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The quiet crisis

Story by Amy Spindler | Illustration by Dennis Murphy

What is diabetes?

Horizontal

In type 2 diabetes, the pancreas fails to produce enough insulin, cells are resistant to insulin, or both. Insulin helps the body use blood glucose as energy. In people without enough insulin, glucose builds up in the bloodstream.

Type 2 diabetes is progressive, has no cure and can go unnoticed for years because early symptoms are mild. If left untreated, eventually severe complications set in including heart disease, stroke, kidney disease, blindness and nerve damage, which can lead to the loss of limbs, usually feet. The common thread of these complications is damage to small blood vessels in the body.

The severity of type 2 diabetes varies from patient to patient. Some can control the disease by eating healthfully and exercising. Others may also need to take oral medication or inject insulin.

New medications are making it easier for diabetics to handle the constant and crucial task of controlling their blood-sugar levels. Doctors are prescribing medication that can improve cells' insulin sensitivity or boost the function of pancreatic beta cells, which produce insulin. Byetta, the first in the new class of such drugs, also decreases patients' appetites, which can help control their weight.

Doctors also focus on early detection and prevention because they believe type 2 diabetes can be prevented or delayed. One major clinical trial showed that proper diet and exercise can reduce the chance of developing type 2 diabetes by 58 percent. MU's work is part of this promising wave of research.

Alzheimer's of the pancreas?

Among diabetes experts, M.R. "Pete" Hayden, MD '70, a member of MU's Diabetes and Cardiovascular Disease Research Group, is considered a radical. In his latest research, he

hypothesizes that diabetes may be considered Alzheimer's of the pancreas. "Now that catches doctors' attention!" Hayden says. He focuses on how diabetes and its complications affect cell structure.

Present in both the brain of Alzheimer's patients and in the pancreas of type 2 diabetics are amyloid deposits, or insoluble, fibrous protein masses.

"It's like pink bubble gum in the pancreas, but then it hardens like concrete, and you can't get it out," Hayden says. "By the time diabetes is diagnosed in a patient, it has already done its damage. Here, amyloid interferes with the secretion of insulin from the beta cell of the pancreas."

These amyloid deposits contain amylin, a hormone that complements insulin because it slows the absorption of sugar. Without amylin, the body absorbs too much sugar, so the pancreas releases insulin, resulting in low blood sugar and hunger.

Researchers debate whether amyloid deposits are the cause or symptom of a disease, but Hayden feels certain the deposits offer clues to the cause of diabetes. He bases his observations on experiments showing that when rats are genetically altered to produce human amyloid, they spontaneously develop diabetes. Normal rats do not spontaneously develop diabetes. "My hope is that we can turn more doctors into amyloid believers. This is a new find, and we need to understand it."

The heart and diabetes

James Sowers, MD '71, knows there is a powerful link between diabetes and heart disease. But which comes first? Type 2 diabetics' risk of cardiovascular disease is two to four times higher than that of the general population. "We want to know why cardiovascular disease occurs in such a strident, accelerated fashion among diabetics," says Sowers, who holds the Thomas W. and Joan F. Burns Missouri Chair in Diabetology and directs the MU Diabetes and Cardiovascular Center.

His studies suggest that the hardening of coronary arteries leading to cardiovascular disease and other cardiovascular risk factors are present before the onset of type 2 diabetes. Studies have shown that medication that doctors use to control high blood pressure also can reduce the risk of developing type 2 diabetes. The same medication also delays the development and progression of kidney disease in type 2 diabetics.

"This group of medications restores beta cell function and reduces scarring, which is important because every chronic disease associated with diabetes is associated with internal scarring," Hayden says. "Boy, was there excitement when we saw this."

Diabetes can devastate the kidneys

Adam Whaley-Connell, nephrologist and assistant professor of internal medicine, has found that one of the earliest markers of kidney damage, small amounts of proteins in the blood that are normally reabsorbed by healthy kidneys, also signals risk for cardiovascular disease. The presence of these proteins makes a diabetics' risk for heart failure nearly four times greater than in diabetics where the proteins aren't leaked into the blood.

Roughly 40 percent of type 2 diabetics will develop kidney disease because of damage to the organ's blood vessels. Damaged kidneys don't clean blood properly, so waste materials build up. In diabetics, kidney disease usually leads to kidney failure within 5 to 7 years. Identifying the early marker for kidney damage allows doctors to begin treatment earlier, delaying the onset of kidney disease.
Kidney disease can be both a cause and consequence of cardiovascular disease. Because the kidneys help maintain constant blood volume, damaged kidneys can lead to high blood pressure. Conversely, severe high blood pressure can cause kidney damage.

The number of people with kidney disease has doubled in the past decade. As diabetics live longer because of better treatment, their likelihood of developing chronic kidney disease increases. Treatment of chronic kidney disease will cost the United States $28 billion annually by 2010, according to the United States Renal Data System.

Whaley-Connell worries that the epidemic of type 2 diabetes will result in an epidemic of cardiovascular disease and kidney failure. "It's imperative that we investigate early mechanisms of kidney injury so we can much better prevent or arrest kidney disease," he says. "We need to intervene more aggressively and earlier."

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