FACT SHEET

Type 1 Diabetes

NATIONAL INSTITUTES OF HEALTH

Yesterday

- In the 1950s, about one in five people died within 20 years after a diagnosis of type 1 diabetes. One in three people died within 25 years of diagnosis.
- About one in four people developed kidney failure within 25 years of a type 1 diabetes diagnosis. Doctors could not detect early kidney disease and had no tools for slowing its progression to kidney failure. Survival after kidney failure was poor, with one of 10 patients dying each year.
- About 90 percent of people with type 1 diabetes developed diabetic retinopathy within 25 years of diagnosis. Blindness from diabetic retinopathy was responsible for about 12 percent of new cases of blindness between the ages of 45 and 74.
- Studies had not proven the value of laser surgery in reducing blindness.
- Major birth defects in the offspring of mothers with type 1 diabetes were three times higher than in the general population.
- Patients relied on injections of animal-derived insulin. The insulin pump would soon be introduced but would not become widely used for years.
- Studies had not yet shown the need for intensive glucose control to delay or prevent the debilitating eye, nerve, kidney, heart, and blood vessel complications of diabetes. Also, the importance of blood pressure control in preventing complications had not been established yet.
- Patients monitored their glucose levels with urine tests, which recognized high but not dangerously low glucose levels and reflected past, not current, glucose levels. More reliable methods for testing glucose levels in the blood had not been developed yet.
- Researchers had just discovered autoimmunity as the underlying cause of type 1 diabetes. However, they couldn't assess an individual's level of risk for developing type 1 diabetes, and they didn't know enough to even consider ways to prevent type 1 diabetes.

Today

- The long-term survival of those with type 1 diabetes has dramatically improved in the last 30 years. For people born between 1975 and 1980, about 3.5 percent die within 20 years of diagnosis, and 7 percent die within 25 years of diagnosis. These death rates are much lower than those of patients born in the 1950s, but are still significantly increased compared to the general population.
- After 20 years of annual increases from 5 to 10 percent, rates for new kidney failure cases have leveled off. The most encouraging trend is in diabetes, where rates for new cases in whites under age 40 are the lowest in 20 years. Improved control of glucose and blood pressure and the use of specific antihypertensive drugs prevent or delay the progression of kidney disease to kidney failure.
- Annual eye exams are recommended because, with timely laser surgery and appropriate follow-up care, people with advanced diabetic retinopathy can reduce their risk of blindness by 90 percent. A new study shows that vision loss that is often associated with laser therapy can be reduced when the drug ranibizumab is used in combination with laser.
- For expectant mothers with type 1 diabetes, tight control of glucose that begins before conception lowers the risk of birth defects, miscarriage, and newborn death to a range that is close to that of the general population.
- Patients use genetically engineered human insulin in a variety of formulations, e.g., rapid-acting, intermediate acting, and long-acting insulin, to control their blood glucose. Insulin pumps are widely used.
- A major clinical trial, the Diabetes Control and Complications Trial (DCCT; http://diabetes.niddk.nih.gov/dm/pubs/control), showed that intensive glucose control dramatically delays or prevents the eye, nerve, and kidney complications of type 1 diabetes. A paradigm shift in the way type 1 diabetes is controlled was based on this finding. As researchers continued to follow study participants, they found that tight glucose control also

reduces cardiovascular complications, such as heart attack and stroke. This research has contributed to greatly improved health outcomes for patients.

- Patients can regularly monitor their blood glucose with precise, less painful methods, including a continuous glucose monitor (CGM). Technology pairing a CGM with an insulin pump is also available and was found to help patients achieve better blood glucose control with fewer episodes of dangerously low blood glucose compared to standard insulin injection therapy.
- The widely used HbA1c test shows average blood glucose over the past 3 months. The HbA1c Standardization Program enabled the translation of tight blood glucose control into common practice.
- Scientists have identified a key gene region that contributes nearly half the increased risk of developing type 1 diabetes, and have also learned a great deal about the underlying biology of autoimmune diabetes. They have used this knowledge to develop accurate genetic and antibody tests to predict who is at high, moderate, and low risk for developing type 1 diabetes. This knowledge and recent advances in immunology have enabled researchers to design and conduct studies that seek to prevent type 1 diabetes and to preserve insulin production in newly diagnosed patients. This new understanding has prevented life-threatening complications in clinical trial participants at risk for developing diabetes.
- Scientists have identified nearly 50 genes or gene regions associated with type 1 diabetes.
- Many people who received islet transplants for poorly controlled type 1 diabetes are free of the need for insulin administration a year later, and episodes of dangerously low blood glucose are greatly reduced for as long as 5 years after transplant. But, the function of transplanted islets is lost over time, and patients have side effects from immunosuppressive drugs.
- The SEARCH for Diabetes in Youth Study (www.searchfordiabetes.org/) provided the first national data on prevalence of diabetes in youth: 1 of every 523 youth had physician diagnosed diabetes in 2001 (this number included both type 1 and type 2 diabetes). SEARCH also found that about 15,000 youth are diagnosed with type 1 diabetes each year.

Tomorrow

- By finding the environmental factors (e.g., viruses, toxins, dietary factors) that trigger type 1 diabetes through the NIH's TEDDY study (www.teddystudy.org), researchers will identify ways to safely prevent the autoimmune destruction of insulin-producing cells.
- Approaches to prevent or slow progression of type 1 diabetes will be identified through research conducted by NIH's Type 1 Diabetes TrialNet (www.diabetestrialnet.org). TrialNet will also be poised to test new therapies emerging from research on environmental and genetic contributors to disease.
- Research by the NIH's Clinical Islet Transplantation Consortium (www.citisletstudy.org) will improve methods for islet transplantation, allowing more people to benefit from this treatment strategy.
- Methods for safely imaging the insulin-producing beta cells will help scientists better understand the disease process and assess the benefits of treatments and preventions that are under study.
- Knowledge from the NIH's Beta Cell Biology Consortium (www.betacell.org) about biological pathways regulating development and growth of insulin-producing beta cells will help scientists generate beta cells in the lab. This progress may relieve the shortage of beta cells for transplantation and lead to ways to promote beta cell regeneration in people with type 1 diabetes.
- New technologies, such as a closed loop system that automatically senses blood glucose and adjusts insulin dosage precisely, will become available—allowing patients to more easily control their blood glucose levels and develop fewer complications.
- As molecular pathways by which blood glucose causes cell injury are better understood, scientists will develop medicines to prevent and repair the damage.
- Tracking the number of children with diabetes through SEARCH will allow scientists to see how rates are changing over time and inform research and public health efforts to combat the disease.

For more information, contact The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK): NIDDKinquiries@nih.gov

www.niddk.nih.gov