Network-Based Identification of New Targets for Natural Products Enables Potential Uses in Aging-Associated Disorders

Jiansong Fang, Haobin Cai, Yunbo Chen, Qi Wang

Institute of Clinical Pharmacology, Guangzhou University of Chinese Medicine, Guangzhou, China

Background: aging that refers the accumulation of genetic and physiology changes in cells and tissues over a lifetime has a higher risk of developing various complex diseases, such as neurodegenerative diseases, cardiovascular diseases, and cancers. Over the past several decades, natural products act as anti-aging interveners with various molecular mechanisms via extending lifespan and preventing age-related diseases.

Methods: we developed an integrated systems pharmacology infrastructure to uncover new indications for various age-related diseases by natural products. Specifically, we incorporated high quality aging-associated human or human-orthologous genes. We reconstructed a global drug-target network of natural products by integrating both experimental and the computationally predicted drug-target interactions via the predictive network models. We further built the statistical network models for identification of new anti-aging indications of natural products through via integration of the curated aging-associated genes and drug-target network of natural products.

Results: high accuracy was achieved for the statistical network model. Furthermore, we showcased multiple predicted anti-aging indications of several typical natural products (e.g. resveratrol, ellagic acid, caffeic acid, and metformin with new mechanisms-of-actions).

Conclusions: this study demonstrates a novel systems pharmacology infrastructure to identify new indications for various age-related diseases by natural products.