www.jmscr.igmpublication.org
Index Copernicus Value: 79.54
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossrefDOI: https://dx.doi.org/10.18535/jmscr/v7i2.12

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

An Overview of Drug Repurposing: Review Article

Authors
Gargi Dey[1], Jyothi R[2], Girish K[3]
[2]Professor, [3]Head of the Department
[1,2,3]Department of Pharmacology Kempegowda Institute of Medical Sciences Bangalore, India

Abstract
Drug Repurposing is finding new use of an already existing drug. It offers affordable, cheap and faster treatment. Strategies such as in- silico models, data mining, artificial intelligence etc. help accelerate it. However there are few barriers which need to overcome like legal and economic barriers. Collaboration between various sectors, awareness and encouragement can promote in flourishing of drug repurposing which holds a great future in the modern medicine sector.
Keywords: *Drug Repurposing, Artificial Intelligence, Rare Diseases, Orphan drugs, Corporate Social Responsibility.*

Introduction

Drug Repurposing can be compared to recycling. It is the application of known drugs for treating conditions other than their original use.[1]

Drug repurposing offers drugs at a much cheaper, faster and accessible way to the patient population.[2] The drug studied for repurposing are the shelved drugs which either could not made to the late phases of clinical trials or have failed in the market. Since the efficacy, safety and toxicity of the drug is already known, the initial phases of the clinical trials can be skipped which brings down the cost and duration of the clinical trials. It takes about 15 years to bring a new drug to the market whereas repurposed drug is cuts down both the duration (3 to 12 years) and costs.[3]

The challenges are to identify the right compound for the new purpose, to use the resources judiciously and to not fail again after bringing the failed drugs back into clinical trials.[4,]

Strategies for accelerating drug repurposing

1. In-silico models- In-silico models or bioinformatics help in identifying the complex relationships among drugs, targets and diseases required for repurposing.[5]
2. Target docking – Using high-throughput screening technologies to find out polypharmacological compounds acting on multiple targets can cure multifactorial diseases like cancer, neurodegenerative diseases.[6]
3. Artificial intelligence (AI)- AI improves access to data. Extensive data mining in literature to find out drug interactions, adverse effects, mechanism of actions, gene regulations can help accelerating drug development.[4] The side effect of one drug can be used as a treatment for another condition. If drugs have same adverse effects then they may work on same disease.[2]

Pathway mining which involves identifying a specific pathway which is linked to different diseases and hence finding out drugs to hit that particular pathway for curing of diseases.[4]

Barriers

1. Regulatory

If a shelved compound is brought back to the clinical trial it has to pass through all the regulatory requirements like filling NDA, issue of secondary patents, updated pharmacokinetic profile which is a time consuming, costly and complicated process.[7]

2. Low economic returns

For the company which acquires the secondary patent by going through all regulatory norms, it can't be assured that it will recover its Research and Development (R&D) costs by marketing of the drug because for the drug which is already available in the market, the company can't set a new price for the drug. It still will be continued to be used for new purpose at the same old price.[7]

If a new use for an already generic drug has been discovered, it is difficult to ascertain that the clinicians will prescribe or the pharmacists will sell the drug of a particular manufacturer. Hence, the company which invested for the Drug Repurposing R&D will have low profit or worse will be at loss.[7]

3. Financial risk

For drugs mean to treat rare disease or orphan drugs the population in use is small and hence the economic return. The company has to put a huge risk in the investment for those kinds of drugs.[7]

Steps to promote Drug Repurposing

1. Collaboration is the key to success. Collaboration between industries, academias, government, non-government organisations, and philanthropists brings different ideas and approaches.[2]
2. Corporate Social Responsibility (CSR) to reach out to the population suffering from rare, acute and malignant diseases and helping them by providing treatment/drugs in an accessible way.
3. Social media to create awareness about Drug Repurposing, sharing of experiences about the off labelled used drug like side effects, curable rates etc.

Financial incentives by government and philanthropists can reduce the burden on companies which suffer from dilemmas to invest in R&D of drugs whose success is unsure.

Conclusion

Drug Repurposing is the future of modern medicine. Proper strategies and techniques can help revolutionise DR to meet the unmet need of the population especially in the field of orphan drugs.

References

1. Javier Setoain, Mónica Franch et al., NFFinder: an online bioinformatics tool for searching similar transcriptomics experiments in the context of drug repositioning, Nucleic Acids Res. 2015 Jul 1, 43 (Web Server issue): W193-W199
2. Sarah H. Beachy, Samuel G. Johnson, Steve Olson, and Adam C. Berger, Rapporteurs; Drug Repurposing and Repositioning: Workshop Summary; Roundtable on Translating Genomic-Based Research for Health; Board on Health Sciences Policy; Institute of Medicine National Academy of Sciences, 2014
3. Chong CR, Sullivan DJ Jr., New uses for old drugs; Nature,2007 Aug 9,448(7154):645-6
4. Cynthia A. Challener., Can Artificial Intelligence Take the Next Step for Drug Repositioning? PharmTech.com. Sept 02, 2018, Volume 42, Issue 9, page 22-26
5. Zhichao Liu, Hong Fang et al., In silico drug repositioning – what we need to know, Volume 18, Issues 3-4, February 2013, Pages 110-115
6. Scotti L, Mendonca Junior FJ et al., Docking Studies for Multi-Target Drugs, Current Drug Target. 2017;18(5):592-604
7. Repurposing Drugs 101, https://repurposingdrugs101.com