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2011-01-06: A cellular roadmap for medical researchers

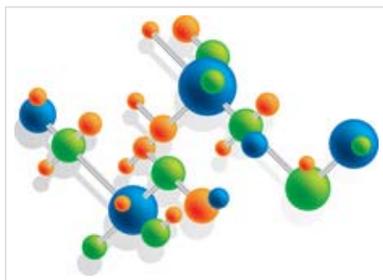
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A cellular roadmap for medical researchers



A new paper from Northeastern researcher Albert-Laszlo Barabasi reviews network medicine and its potential to help cure disease. iStock photo

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Advances in network science to map the complexity of human cells promises to offer significant new resources for health professionals striving to cure disease, according to a new paper coauthored by Albert-László Barabási, a world-renowned network scientist at Northeastern University.

The paper, published in the January issue of *Nature Reviews Genetics*, presents the first major overview of the current state of network medicine and what lies ahead in taking a network-based approach to identifying and battling disease.

"I really think the future of medicine will, to a certain degree, depend on obtaining and understanding the diagram that controls the interactions between the molecules in the cell," said Barabási, Distinguished Professor of **Physics** and director of Northeastern's **Center for Complex Network Research (CCNR)**. The study advances Northeastern's research mission to solve societal issues, with a focus on global challenges in health, security, and sustainability.

Understanding cellular networks could help identify new disease genes and pathways, and reveal the biological significance of mutations associated with disease, according to the paper. As a result, better disease-targeting drugs could be developed, while biomarkers could improve how diseases are classified and how cellular networks ravaged by disease are monitored.

Barabási said this network-based approach compares to how a mechanic fixes a car. For instance, a car's power failure could stem from a faulty battery, a broken cable or a blown fuse. So the mechanic first turns to the wiring diagram of the car to identify the cause of the problem.

"In order to fix a car problem, you need to have a map of the network, and in a way, this is not different for diseases," Barabási said. "You need to find and understand the underlying network behind the disease, and that will eventually lead to a cure."

The paper follows up on a 2004 article Barabási coauthored for the same journal, which explored network biology and the inner workings of human cells. That paper is the second-most cited article in the history of the journal. Since then, network scientists have improved their grasp on the laws that govern networks and started applying that knowledge in significant ways, such as facilitating new treatments for disease.

However, Barabási said it would take time for medical advances to catch up.

"The thinking behind it is this: the cell is like a map of Boston," Barabási explained. "What is happening now is that we've started to simply find the neighborhood where individual diseases are, so we are starting to be able to associate certain regions of the cell with particular diseases."

Barabási, the lead author, collaborated on the paper with Natali Gulbahce, a former postdoctoral research fellow at CCNR, and Joseph Loscalzo, chair of Brigham and Women's Hospital's Department of Medicine and a professor at Harvard Medical School.

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