

Polypharmacology: The Future of Drug Discovery

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Editorial

Polypharmacology involves the pharmaceutical compounds that exert an impact on multiple targets within the body. There's currently significant interest during this area of research for drug discovery within the future thanks to the projected ability to enhance efficacy and reduce drug resistance. However, there's some concern about the adverse effects which will be observed with polypharmacological treatments.

Polypharmacology refers to one drug that acts on multiple targets, which can be related to one disease pathway or several different disease pathways. This approach also utilizes drug repurposing, which involves the invention of unknown secondary targets of existing drugs and integrating this data into practice.

There are several samples of this phenomenon already commonly in use. For instance, aspirin is typically recommended to alleviate pain or reduce fever, but it also has an impact on inflammation and clotting factors within the blood. For this reason, it also can sometimes be prescribed for other conditions, like atrophic arthritis or to stop cardiovascular events.

Similarly, sildenafil was originally developed for hypertension and to stop heart condition but when it had been utilized in practice, a secondary effect on its ability to treat male erectile dysfunction was discovered. Today, the first use of sildenafil is for the treatment of male erectile dysfunction.

Patient safety

However, polypharmacology has the potential to cause problems when it's not used correctly, or insufficient information is understood about the activity of the drug. This is often primarily a results of adverse effects that result from secondary drug targets.

For example, lumiracoxib was faraway from the drug market in Australia thanks to concerns of the non-steroidal anti-inflammatory (NSAID) working on the liver and resulting in hepatic failure. Other drugs that are the topic of comparable concerns in reference to polypharmacology include rofecoxib and staurosporine.

The safe and effective use of medicines with polypharmacological properties requires extensive data collation to make sure the simplest results. This process includes computer models, synthetic chemistry, pharmacological testing, and clinical trials before it are often implemented in widespread practice.

Scientific research

At present, there's extensive research being administered to collect data about polypharmacology and its place within the way forward for drug development. There are several database resources that compile information about different medications, including:

- Drug targets
- Molecular pathways
- Crystal structures
- Binding experiments
- Side effects
- Biological and chemical properties
- Disease relevance

Challenges

There remain some challenges in polypharmacology that limit its utility in drug development within the present and future.

Most prominently, the understanding of the pathways and mechanisms involved isn't complete, and that we don't comprehend the complete polypharmacological effect on the body at a molecular level. The technology and research currently available are often not sufficient to ensure safety to patients receiving treatments with high confidence. Additionally, the prices to conduct necessary studies are often high.

Future of Drug Development

Polypharmacology certainly has the potential to play a bigger role within the development of medicine within the future, although it's essential that appropriate care is taken to reap the advantages of multiple drug actions while minimizing the associated risks.

It is expected that within the near future, there'll be more research during this area, particularly within the field of drug repurposing and increasing the utility of medicine already approved for safety. This is often likely to grow into the longer term, perhaps expanding to develop drugs initially to focus on unique pathways within the body.

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