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Researchers share insights into RNA

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Investigators from around the country came to Sanford-Burnham Medical Research Institute (Sanford-Burnham) on Friday, May 7, to share their knowledge of the burgeoning young field of microRNAs. These small non-coding nucleic acids turn off proteins and have been implicated in viral infection, cancer, cardiovascular disease, HIV and numerous other conditions.

"The discovery that small RNAs could shut down gene expression was revolutionary," said Tariq Rana, Ph.D., who directs the RNA Biology program at Sanford-Burnham. Dr. Rana organized the symposium with Sanford-Burnham colleagues Rolf Bodmer, Ph.D., and Sumit Chanda, Ph.D.

The symposium, entitled RNAi and microRNA Regulatory Functions, featured a who's who of RNA biologists sharing their understanding of how these small RNAs regulate gene function and contribute to disease.

One of the speakers, Shiv Grewal, Ph.D., senior investigator at the National Cancer Institute, works to understand how RNAi regulates chromatin, the combination of proteins and DNA that makes up chromosomes. Dr. Grewal's research has shown that RNAi machinery stabilizes these critical structures. "If you disrupt this process, chromosomes will not segregate properly," said Dr. Grewal. "After cell division, one cell will get more and the other will get less, a very common feature in cancer cells."

Deepak Srivastava, M.D., a pediatric cardiologist and director of the

Gladstone Institute of Cardiovascular Disease, has been working to understand how the heart develops. His research has shown that microRNAs and proteins work in complementary networks to help progenitor cells choose what kind of heart cells to become. "There is a transcriptional network that controls cell fate decisions in the heart," said Dr. Srivastava. "Overlaid on that is a translational network controlled by microRNAs that controls how much protein is made of those same transcription factors. But also, those transcription factors control the dose of microRNAs. It's a very coordinated network."

Amy Pasquinelli, Ph.D., associate professor at UC, San Diego, is working to determine how microRNAs bind to their target. "We want to understand the pairing rules," said Dr. Pasquinelli. "If we can understand those, we can use bioinformatics to predict, simply by looking at the microRNA sequence, where it's going to bind, what gene it will target and what will be the ultimate result."

Other researchers shared their work on a number of topics, including the fundamental roles of microRNAs in biology and epigenetics; developing cutting-edge technologies that use small RNAs to investigate disease processes; high-resolution structures of RNAi machinery; RNA-mediated regulation of herpes infections; and RNA-based treatments for neurodegenerative disorders, AIDS, cancer and metabolic diseases.

Provided by Sanford-Burnham Medical Research Institute