An X-ray for your genes

October 7 2010

Prescription drugs and their dosages may be standardized, but not every patient reacts to a medicine in the same way. The personal genetic characteristics of individuals and populations can explain why a specific prescription successfully treats one patient and not another, so medical researchers are adopting the new approach called "personalized medicine" and a Tel Aviv University lab is leading the way.

Dr. Noam Shomron of Tel Aviv University's Sackler Faculty of Medicine is developing a new method for the advancement of personalized medicine, an expanding area of research that optimizes individual patient care. With a deep sequencer, a machine that reads the human genome and its expression, Dr. Shomron is looking at how the genetic expression of small regulatory genes, called microRNAs, affects the way a patient reacts to medication. This could mean fewer deaths from adverse drug effects and novel and safe uses for existing medications.

Dr. Shomron hopes to create a map of gene regulatory pathways — how a person's genes react to a drug — and how this affects a person's ability to metabolize different drugs. Some of his recent findings were detailed the journal *Pharmacogenomics*.

For matters of the heart

Each person has a slightly different genetic make-up, leading to small differences in the way genes are expressed and regulated. Major players in gene regulation are microRNAs, genetic snippets that control many of

our genes by binding and degrading them, including those involved in drug metabolism, explains Dr. Shomron. Studying particular genes and their regulators is an important step in determining the efficacy of a medication for individual patients.

This genetic "fingerprinting" has quickened interest in tailoring treatment for each person's particular needs. In their recent experiments, Dr. Shomron and his team of researchers examined how a common blood thinning medication to treat heart disease can be strongly affected with these microRNA molecules. With this information, researchers might be able to predict how a patient will react to their prescriptions.

Once they have mapped the connections between genetic expression and different medications, explains Dr. Shomron, he and his team of researchers will create a comprehensive database to help physicians make important decisions regarding patient care. This database will be available to clinicians around the world. In the future, when physicians decide to administer a drug, he says, they will be able to scan the patient's genome and decide which medication is best to prescribe as well as its optimal dosage.

A prescription for the future

"One day, people will be able to have their whole genome sequenced and their gene and microRNA expression mapped, and this will become a part of their medical file," he says. "They will be able to bring this information with them from doctor to doctor, much like an x-ray." This will also help doctors understand how different drugs combine when a patient is taking one or more medications, which may avoid a toxic overload of chemicals.

Mostly, says Dr. Shomron, pharmaceuticals and pharmaceutical companies need to comprehend the scope of microRNA's involvement

in personalized medicine in order to take advantage of this emerging scientific field. He hopes to accelerate this understanding.

Provided by Tel Aviv University