

Strategies and Challenges of Drug Repurposing

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DESCRIPTION

Drug repositioning, drug re-tasking, drug reprofiling, drug rescue, drug recycling, drug redirection, and therapeutic switching are other terms for Drug Repurposing (DR). It can be summed up as the process of identifying new pharmacological indications from old/existing/failed/investigational/already marketed/FDA authorized medications/pro-drugs, and the usage of the newly generated drugs to treat diseases other than the drug's original/intended therapeutic use. It involves finding new therapeutic applications for already-approved, removed from use, abandoned, and experimental medications. Traditional drug discovery is a long, highly expensive, and dangerous procedure.

Strategies of drug repurposing

Depending on the quality and quantity of information related to the physico-chemical, biological, pharmacological, toxicological, and pharmacokinetic properties of drug molecules, the methodologies involved in drug repurposing can be divided into three groups, including drug-oriented, target-oriented, and disease- or therapy-oriented. Drug repurposing techniques are becoming more popular quickly, particularly in the field of rare and untreated disorders.

There are four main types:

1. **Drug repurposing:** When a previously approved medication is repurposed for a different use than it is now intended in order to obtain a new-use patent.
2. **Drug repositioning (target-centric):** Involves applying the same medication to a new indication in the same therapeutic field or to an adjacent indication.
3. **Drug rescue (drug-centric):** When new applications for chemical and biological substances that used to be the subject of clinical studies but either had to be taken off the market or had not been further developed or submitted for regulatory approval find new uses.
4. **Combination therapies (disease-centric):** Involves integrating elements from two or more current medications

to create a molecule, when combined, effectively addresses a critical medical need.

Drug repurposing as a strategy to identify new therapeutic agents

Drug repurposing is regarded as an innovative technique of computational method to quickly find novel therapeutic molecules for COVID-19 therapy. This approach is based on virtual screening of drug libraries to identify suitable drugs and their binding interactions with target protein by using computational tools such as molecular similarity and homology modeling etc. To further establish the binding affinities and interactions between drug compounds and receptors, molecular docking and binding free energy simulations are also performed out.

Challenges with repurposing of drugs

Besides the advantages, repurposing drugs is extremely difficult, and as a result, the market for repurposed treatments is limited. Repurposing clinical studies involves significant financial outlay, safety requirement proof, efficacy verification, absence of patent protection, and marketing. The financial support for drug repurposing techniques has been insufficient, along with shorter patent durations and low returns on investments, in spite of the benefits such as cheap cost and reduced time requirements. Moreover, the FDA only permits a new use of a previously used medicine for a new indication for a period of three years, which is a relatively little time for the pharmaceutical sector to recover its investment and any losses.

Drug Repurposing continues to grow in popularity as advanced AI opens the door to new insights into disease drug targets and increases the odds that clinical development trials will be successful. In the conclusion, this method will give patients faster access to new medications, providing relief for the symptoms of rare diseases and potentially saving lives.

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