

# 50 years of diabetes research and treatment

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From how people test their glucose levels to how long they can expect to live, almost everything has changed over the past 50 years for Americans with diabetes. A special symposium held at the American Diabetes Association's 75th Scientific Sessions features a look back at what physicians and researchers have learned and how the lives of patients have changed during the past five decades.

"There are things that have happened over the past 50 years that clearly make life a lot better for people," said Fred Whitehouse, MD, Division Head Emeritus at the Henry Ford Health System in Detroit, who has been treating people with diabetes for just as long.

For example, when Whitehouse first started seeing patients the only option for the treatment of type 1 diabetes was to inject animal insulin, which came from cows or pigs and sometimes caused adverse reactions in people. Today, human insulin produced by microorganisms is used, an important difference because not only are there fewer adverse reactions, there's no fear of running out of it, he said. What's more, there are now long- and rapid-acting insulins and a variety of delivery systems, including insulin pumps, which improve accuracy and comfort while tightening [blood glucose](#) control and reducing hypoglycemia.

The way [glucose levels](#) are tested has also changed dramatically, said Whitehouse. Whereas once the only way to assess [diabetes control](#) was by testing for the presence of sugar in a person's urine, today there are numerous, far more accurate ways to test [blood glucose levels](#), including the non-invasive A1C, which measures average blood glucose levels over

a three-month period. "This gives us a nice marker for showing whether a person is on the right road or not," Whitehouse said.

Yet there is still a long way to go, he noted. "There's been a lot of change, most of it for the better, but what people want is a cure and we don't have that yet."

Daniel Porte, Jr., MD, has been conducting diabetes research for more than 50 years and has witnessed a sea change in how much is known about the mechanisms involved in diabetes. He remembers when the endocrine and nervous systems were considered completely unrelated, when glucose was considered the only regulator of insulin and when there was only one method for administering insulin. While researchers have learned much about diabetes over the past 50 years - including how it develops, how to prevent or delay it and how it affects the rest of the body, all of which were virtually unknown in the 1960s - perhaps the most important lesson, he said, is that the fruits of investigation don't ripen overnight.

"In order to understand disease, you have to do basic research," said Porte, a professor at the University of California, San Diego and Professor Emeritus at the University of Washington. "But you've got to be patient, because it takes a long time to go from basic research to clinical impact."

"For example," he said, "the drugs we use now to treat diabetes were first studied 30 to 40 years ago. And there are many more than the one or two that were being used back in the 1970s."

During the time Porte has been involved in diabetes research, the field has grown from taking simple measurements of hormones to increasingly complex investigations that look at the inter-relationship between hormones and the nervous system, an area still being plumbed

for new discoveries. "This year, amazingly enough to me," he said, "it was discovered that insulin sent to the central nervous system not only feeds back to the brain, it also affects glucose production. It regulates the islet cells, so there is a complete integration of the endocrine system and the nervous system. It took 40 years to discover this."

Not only do these discoveries help us develop better treatments for diabetes, said Porte, they can also help in the treatment of other diseases, such as Alzheimer's. "We now believe that perhaps impaired insulin action in the central nervous system leads to the behavioral changes we see in Alzheimer's patients," he said.

Michael Brownlee, MD, who has experienced life as a person with diabetes, physician and researcher, said the one thread that ties all three roles together is the issue of diabetes-related complications.

"The reason diabetes is a serious health problem is because of the complications," said Brownlee, Anita and Jack Saltz Chair in Diabetes Research and Associate Director for Biomedical Sciences at the Albert Einstein College of Medicine's Diabetes Research Center. "If there were no complications, diabetes would be like hypothyroidism and other easily managed diseases. You'd take a tablet to replace the hormone and everything would be fine. It wouldn't be a public health problem costing billions of dollars in care each year and requiring billions of dollars of research."

Brownlee, diagnosed with type 1 diabetes at age eight, has suffered from the two potentially fatal acute complications of this disease—ketoacidosis and severe hypoglycemia—but not from any of the chronic complications that cause blindness, kidney failure and heart attacks. He remembers applying to medical school at a time when only half of people with type 1 diabetes were expected to live into their 40's or early 50's. Some schools were reluctant to admit him because he

"wouldn't be able to practice medicine for a full lifetime," he said. "They said they'd rather give the spot to someone with a normal lifespan. Fortunately, advances in diabetes research and treatment have made those old statistics obsolete."

Brownlee's research on the mechanisms that cause diabetic complications has created a paradigm shift in the field. He noted that until 1993, diabetes complications—such as eye and kidney disease—were considered consequences of diabetes, rather than of [high blood glucose](#) levels. "Prior to the Diabetes Control and Complications Trial (DCCT) study that was published that year, the general dogma was that diabetes caused both metabolic changes and complications, which had nothing to do with each other. They were just two parallel manifestations of the disease," he said.

"Now it's known that prolonged [high glucose levels](#) increase the risk for eye and kidney complications associated with diabetes, and maintaining tighter control of blood glucose levels reduces that risk," he said. "We also learned from EDIC, the follow-up study to the DCCT, that the adverse effects of early high blood glucose levels persist for many years after A1Cs are improved, a phenomenon called 'metabolic memory'." A major focus of his current research is identifying the mechanisms responsible for metabolic memory.

Kathryn Ham, who turns 86 this week, has seen tremendous changes in the treatment of diabetes over the 78 years she has been living with [type 1 diabetes](#). But she also believes firmly in the importance of keeping some things the same - such as when she gives herself insulin each day and when she tests her blood glucose levels. That kind of discipline, she said, prevents her from making mistakes or forgetting to take her insulin.

"Every person with diabetes needs to create a system for remembering and/or dealing with his or her own treatment," she said. "My system,

though antiquated, works for me. I still inject insulin four times per day. I have a cup into which I put the used testing needle and used insulin needle. If I am interrupted, for example by a telephone call, while administering treatment, I can look in the cup to see if I have already taken my insulin, because I am forgetful. Of course nowadays, use of an insulin pump renders this unnecessary for many people, but there are always things you need to remember so dream up your own system."

Over the years, Ham said, she has seen the needles grow smaller, the addition of the A1C [blood glucose test](#), new forms of [insulin](#), new treatments for diabetes-related eye disease and the introduction of digital blood glucose meters, "which have all made a tremendous difference in [diabetes care](#)."

"Despite the enormous growth in our understanding of diabetes and its complications, we are still only able to manage the disease," said Robert Ratner, MD, Chief Scientific & Medical Officer for the American Diabetes Association. "The next 50 years must elucidate the mechanisms by which both type 1 and type 2 diabetes occur, along with those critical steps at which we might intervene to prevent disease. Treatments must provide optimal glucose and metabolic control, without the risk of hypoglycemia, and complications of [diabetes](#) should become historical memories."

Provided by American Diabetes Association

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