

Meet DNA's personal assistants

May 7 2009

Just as scientists finished sequencing the human genome, they got a new surprise. Inside the genetic pathway, where DNA produces proteins to sustain life, they found microRNA. These tiny ubiquitous molecules have opened a new research channel in biology, allowing scientists to more closely examine what causes genetic diseases, and what makes our cells tick.

"This is a pivotal mechanism for solving genetic diseases," says Dr. Noam Shomron of the Faculty of Medicine at Tel Aviv University. "It's like the Gold Rush in the 1800s — everywhere we look we find microRNAs."

Taking all this valuable information — some 700 microRNA's are now indexed — and condensing it all on a biological "[DNA](#) chip" that looks like a common scientific slide, Dr. Shomron is helping scientists the world over understand what role microRNA plays in skin, cervical and brain cancer, leukemia, HIV, depression, and schizophrenia.

A Worldwide Reach

Utilizing his basic research, Dr. Shomron developed a popular online tool that Harvard, MIT, and Yale researchers are regularly referencing to "see" what kinds of microRNAs appear in the human and other genomes. "It's like looking at the globe for first time from outer space. It's the only tool that profiles microRNA in visuals," he says.

"I am helping scientists find the microRNA fingerprint," says Dr.

Shomron, who started this work at MIT. "Using the DNA chip I've built, scientists can scan all human microRNAs at the same time and associate them with various pathologies. This gives them volumes of new information about the diseases they are studying."

How It Works

Each cell in our bodies has the instructions needed for building cells identical to it encoded in its DNA. RNA is "photocopied" from DNA in the cells, and from these instructions new proteins, machines that carry out orders in the body, are built.

But somewhere along the way, the photocopied instructions of what to do can get discarded or misplaced, and this is what leads to cancer and other genetic diseases. Like mischievous "personal assistants," microRNAs connect to the photocopied message and disrupts its delivery. "Sometimes they throw out perfectly good instructions, or fail to carry out orders," says Dr. Shomron. Why they do this is the mystery that biologists everywhere want to solve. Dr. Shomron is playing no small role.

"Scientists have been trying to solve [genetic diseases](#) for many years, and God noticed we weren't vastly improving," says Dr. Shomron. This changed with the discovery of microRNAs. "When the genetic mechanism known as microRNA was described to the scientific community, we knew it would change how we studied genetic disease as we have an additional gene regulatory mechanism to look at."

Cells Behaving Badly

Scientists don't know why some breast cancer patients respond well to chemotherapy, while others do not. With the ability to provide a

complete genetic profile, Dr. Shomron's research lets scientists look into a deeper layer of information about disease behavior and the potential to build specialized treatments around it. This research falls in the area known as personalized medicine.

Applications of his research can lead to understanding the effects of the environment on our cells as well. Dr. Shomron is also exploring the use of microRNA for "smart drugs" that can target individual and damaged [cells](#).

Source: Tel Aviv University ([news](#) : [web](#))

Citation: Meet DNA's personal assistants (2009, May 7) retrieved 3 May 2024 from <https://phys.org/news/2009-05-dna-personal.html>

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