BRIGHAM AND WOMEN'S HOSPITAL

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Department of Medicine
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Channing Network Science Seminar
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Illuminating Drug Action by Network Integration of Disease Genes: A Case Study of Myocardial Infarction

Abstract: Drug discovery and development have produced many successful drugs during the past several decades. However, many of these drugs were developed without a deep understanding of the molecular mechanisms of drug action responsible for their indicated diseases. In addition, many computational approaches deal with prediction of drug-target interactions and drug-disease associations, but few studies focus on drugs used for a specific disease. Gene-disease associations produced by molecular and genetic studies of complex diseases over recent decades provide great opportunities for a better molecular-level understanding of drug activity. In this study, we focus on a highly prevalent and morbid disease, acute myocardial infarction (MI), and integrate drugs used for MI, drugs that interact with MI drugs, corresponding drug targets, and MI disease genes into the comprehensive human interactome. We analyze the topological relationships between drug targets and MI disease gene products and show that MI-related drugs are very close to MI disease genes in the interactome. We then construct a bipartite network of drug targets and MI disease genes and derive drug-target-gene (DTG) modules from the bipartite network. We demonstrate that these modules are biologically significant and represent potential signaling pathways of drug action, which are insightful for understanding the integrative mechanisms of action of MI drugs and the cardiovascular side effects of non-MI drugs.

Bio: Ruisheng Wang received her Ph.D. in Operations Research from Academy of Mathematics and Systems Science, Chinese Academy of Science in 2005. Then she joined in Renmin University of China as an assistant professor. In 2008, she joined Prof. Reka Albert's lab at Pennsylvania State University for her postdoctoral training. Then in 2013 she joined the research group of Dr. Joseph Loscalzo as a Research Associate in Department of Medicine, Brigham and Women's Hospital. Her research interests include biological network inference, analysis, and modeling, therapeutic target discovery in disease networks, as well as high-throughput data analysis.

hosted by Yang-Yu Liu