Network Pharmacology: A New Era

Amit Gupta¹* and Vikas Saxena²

¹*Assistant Professor, Rakshpal Bahadur College of Pharmacy, Bareilly, India*

²*Director, Rakshpal Bahadur College of Pharmacy, RBMI Group of Institutions, Bareilly, India*

*Corresponding Author: Amit Gupta, Assistant Professor, Rakshpal Bahadur College of Pharmacy, Bareilly, India.

Introduction

A new discipline called Network Pharmacology has come into picture which attempts to understand the drug actions and inter-actions with the multiple targets. The origin of network pharma-cology can be traced back to 1999 when Shao Li pioneered the "Syndrome" of a link between TCM and biomolecular networks at the annual Academic Conference of Chinese Association for Science and Technology. After a few years, he suggested that the disease gene network might be regulated by the muti casual and micro effective effects of herbal formulae. Meanwhile, Network Pharmacology was introduced by Andrew L. Hopkins a pharma-cologist at Dundee university in the UK. In the recent year 2021, Li's team developed and published the first international Standard for Network Pharmacology, "Guidelines for Evaluation methods in Network Pharmacology".

Scope

Due to the complex signaling network of diseases, multi tar-get and combinatorial drug therapy provide a new network-based approach to drug discovery. It not only improves the therapeutic efficacy of drugs but also provide a broader choice of disease tar-gets. It mainly utilizes the computational power to categorize the molecular interactions of a drug molecule in a living cell. It empha-sizes to understand the complex relationship between botanical formula and the human body. It also helps to discover new drug leads and targets and in drug repurposing. Moreover, it also aims to improve the safety and efficacy of the existing drug molecule.

Key concepts

Year	Description
1999	Hypothesis of the relationship between TCM Syndrome and molecular networks.
2007	Proposed a network based TCM research framework related to TCM Network Pharmacology
2007	A network-based case study on Cold/Hot Herbal formulae and Hot/Cold Syndrome
2009	Proposed the "Herb Network Biological Network Pheno-type Network'
2011	Proposed the concept of "New Target"
2015	Map the unexplored target space and therapeutic poten-tial of natural products.
2019	From single drug targets to synergistic network pharma-cology
2022	Network pharmacology curing causal mechanism, in-stead of treating the symptoms.

Table 1

Research strategies

The procedure of Network Pharmacology mainly involves the following steps-

- Mapping the disease phenotypic targets and the drug tar-gets together in the biomolecular network
- Establishing the mechanism of association between dis-ease and drugs.
- Analyzing the network to dissect the mechanism between network targets and the system regulation.

Databases for network pharmacology

It is mainly based on screening of information on bioactive components, target genes and disease genes in various databases. The databases are mainly divided into various categories such as herb/compound database, gene/protein database.

The commonly employed databases in network pharmacology are as follows- TTD, MATADOR, ChEMBL, STITCH, Super Target, TDR Targets, PDTD, Integrity, FAERS, SIDER, JAPIC, CancerDR, Binding DB, ZINC, canSAR, ASDCD, DINIES, SuperPred, Swiss Target Prediction, TCMSP, HERB, TCM Bank, HIT, ETCM, TCMID, CMAUp, YaTCM, TCM, Pubchem, STRING, Uniprot, Drugbank, OMIM, Genecards, DisGeNET, TTD, DAVID, Metascape, KEGG etc.

Limitations

- Problem formulation by more realistic regression formulation rather than standard binary classification.
- Model prescription based on quantitative bioactivity data rather than on/off interaction data.
- Model validation based on simple or nested cross validation.
- Model performance report based on different experimental setting to find out whether training and tests set share common drugs and target, only drugs or targets or neither.

Conclusion

Network pharmacology approach has unique features of being probable and regular. It has made the drug discovery process predictable due to the computational techniques. Therefore, it has the capacity to manage big data. It can make the systematic study of drug formulae achievable. Its intents to comprehend the systematic level of the disease and interaction of the drug with the body through biological networks.

Bibliography

1. Chaudhuri TK., *et al*. "Book - Physics of God, Universe, Humankind and Peace in Family". Publisher - iUniverse, USA (2015).

2. Chaudhuri TK. "Book - Electromagnetic Energy of the Human Mind". Publisher – Create Space, USA (2017).

3. Chaudhuri TK. "Theophysics: A Prescription for Better Human Life". *Acta Scientific Pharmaceuticals Sciences (ASPS)* 7.12 (2023): 42-44.

4. Chaudhuri TK. "Application of Quantum Mechanics in Spiritual Physics (Theophysics)". *Acta Scientific Pharmaceuticals Sciences* 8.3 (2024): 57.

5. Chaudhuri TK. "Role of the ophtsics in the Formation of Human Mind and Soul at Conception". *Acta Scientific Pharmaceuticals Sciences* 8.2 (2024): 14-16.

6. Chaudhuri TK. "Prescription to Prevent Mental Health Problem and Gun Violence Ideation in Children". *Acta Scientific Pharmaceuticals Sciences* 7.4 (2023): 13-14.