Researchers find snippet of RNA that helps make individuals remarkably alike

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"No two people are alike." Yet when we consider the thousands of genes with frequent differences in genetic composition among different people, it is remarkable how much alike we are.

Uniformity, or singleness of form, is not unique to humans but a general property of life. Biologists have long pondered how this feature is produced in the face of such great variation in genetics as well as environmental conditions.

Northwestern University researchers now have identified a type of molecule that plays a specific role in maintaining uniformity: a little snippet of RNA called a microRNA. They found that a microRNA called miR-7 is critical to the robustness of the molecular network that helps regulate uniformity.

The findings are published online by the journal *Cell* and also are featured in a *Cell* podcast: http://www.cell.com/. This knowledge could lead to a better understanding of the workings of cancer cells, which do not act in controllable, uniform ways.

The Northwestern research builds on an idea that originated in the 1940's: Molecules within cells of the body work together in networks, each molecule interconnected with others.

"When something is changed, say the genetic sequence of a molecule or the temperature of the organism, the network responds to compensate

for the change and keep things intact," said Richard W. Carthew, Owen L. Coon Professor of Molecular Biology in the Weinberg College of Arts and Sciences at Northwestern. Carthew led the research. "This design is similar to the principle that engineers use to design safety features into products."

There are hundreds of different types of microRNAs in animals. Their function is to dampen or shut down the production of proteins in the body. The Carthew group found one of these microRNAs, miR-7, dampens production of proteins that work in the same networks as miR-7.

In a study of Drosophila, when the researchers eliminated miR-7, the networks remained intact but only under uniform environmental conditions. When the researchers perturbed the environment by modulating the temperature, the networks failed to keep things intact, and animals suffered from developmental defects. If the microRNA was present, however, the networks resisted the temperature fluctuation, and animals were normal and healthy.

MicroRNAs, found in all plants and animals, may have evolved as tiny buffers within multicellular organisms to allow the remarkable unity of form in a constantly changing environment.

"This idea has health implications as well," said Carthew. "Cancer cells are notoriously heterogeneous and do not act in controllable ways. Interestingly, microRNAs are among the most frequently mutated targets in cancers, leading some to speculate that their absence is linked to cancer's heterogeneous behavior."

Source: Northwestern University (news : web)