Examining the intersection between network pharmacology and personalizing medicines

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We examine the intersection of personalizing medicines and network pharmacology to identify strategies for the development of therapies that are fully informed by both concepts. Current approaches to personalizing medicines have benefited from the development of new diagnostics that enable more effective treatment selection for cohorts or individuals. The concept of network pharmacology is less familiar but may be defined as seeking to describe therapeutically beneficial and adverse drug reaction outcomes of medicines in terms of the molecular interaction of drugs with several inter-related proteins or networks. Crucially this differs from the traditional one target – one drug model that continues to dominate classic medicinal chemistry thinking.

This new, explicit recognition of the network nature of targets and therapeutics provides a framework for discussing the impact that personalized medicine will have on chemistry and pharmacology in the broadest sense. This includes drug discovery, formulation and delivery, the adaptations and changes in ideology required and the contributions already made from both fields.

A number of specific developments should enable rapid, beneficial advances to be made in preventative medicine and individualized therapy in clinical settings. These include:

- Appreciation by chemistry and drug discovery that drugs affect individuals differently
- Ability to modulate multiple targets in a network pharmacology framework
- A shift is from a gene-centric to a network-centric view
- Formulation and titration of new combinations of drug molecules as a key for future personalized drug prescription
- Advances in multi-targeted drug discovery using new methods and models
- Development of novel screening technologies and informatics approaches.

A major change in conceptualising chemistry's relationship with medicine would lead to new approaches to drug discovery and hold the promise of delivering safer and more effective personalized therapies.