Memphis scientists' diabetes research may offer solutions to variety of diseases

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In the capital of adult-onset diabetes, a couple of Memphis scientists instead are looking at Type I and trying to figure out why a child's immune system destroys its own insulin-producing cells.

As odd as it sounds, the research could answer fundamental questions about conditions from arthritis to heart disease, and it's all made possible by a revolutionary form of research known as the Discovery Approach.

Ivan Gerling is an associate professor of endocrinology at the University of Tennessee Health Science Center, and works alongside professor Solomon Solomon in the labs at VA Memphis Medical Center. For years they've toiled to understand Type I diabetes, in which the immune system identifies as foreign invaders the normal eyelet cells in the pancreas and schedules them for execution.

People are born with a susceptibility to Type I, but probably also need an environmental trigger to bring on the disease. That trigger may be a food protein, a virus or something else, but it stimulates the immune system. Once the trigger is eliminated, some white cells continue hunting and may pick on the eyelets.

A person is born with so many spare eyelets that by the time any symptoms appear the serious damage is done and the person is a diabetic for life. Gerling hopes to find a chemical signal in the body of a newborn that identifies the baby as a high-risk candidate for Type I.

As it stands, a 12-week-old baby may catch a virus, trigger the immune system and start the diabetes process that's only detected at age 16.

"We can already measure the immune response in the antibodies that bind the cells," he says. "But that's too late to do anything to prevent the disease."

The research has been slow going until the recent emergence of the Discovery Approach. Now, advances are coming so quickly that the National Institutes of Health has just given Gerling $1.4 million to keep his momentum.

In traditional research a scientist comes up with a hypothesis, and then develops tests to prove or disprove it. Under the Discovery Method a tissue sample goes into a mass spectrometer or an Affymetrix chip. The result is a graphic that shows the dozens -- even hundreds -- of genes that are all switched on and influencing one another.

Suddenly, a universe of unimagined possibilities has been created.

"Because you can get so much information from these new technologies you have to alter the way you think about science," says Robert Rooney, chief scientific officer at Genome Explorations, which

provides genetic profiling to labs. "The old way was a fishing expedition; now you can collect so much related data that the data become your playground."

Gerling now believes that potential diabetics are all born with the same 15-20 genes with very specific settings, awaiting the trigger. Because the immune system attacks the eyelets, it's easy to think in terms of an aggressor and a victim, but he believes there are defects on both ends. The odds of having all those variables in place in one person are slim, which is why Type I is relatively uncommon.

Since it's the immune system that is involved, even radical new techniques under development elsewhere at UT are not useful. Malak Kotb, for example, is working on a technique to implant eyelet cells into the liver of diabetics, where they latch onto a blood supply and begin producing insulin. That could be standard medicine in five years for some patients.

But it's no good for Type I, Gerling says. Giving the body new eyelets just stimulates the immune system with fresh targets.

The frontier that Gerling's research has also helped open is in collaboration with people like rheumatologists Andy Kang and Arnold Postlewaite at the UT Centers of Excellence for Disease of Connective Tissue. Their use of the Discovery Approach shows that arthritis is also an immune response.

Similar to what Gerling has found, the digestive system encounters a novel protein and the immune system profiles it as an invader. Later on, cartilage is mistaken as the same invader, so the immune system attacks. Other research shows that sudden heart attacks may have a similar pathway