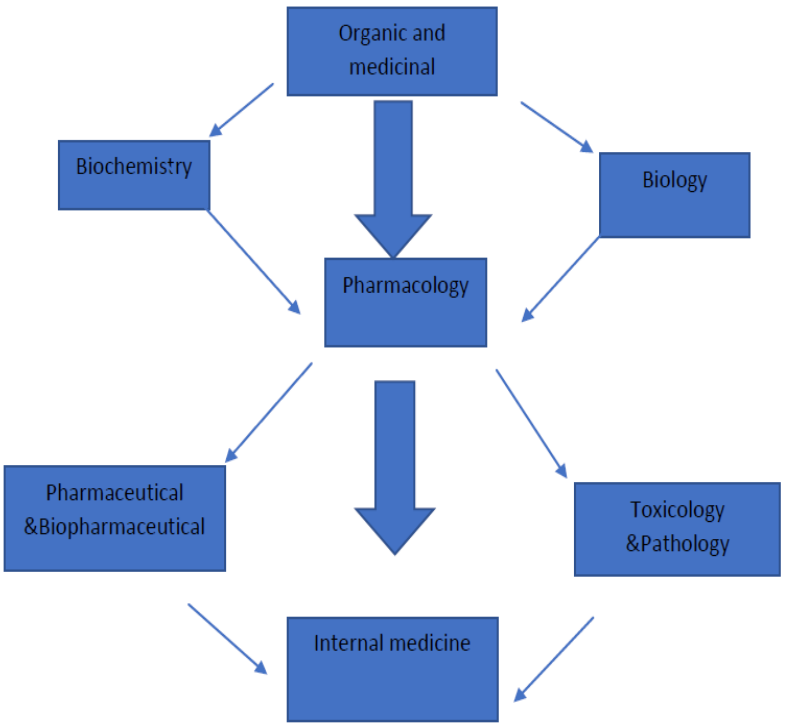
Organic chemistry plays an important role in the new research and development of drug by changing structural and molecular of the drug. Organic chemistry involves various chemical synthesis route and other all kinds of the chemical constituents study.

Computational chemistry is speciality that contributes to design of drug as well as the drug discovery process by helping design and study of molecular structures and chemical compounds that are used as foundation of the new drugs and medicines.

Analytical Chemistry is an ideal background when working on 'Pharmaceutical Quality control and Quantity Assurance'. Due to this we get brief information and knowledge about safety,stability, efficacy of drug and medicine.

With HPLC and Analytical chemistry its become easy to drug development study.

Physical chemistry is most important type of chemistry used in study of physical nature of compound.



Drug Discovery[1,2,3,4,5,6]

The first step of drug discovery is identify the suitable 'druggable' target. Which is used Bio molecular Or protein receptor that is expressed to connected with all disease condition or pathology. After identify the target the next step is validation and confirmation and in the disease development.

Stages of drug discovery;

1.Target identification

2.Target validation

3.lead identification.

4.lead optimization

5.product characterization

6.formulation and development

7.preclinical research

8.investigation new drug

9.clinical trials

10.new drug application

11.approval

1.Target Identification

Identification of biological origin of a disease is first step of discovery. In Target identification start with isolating the function of a possible therapeutics target and it's role in the disease. Identify target must be efficacious safe, meet clinical and commercial requirements and be druggable also. The principal and target identification based on molecular biology biochemistry genetics biophysics and other disciplines.

2.Target validation

In this process the expected molecular target in example of gene, protein and nucleic acid in small molecule is certified.

Target molecular include

1. SAR defined
2. Drug ability (preliminary toxicity)
3. synthetic feasibility
4. select mechanistic assays
5. In vitro assessment of drug molecule resistance and efflux potential

6. Evidence of in vivo efficacy of chemical class.
7. pk/toxicity of chemical class know based on preliminary toxicity or in silicon studies

Target validation is important in transforming a compound from lead molecule in a drug

3. lead optimization

Lead optimization is process of the drug designed after an initial lead compound. Its identification Labs required the acquire data on the toxicity efficacy, stability and Bioavailability of leads, in order to accurate characterize compound and establish the route of optimization. Mass spectrometry is used the detection and quantitation of metabolites.

4. Product Characterization

When any drug molecule have promising therapeutic activity. The molecule characters by its size, shape, strength, weakness, use, toxicity and biological activity. This is helpful characterize the mechanism of action of the compound.

5.Formulation development

The Physicochemical property of active pharmaceutical ingredient (APIs) are characterized to product a bioavailable, stable and optimal dosage form for a specific administration route.

6. Preclinical research

Pre - clinical research in drug development process includes evaluation of drug safety and efficacy in animal species that involved to prospective human outcome. Preclinical trial acquire by corresponding regulatory authorities. This authorities conducted safe and ethical way. Authorities conducted in two ways general pharmacology and toxicology. Pharmacology in that Pharmacokinetic and pharmacodynamics properties of drug.(7) In this involved absorption, distribution, metabolism and excretion. Toxicity is the in-vitro and in-vivo test evaluation.

7.The Investigation new drug process (IND)

In this application to FDA before commencement clinical research. In IND application develops.

1.preclinical and toxicity study data
2.drug manufacturing information
3.clinical research protocols for studies to be conducted
4.previous clinical research data

5. information about the investigator developer

8. clinical Research

In clinical trials those people are intended to answer of specific questions about safety and efficacy of drug. Vaccines, therapies and new methods using current treatment. Phases of clinical trials in that;

Phase 0:clinical trials

Phase1: safety and dosage

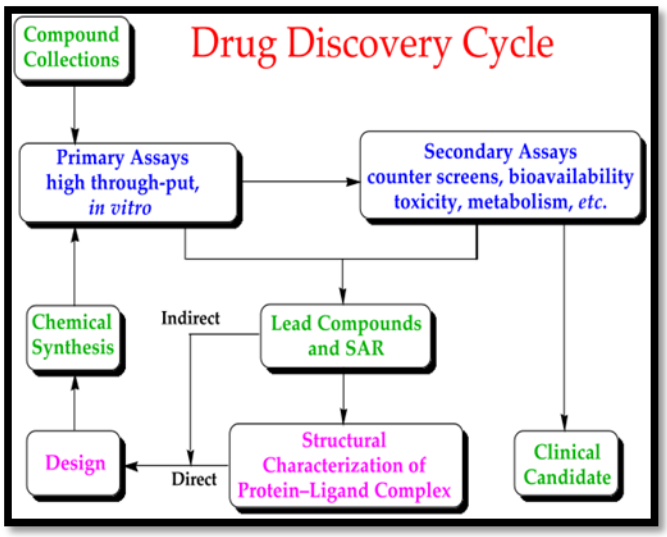
Phase 2: efficacy and side effects

Phase 3: efficacy and adverse drug reaction monitoring

Phase 4: Post - market drug safety monitoring

9. New drug application

New drug application means all story of drug molecule. In that verify the drug and effective the use of people studied. It's include phase of clinical trials.



Drug Design[8,9,10,11]

Drug design mainly referred as rational drug design or simple rational design. The process is unique process of finding new medication based on biological fix target. The design drug is organic molecule that active or inhibits the function of biomolecules, which result in therapeutic benefit to patient. The design drug replace shape and charge to targeted biomolecule, which interact and bind it. The drug design is know ledge of three dimension structure of bimolecular target called structure-based drug design.

The drug design process is multiple cycle optimised lead to phase 1 clinical trials. (8)The first step is cloning, purification and structure determination of target protein their are three principle method X- crystallography, NMR and homology modelling using computer check static and electrostatic interaction with target site and tested with biochemical assay.

Choice of drug target

The choice drug target is made biological and basis. The targeted drug for structure base drug design closely linked to human disease and bind drug molecule to carry function. The target molecule usually bind pocket.

Identification of target site

The drug identification of potential ligand bind target molecule. The target site pocket of potential hydrogen bond donors.

Drug design method

The structure and target site identified to develop good lead based structure of target. The path is computer aided experiments. They focus on review,. High throughput screening with combinatorial chemistry.

Modifying initial compound

The targeted drug are include subtracted and cofactors are modified to excellent inhibits in presence of substrate, cofactors, drug lead and inhibit silicon based interaction.

Docking on small molecules Vs De Nava generation:

The main principle of docking compounds from data bases.(9) The available chemicals database into target site compound purchased and tested using biochemical assay.

Application

1. Structure based Drug Design

The performed with available Structure model of target proteins provide x - ray diffraction, Nuclear magnetic resonance (NMR) and molecular stimulation, In complexity of cancer diverse phenotype and multiple etiologist.(10) The design strategy for development of cancer to does not yield successful results.

2. Ligand - Based Drug Design

The ligand based drug design doesn't search small molecules libraries. It relief knowledge of known molecules bind to target proteins of interest.[11]

3. Virtual Screening

The rapid development of computational resources and small molecules data base have breakthrough in development of compound.[12] The Virtual Screening is part of computer aided drug design methods, To identify the potential compound for successful using this technology.[13]

4. Molecular dynamic of cardiac Modeling

5.Cancer modelling and network biology

6.Multiscale modelling for drug discovery in brain disease.

7. Infectious disease.

CONCLUSION

From these reviews paper it clear that chemistry plays an important role in drug discovery and drug design. In future these paper will become useful for study of chemistry research.

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