National Institutes of Health

Fact Sheet — *Type 2 Diabetes*

30 Years Ago

- No proven disease prevention strategies existed.
- The only ways to treat diabetes were the now obsolete forms of insulin from cows and pigs, and drugs that stimulate insulin release from the beta cells of the pancreas (sulfonylureas). Both of these therapies cause dangerous low blood sugar reactions and weight gain.
- No proven strategies existed to prevent disease complications, such as blindness, kidney disease, nerve damage, and heart disease.
- No proven tests were available for assessing patient control of their blood sugar levels.
- While scientists knew that genes played a role (i.e., the disease often runs in families), they had not identified any specific culprit genes.
- National efforts were not being made to combat obesity--a serious risk factor for the disease. Fewer people developed type 2 diabetes compared to today because overweight, obesity, and physical inactivity were not pervasive.
- Patients were almost exclusively adults—the reason that the disease was formerly called "adult onset diabetes." It was rare in children or young adults.

Today

- Type 2 diabetes can be prevented or delayed! The NIH-funded Diabetes Prevention Program (DPP) clinical trial studied over 3,000 adults at high risk for developing type 2 diabetes due to elevated blood sugar levels and overweight. The lifestyle intervention reduced by 58 percent the risk of getting type 2 diabetes. This dramatic result was achieved through modest weight loss (5 to 7 percent of body weight) and 30 minutes of exercise 5 times weekly. In another arm of the study, the drug metformin reduced development of diabetes by 31 percent. Both Caucasian and minority populations benefited from the interventions.
- Based on the DPP findings, the NIH developed the education campaign, *Small Steps, Big Rewards, Prevent Type 2 Diabetes*, to help people at high risk take the necessary steps to prevent the disease (www.ndep.nih.gov). The CDC and over 200 private partners have joined this effort. Moreover, the NIH has launched translation research initiatives to determine the best ways to promote adoption of the DPP prevention-oriented findings in real-world settings.
- Vigorous research continues to combat type 2 diabetes, which—even with proven prevention strategies—is escalating in the U.S. The escalation appears linked to the rising rate of obesity. Approximately 23.6 million Americans have type 2 diabetes, which represents 7.8 percent of the U.S. population and about 1/4 of them don't even know it. In addition, we now know that at least another 57 million Americans have "pre-diabetes." Diabetes is conservatively estimated to be the seventh leading cause of death in the U.S.
- Minority populations are disproportionately affected (African Americans, Hispanics, American Indians, Alaska Natives, Asian Americans, and Pacific Islanders). For example, African Americans are 1.8 times more likely to develop type 2 diabetes compared to non-Hispanic whites.
- Increased diagnosis of type 2 diabetes in children is also associated with rising rates of obesity. This trend is especially alarming because, as younger people develop the disease, the complications, morbidity, and mortality associated with diabetes are all likely to occur earlier. Furthermore, offspring of women with type 2 diabetes are more likely to develop the disease. Therefore, the burgeoning of diabetes in younger populations could lead to a vicious cycle of ever-growing rates of diabetes.
- The SEARCH for Diabetes in Youth Study has 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 has also provided the first data on the rate of development of new cases of childhood diabetes and will continue to monitor trends in the future.
- The NIH launched a major clinical trial, called HEALTHY, which is examining whether an intervention given to middle schoolers will prevent development of type 2 diabetes risk factors. For youngsters who already have the disease, the TODAY clinical trial is determining the best treatment strategies.

- Research has vastly expanded understanding of the molecular underpinnings leading to diabetes and its complications and has laid the foundation for improvements in the survival and quality-of-life for people with the disease.

- Studies have dramatically increased knowledge about the complex genetic underpinnings of type 2 diabetes. Recent studies have boosted to 16 the total number of gene regions associated with increased risk of type 2 diabetes.

- New drug development has been aided by NIH-supported clinical trials that validated a marker, called hemoglobin A1c (HbA1c). This marker reflects average blood sugar control over a 3 month period. Thus, a simple lab test can tell patients whether they are achieving good control of blood sugar levels.

- Tight control of blood sugar has become a standard of treatment based on results from NIH clinical trials demonstrating that tight control (i.e., HbA1c less than 7) can prevent or delay the development of devastating complications. Unfortunately, few patients currently achieve the close control needed for preventing complications. Researchers are urgently seeking improved methods of achieving tight control.

- New and more effective treatments have become available through research. New oral agents targeting the specific metabolic abnormalities of type 2 diabetes are available. Patients are benefiting from improved forms of insulin, a range of oral medications to control blood sugar and reduce the need for insulin, and new drugs that may not only control blood sugar, but also strengthen the activity of patients' own insulin-producing cells.

- New technologies are emerging, such as the recently-approved continuous glucose monitors. These devices have the potential to dramatically improve patients' ability to control their sugar levels—key for preventing complications—and to improve their quality-of-life by eliminating the need for invasive finger sticks.

- Kidney disease can be detected earlier by standardized blood tests to estimate renal function and monitor urine protein excretion. Therefore, patients can be treated earlier to slow the rate of kidney damage. Improved control of glucose and blood pressure and the use of antihypertensive drugs called ACE inhibitors and ARBs prevent or delay the progression of kidney disease to kidney failure. With good care, fewer than 10 percent of patients develop kidney failure.

- Clinical trials have shown that blood pressure and lipid control reduce diabetes complications by up to 50 percent. Physicians are now much better equipped to control hypertension and unhealthy blood fats, which often accompany diabetes and raise the risk of heart disease, the leading cause of death of people with diabetes.

- Results from a large clinical trial showed that patients with type 2 diabetes at high risk of heart disease do not benefit from intensive blood glucose control below current recommendations. Although these findings are important, they will not change therapy for most patients with type 2 diabetes because they are not treated to blood sugar levels as low as those tested in this trial.

- With timely laser surgery and appropriate follow-up care, people with advanced diabetic retinopathy can reduce their risk of blindness by 90 percent.

- The NIH spends $1.037 billion on diabetes research. In 2007, total costs attributable to diabetes for Americans was estimated at $174 billion—an increase of 32 percent since 2002.

Tomorrow

The NIH is poised to make major discoveries in the *prediction* of who will develop type 2 diabetes and its complications, to *personalize* individual treatments, and to use this information to *preempt* disease onset and development of complications. This knowledge will have a major impact on reducing the human and economic toll that type 2 diabetes places on the U.S.

- Researchers are pursuing earlier and more aggressive treatment approaches that would help to *preempt* diabetes complications.

- New understanding of the molecular links between obesity and insulin resistance will inform the development of new therapeutic targets for preventing and treating type 2 diabetes.

- Identification of susceptibility genes for diabetes and its complications will enable earlier implementation of prevention measures targeted to those at highest risk.

- *Preempting* diabetes will eliminate the life-threatening complications, which will mean that people will live longer, healthier lives without fear—such as the fear of going blind or losing a lower limb.

- Research on the effect of maternal diabetes on offspring will help to break the vicious intergenerational cycle.

- Continued research on the mechanisms underlying the development and progression of disease complications will result in the ability to *predict* who is likely to develop them. *Personalized* treatments could then be developed to *preempt* complications. This strategy would dramatically improve the health and well-being of patients.

- Results from NIH clinical trials will help to identify strategies to *preempt* type 2 diabetes in children, thereby stemming the alarming trend of increased rates of this disease in youth.

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