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## Fact Sheet

## Type 2 Diabetes

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### Thirty 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 caused 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 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 action to prevent the disease ([www.ndep.nih.gov](http://www.ndep.nih.gov)). The CDC and over 200 private partners have joined this effort. Moreover, the NIH 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 19-20 million Americans have type 2 diabetes, and about 1/3 of them don't even know it. Diabetes prevalence in this country has increased by 49 percent from 1990 to 2000. Diabetes is conservatively estimated to be the sixth 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).
- 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 NIH is launching a major clinical trial, called HEALTHY, which will examine whether an intervention given to middle schoolers will prevent development of 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.

- Progress has been achieved in identifying some genes that predispose individuals to developing type 2 diabetes, and the NIH is supporting a major genetics consortium to pool data for the gene hunt.
- 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 blood sugar 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 now 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.
- As a result of research, 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.
- With timely laser surgery and appropriate follow-up care, people with advanced diabetic retinopathy can reduce their risk of blindness by 90 percent.

- Currently, the NIH spends \$1.055 billion on diabetes research. In 2002, total medical expenditures attributable to diabetes for all Americans was estimated at \$132 billion. Approximately one-third of Medicare expenses are associated with treating diabetes and its complications.

## 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* complications. Clinical trials currently under way will provide information about preventing diabetes complications with intensified control of glucose, blood pressure, and lipids, with improvements in lifestyle to achieve weight loss, and through use of specific glucose control strategies and revascularization interventions.
- 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. Identification of genes will also reveal new targets for drug development.
- *Preempting* the disease before it starts 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 uncover ways 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. With this knowledge, *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.