

Type 2 Diabetes



Yesterday

- No proven strategies existed to prevent the disease or its complications.
- 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. 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.
- 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 (<http://diabetes.niddk.nih.gov/dm/pubs/preventionprogram/>) found a lifestyle intervention (modest weight loss of 5 to 7 percent of body weight and 30 minutes of exercise 5 times weekly) reduced the risk of getting type 2 diabetes by 58 percent in a diverse population of over 3000 adults at high risk for diabetes. In another arm of the study, the drug metformin reduced development of diabetes by 31 percent.
- Based on the DPP findings, the National Diabetes Education Program 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).

- Ongoing NIH translational research efforts are testing cost effective ways to deliver the DPP-proven lifestyle change in real-world settings. This vigorous effort is needed to address the escalating prevalence of type 2 diabetes which now affects 7.8 percent of Americans, disproportionately affects minorities, and is conservatively estimated to be the seventh leading cause of death in the U.S.
- Type 2 diabetes is increasing in children, in tandem with rising obesity rates. This trend is alarming because, as younger people develop the disease, the complications, morbidity, and mortality associated with diabetes are all likely to occur earlier. Also, offspring of women with type 2 diabetes are more likely to develop the disease. Thus, 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 (www.searchfordiabetes.org) has provided the first national data on incidence and prevalence of diabetes in youth. About 3700 youth under 20 years old are diagnosed with type 2 diabetes each year, and the disease is particularly prevalent in minority youth.
- Research has vastly expanded understanding of the molecular underpinnings of diabetes and its complications. Recent work has boosted to nearly 40 the number of gene regions associated with increased risk of type 2 diabetes, laying the foundation for new approaches to prevention and therapy.
- NIH-supported clinical trials validated a marker called hemoglobin A1C (A1C). This marker reflects average blood sugar control over a 3 month period. This technology, along with tests that allow patients to monitor their own blood glucose throughout the day, helps make better blood glucose control achievable for many people with type 2 diabetes.
- Because lower A1C levels have been shown to be predictive of longer life and fewer complications, the test has helped speed development and approval of better forms of insulin and new diabetes medicines that work through a variety of mechanisms. New drugs are available

that lower glucose without weight gain or even with modest weight loss. Several agents targeting the specific metabolic abnormalities of type 2 diabetes are now available and can be combined, thus delaying the need for insulin.

- Tight blood sugar control has become a standard of treatment for most diabetes patients based on results from NIH clinical trials demonstrating that keeping A1C below 7 can prevent or delay devastating disease complications.
- A large clinical trial showed that older patients with longstanding type 2 diabetes at high risk of heart disease do not benefit from more intensive blood glucose control than is currently recommended. These findings spare patients from unneeded therapy and provide important data to help individualize therapy, with less stringent A1C targets suggested for some people such as those with advanced diabetes complications.
- 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 prevent and control heart disease, which often accompanies diabetes, and is the leading cause of death in people with diabetes.
- Nationwide improvements in risk factor control show research-proven strategies are being translated into practice. Improvements in control of cholesterol, blood glucose, and blood pressure have added an estimated one year to the expected lifespan of a person with type 2 diabetes since 1992, and improved quality of life by reducing the incidence of burdensome complications like blindness, lower limb amputations, kidney failure, and coronary heart disease.
- As a result of research proving their benefits, Medicare now covers blood glucose self monitoring materials and diabetes education services, helping people to better control their diabetes.
- Kidney disease can be detected earlier via urine tests. Therefore, patients can be treated earlier to slow the rate of kidney damage. Improved control of glucose and blood pressure prevents or delays progression of kidney disease to kidney failure. With good care, less than 10 percent of patients develop kidney failure.
- With timely laser surgery and appropriate follow-up care, people with advanced diabetic retinopathy can reduce their risk of blindness by 90 percent. A recent study showed a drug which limits blood vessel growth can be an

important supplement to laser therapy for diabetic macular edema.

- The NIH spent over \$1.1 billion on diabetes research in fiscal year 2009. In 2007, total costs attributable to diabetes for Americans was estimated at \$174 billion—an increase of 32 percent since 2002.

Tomorrow

- Research will find better ways to bring proven diabetes prevention strategies to more people at lower cost.
- Earlier and more aggressive treatment approaches may help better prevent diabetes complications.
- New understanding of the biology of obesity and insulin resistance is informing the development of new therapeutics to prevent and treat 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.
- Research on the effect of maternal diabetes on offspring may help to break the vicious diabetes 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.
- NIH clinical trials will identify new approaches to prevent and treat the emerging problem of type 2 diabetes in children.

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