IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

SIGNIFICANCE AND HYPOTHESIS OF COMPUTER AIDED DRUG DESIGN IN PHARMACEUTICALS

V.VISWANATH[1*],A.TEJASWINI[2]

U.SUDHARSHAN[3]

Department Of Pharmaceutics, P.Rami Reddy Memorial College Of Pharmacy

Kadapa ,Andhra Pradesh, India.

ABSTRACT:

In general, the discovery and development of a new drug is known as a very complex process that takes a great deal of time and resources. So today, computer-aided approaches to drug design are widely used to enhance the drug discovery and development effectiveness. Different approaches to CADD are judged as effective strategies based on their needs, between all these structural approaches to drug design and ligand-based approaches to drug design, known as very effective and powerful drug discovery and production techniques. These two methods can be applied to virtual screening for lead identification and optimisation with molecular docking. In recent times computational tools are widely used in pharmaceutical industries and research areas to improve drug discovery and development pipeline effectiveness and efficacy. . In this article, we provide an overview of the computational approaches that are the inventive process of finding novel leads and aid in the discovery and development of drugs.

Keywords: computer-aided drug discovery, structural drug design, ligand-based drug design, virtual screening and molecular docking.

INTRODUCTION:

Computer Aided Drug Design:

Computer-aided drug design is the use of computers to help create, alter, evaluate or refine drug design.cad software is used to enhance the designer's efficiency, improve design quality, improve communication through documentation and create a production database.

Computational design tools are used by all major pharmaceutical and biotechnology companies worldwide. The contributions at their lowest level represent the replacement of crude mechanical models with structural displays, which are a much more accurate reflection of molecular reality able to demonstrate movement and solvent effects. Beyond this, binding computing is possible through theoretical calculations.

Work is increasingly using open access tools for pathformatics and structural bioinformatics, as well as shared code deposition platforms such as GitHub. This combination promotes and encourages the development of scalable, reproducible, and easy-to-use computer-aided drug design (CADD) pipelines. Pirhadi et al].

Although open access documentation for CADD concepts and applications is available, freely accessible teaching tools are rare. Examples available include the following: on the one hand, tutorials based on the graphical user interface (GUI) teach CADD basics, such as a web-based educational workshop on drug design. On the other hand, Java is examples of tutorials in educational software.

In addition to these resources, the Teach Open CADD platform has been developed to provide new CADD students and researchers and/or to program step-by-step self-study training tutorials as well as classroom lessons, covering both ligand-based and structural approaches. Teacher Open CADD is a new teaching platform that students develop using open source data and Python.

Types of Drug Designs:

There are four different methodologies commonly used in the design of drugs,

1 .Computer Aided Drug Design

2. Structural Based Drug

3. Rational Drug Design

4. Ligand Based Drug Design

1. COMPUTER-ASSISTED DRUG DESIGN:

This methodology uses computational chemistry to detect, enhance or study drugs and related biologically active molecules. The most fundamental objective of this methodology is to predict the binding affinity of the molecule to the target and the associated binding kinetics.

Objectives Of Cadd:

- Objective drug design & testing premium
- Speed-up screening process premium Efficient screening (focused, target-oriented) premium
- De novo design (target-oriented) premium
- incorporation of testing into the design process

Advantages Of Cadd

1. It is a Time saving method

2. It reduces the cost of production..

3. It Improves the quality of life .

4.Accuracy is maintained in this method.

5.Screening process was reduced in this method.

6. It requires Less manpower.

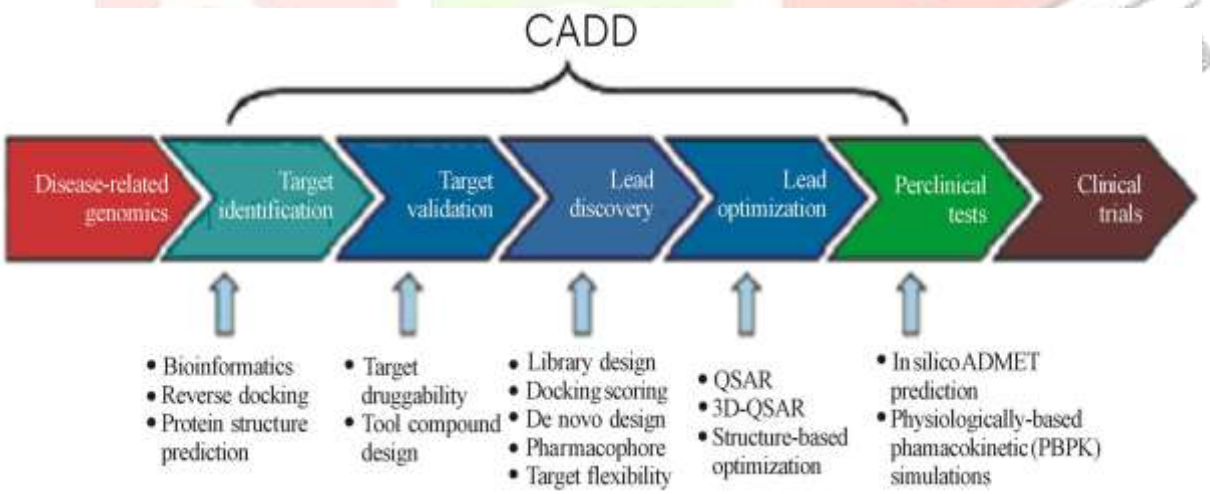
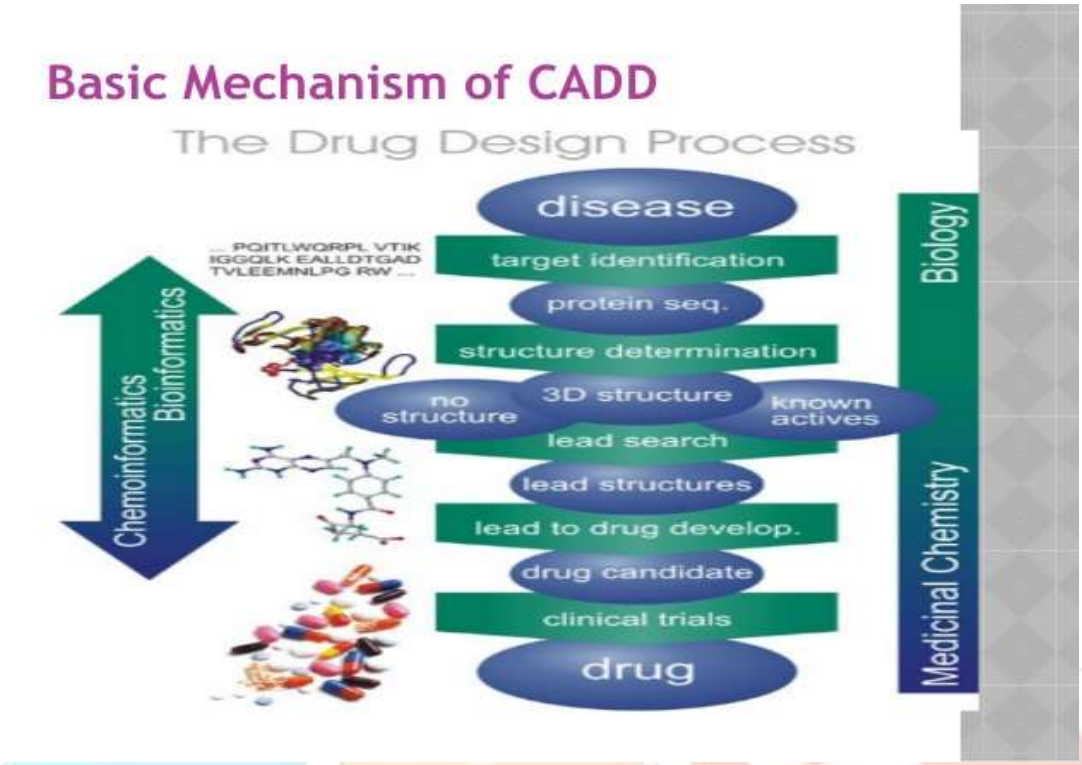


Fig:1

MECHANISM OF CADD:

When the disease process at the molecular level is understood and the target molecules are defined, drugs can be specifically designed to interact with the target molecules in such a way as to disrupt the disease.



Fig;2

Applications Of Cadd:

1) Human rennin inhibitor antihypertensive
2) Collagenase and stgromelysin inhibitor anticancer and antiarthritis
3) Purine nucleotide phoshorylase inhibitor antidepressant
4) Thymidylate synthase inhibitor antiproliferation.
5) Role of computer aided molecular modelling in the design of novel inhibitors of rennin.
6) Inhibitors of dihydrofolate reductase.
7) Approaches to antiviral drug design
8) Conformation biological activity relationships for receptor selective conformationally opiod peptides.
9) Design of conformationally restricted cyclopeptides for the inhibitors of cholate uptake of heepatocytes.

2. LIGAND- BASED DRUG DESIGN

Ligand-based drug design (or indirect drug design): relies on knowledge of other molecules that bind to the interesting biological target that can be used to derive a pharmacophore model that specifies the minimum structural characteristics that the molecule must possess for binding to the target.

Fig:3

Applications:

1) It is useful for virtuval screening process.
2) It is useful in bioremidation.
3) It is used for determination of structural activity relationship of compounds.
4) It is used in ADME modelling.

3. STRUCTURE-BASED DRUG DESIGN (DIRECT DRUG DESIGN):

This is based on knowledge of the three-dimensional structure of the biological target obtained through methods such as x-ray crystallography or NMR spectroscopy. Using the structure of the biological target, candidate drugs are predicted to bind to the target with high affinity and selectivity.

In this design process, digital graphics and the experience of a medicinal chemist are further used.

Relieves on knowledge of the three-dimensional structure of the biological target obtained through,

- ✓ :x-ray crystallography
- ✓ nuclear magnetic resonance (NMR spectroscopy)
- ✓ Homology modelling

Applying the structure of the biological target, candidate drugs that are expected to bind with high affinity and selectivity to the target may be developed using

- Interactive graphics
- Intuition of a medicinal chemist.

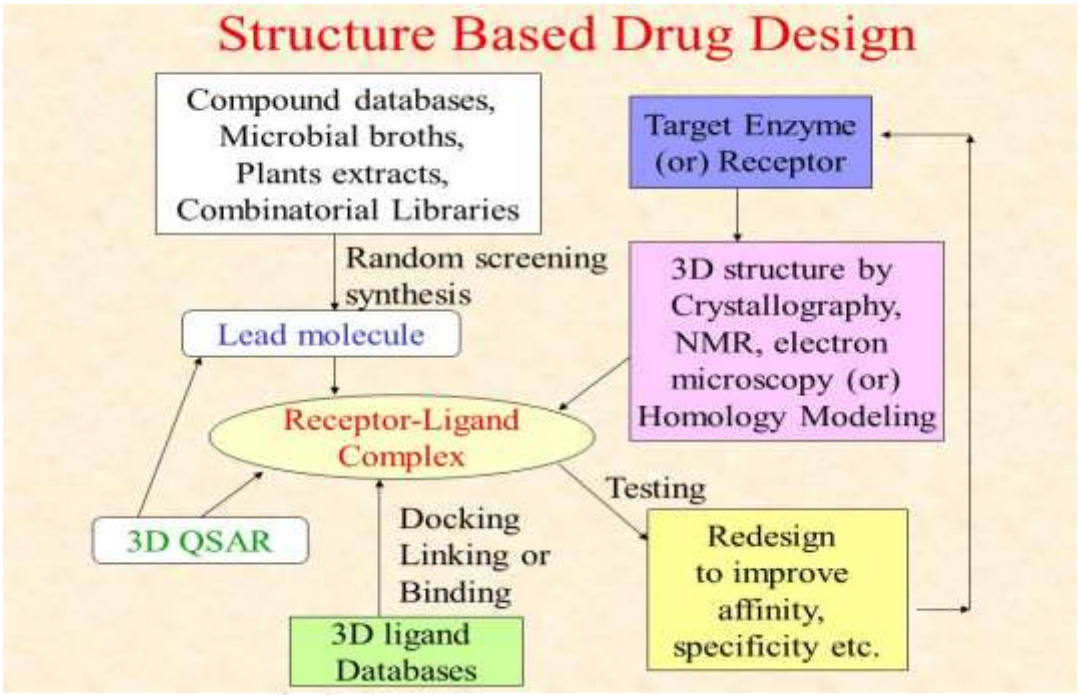


Fig:4

Applications:

1) It is useful for virtuval screening process
2) It is useful in bioremidation
3) It is used for determination of structural activity relationship of compounds
4) It is used in ADME modelling.

4.RATIONAL DRUG DESIGN:

Drug design is the creative process of finding new medicines based on knowledge of a biological purpose, also referred to as rational drug design or simply rational design. Most generally, the medication is an organic small molecule that stimulates or inhibits the action of a biomolecule such as a protein, which in turn gives the patient a therapeutic benefit.

Rational drug design is a process in which finding of newer medication based on knowledge of biological target is done. It involves drug design of tiny molecules that are complementary in shape and charge to biomolecular target.The drug is most widely an organic tiny molecule that activates or inhibits the function of a biomolecules such as a protein, which in turn results in a therapeutic benefits to the patient.

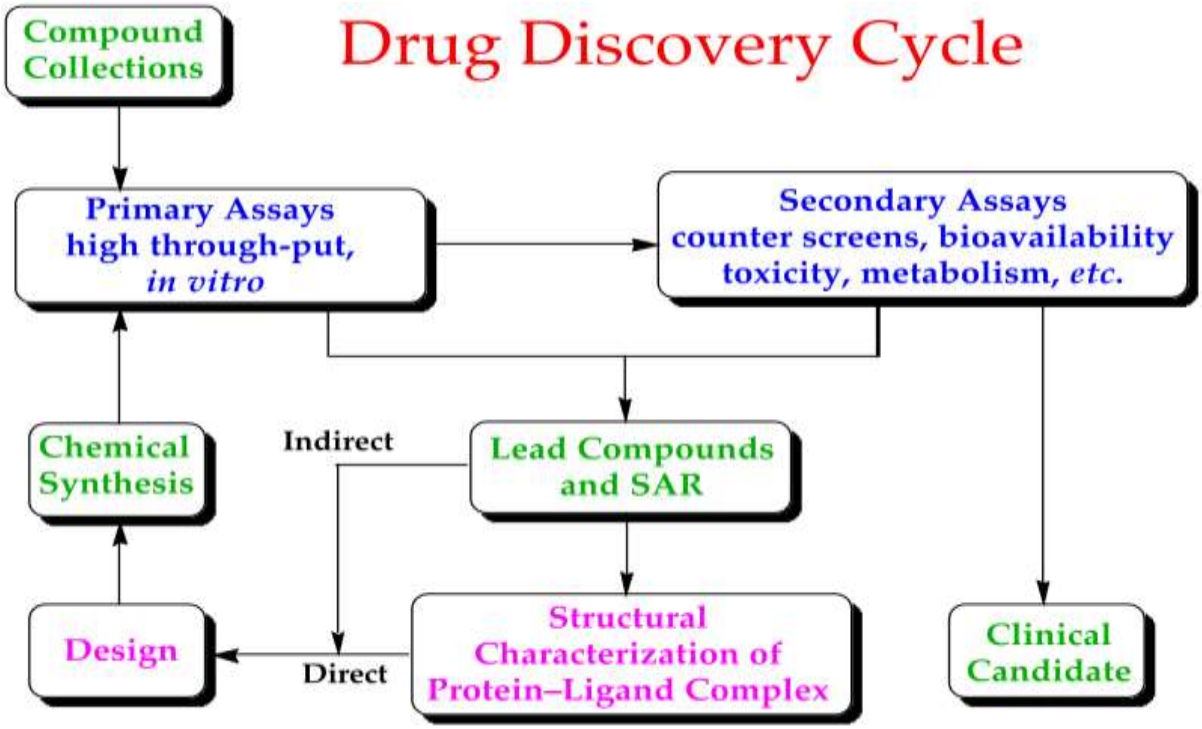


Fig:5

Applications:

1) Potentiate the pharmacological profile of existing drug
2) Provides structural information of the possible protein targets.

CONCLUSION:

Computer aided drug design is an effective tool in drug discovery and development, through which we can find the most promising candidate in a very cost-effective manner. It always lends hope for improvement in the area of drug discovery. There is a promising future of computer-aided drug design with the current achievements to help drug discovery of many more curatives in the future.

REFERENCE:

1. Daina A, Blatter MC, Baillie Gerritsen V, Palagi PM, Marek D, Xenarios I, et al. Drug Design Workshop: A Web-Based Educational Tool To Introduce Computer-Aided Drug Design to the General Public. Journal of Chemical Education. 2017; 94(3):335-44
.
2. Xiang M, Cao Y, Fan W, Chen L, Mo Y. Computer-aided drug design: lead discovery and optimization. Combinatorial chemistry & high throughput screening. 2012; 15(4):328-37.
3. Hopfinger AJ. Computer-assisted drug design. Journal of medicinal chemistry. 1985; 28(9):1133-9
4. Imam SS, Gilani SJ. Computer Aided Drug Design: A Novel Loom To Drug Discovery. Org. Med. Chem. 2017; 1(4):1-6.
5. Ferreira LG, dos Santos RN, Oliva G, Andricopulo AD. Molecular docking and structure-based drug design strategies. Molecules. 2015; 20(7):13384-421
.
6. Cohen ML. Changing patterns of infectious disease. Nature. 2000; 406:762–767. [PubMed: 10963605]
7. Walsh C. Where will new antibiotics come from? Nat Rev Micro. 2003; 1:65–70.
8. Schneider G, Fechner U. Computer-based de novo design of drug-like molecules. Nat Rev Drug Discov. 2005; 4:649–663. [PubMed: 16056391]
9. Yu, W., Guvench, O., MacKerell, AD. Computational approaches for the design of protein–protein interaction inhibitors. In: Zinzalla, G., editor. Understanding and exploiting protein–protein interactions as drug targets. London, UK: Future Science Ltd; 2013. p. 99-102.
10. Panecka J, Mura C, Trylska J. Interplay of the Bacterial Ribosomal A-Site, S12 Protein Mutations and Paromomycin Binding: A Molecular Dynamics Study. PLoS ONE. 2014; 9:e111811. [PubMed: 25379961]
11. Resat H, Mezei M. Grand Canonical Monte Carlo Simulation of Water Positions in Crystal Hydrates. J Am Chem Soc. 1994; 116:7451–7452.