Imagine a Future without Diabetes

Imagine a future without diabetes. A future without constant finger pricks and needle sticks. Without dangerous glucose highs and lows. Without the risk of diabetes-associated blindness, kidney disease, heart attacks, strokes, or limb loss.

The American Diabetes Association is working to secure a future of continuous advancements in diabetes care. We do this by committing to a sustained investment in diabetes research. And we’re able to make this commitment thanks to the generosity of donors who share our passion and our vision.

Since 1952, the American Diabetes Association has invested more than $807 million in more than 4,700 research projects that have helped change the face of how diabetes is treated today.

With these funds, diabetes researchers are hard at work for you. They dedicate their careers to improving health and saving lives. Their research is the path to a future free from diabetes and all its burdens.

Together, we can turn more of their ideas into lifesaving discoveries.

Lynn’s Story: 50 Years Living with Diabetes

“This year was a huge milestone for me...50 years living with T1D. I was diagnosed in 1967 when I was six years old and in kindergarten. I remember being in the hospital for ten days, not being able to have my three siblings come visit me, and remember the nurses teaching my mom how to give a shot by practicing on an orange. Once discharged, I remember my mom boiling my glass syringes, drawing up beef or pork insulin, and having me leave specimens of urine so she could approximate my blood glucose level. Wow, have times changed!

Fortunately, 50 years later, I'm healthy with very minimal complications from diabetes. I've had lots of highs and lows in my life (literally) but have never let diabetes define who I am. I have a positive outlook, a sense of humor, and am grateful for all I have. Yes, there are days when having diabetes really stinks, but I'm human and allow myself those days. I never forget that things could be worse. I am blessed to have a wonderful family and great friends. I've been married for 26 years and have 3 beautiful children...and a much loved dog, Bella. I also have an awesome team of doctors.

I am excited about the future of diabetes research because, as a child, I was told that within my lifetime I would live to see a cure for diabetes. I realize we are not there yet, but all this research has led to some amazing new discoveries and technology. Each day that passes, we are one day closer to a cure!”

— Lynn Galvin, Person with Diabetes, Type 1
**T1D Type 1 Diabetes**

*T1D occurs when the body’s immune system attacks the cells that make insulin.*

When the American Diabetes Association funded its first research grant in 1952, people with diabetes could only estimate their blood glucose levels by testing their urine. Insulin was injected with large, reusable needles. Standardized syringes were not widely available.

**TODAY...** Thanks to advances in research over several decades, we now have new, more effective formulations of insulin and new technologies like continuous glucose monitors and insulin pumps. We know that tight control of blood glucose levels reduces diabetes complications and we have safer, easier ways to manage diabetes.

**IMAGINE...** The American Diabetes Association is funding research exploring stem cells, transplantation, safer continuous glucose monitoring technologies, and approaches to manage diabetes effortlessly.

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**Can people with T1D still make insulin?**

Mark A. Atkinson, PhD, at the University of Florida, has had several American Diabetes Association research grants over the years. This year, he and his team made a paradigm-shifting discovery, published in the prestigious journal *Cell Metabolism*. While scientists have long thought that T1D results after a complete destruction of insulin-producing beta cells, Dr. Atkinson’s research now shows evidence that insulin precursor molecules still exist in people with longstanding T1D. These findings suggest that there might be an alternate form of beta cells in people with T1D.

**What does this mean?** If we can understand how these cells work, we can begin to imagine finding a way to stimulate the insulin precursor molecules to be processed into the body’s own supply of insulin, potentially reversing T1D.

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**Is there a safer, easier way to manage T1D?**

Sumita Pennathur, PhD, at the University of California, Santa Barbara, is a mechanical engineer who never intended to study diabetes. But, like so many parents, her entire life changed when her 5-year-old daughter was diagnosed with T1D. This year, Dr. Pennathur received an American Diabetes Association Pathway to Stop Diabetes® Visionary Award to support her transition to diabetes research. She is applying her engineering expertise to invent and manufacture tiny microneedles that can measure glucose painlessly. She recently started a new company to produce the small, painless, disposable glucose sensors she’s developing for her daughter and other kids (and adults) with T1D.

**What’s next?** If her invention is successful, Dr. Pennathur will bring a minimally invasive continuous glucose monitor to the market, with the potential to dramatically improve the safety and convenience of diabetes management.

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**Can we improve islet transplant to reverse T1D?**

R. Paul Robertson, MD, at the Pacific Northwest Diabetes Research Institute, has had several American Diabetes Association grants over the course of his career. Melena Bellin, MD, from the University of Minnesota Medical Center, who has also been supported by the American Diabetes Association, collaborated with Dr. Robertson. This year, they published an important study in people who received islet transplantations to avoid diabetes following the surgical removal of the pancreas. After transplant surgery, these individuals often suffer from low blood glucose levels. Drs. Robertson and Bellin showed how this occurs. The islets, which are transplanted to the liver, are put into an abnormal setting where they receive crossed signals that tell the liver not to make more glucose when it should.

**The implications?** This study suggests that sites other than the liver may be best for islet transplant in people with T1D. Now, Dr. Bellin has two studies funded by the National Institutes of Health, extending the line of research she started with American Diabetes Association support.
Is diabetes diagnosis the same for everyone?

James B. Meigs, MD, MPH, FAHA, received an American Diabetes Association grant to mentor a postdoctoral fellow in his laboratory at Massachusetts General Hospital in Boston. The funds supported the training of Aaron Leong, MD. Together, along with a large international genetics research team, Drs. Meigs and Leong identified 60 gene variants that influence levels of Hemoglobin A1C (A1C), which are used to both diagnose diabetes and assess diabetes management. While 60 gene variants had modest influences on A1C in white Americans, just one variant—found only in African Americans—significantly reduced the accuracy of A1C testing.

What does this mean? The researchers estimate that about 650,000 African Americans with this gene variant would have their diabetes diagnosis missed with an A1C test alone. This new genetic information can now inform public health efforts to reduce health disparities in diabetes.

How is smell connected to body weight?

Celine Riera, PhD, is a recipient of an American Diabetes Association Pathway to Stop Diabetes® Initiator Award, which has supported her as she started her own laboratory at Cedars-Sinai Medical Center in Los Angeles. This year, Dr. Riera published exciting data indicating that when the sense of smell is destroyed, mice lose weight and improve their sensitivity to insulin. Surprisingly, the weight loss was not connected to how much the mice ate—or even how much they exercised. Those animals that were unable to smell burned more calories and weighed less than those whose sense of smell remained intact.

The implications? If the same systems are at play in humans, this research may lead us to new therapies to prevent obesity and T2D risk.

Can we reduce T2D risk in women with gestational diabetes?

Frank Hu, MD, MPH, received an American Diabetes Association grant, supported in part by the Allen and Eve Fund, to mentor postdoctoral fellows in his laboratory at Harvard School of Public Health. The grant wrapped up this year with several important contributions. The researchers followed women who had gestational diabetes to identify factors linked to later development of T2D in this high-risk population. Now, we know some of the metabolites that are markers for T2D progression, as well as some specific dietary factors that are associated with these high-risk metabolites.

What’s next? Dietary and lifestyle recommendations can be employed to reduce the risk of gestational diabetes and of T2D in these at-risk women. Since children born to mothers who had diabetes during pregnancy are at 10-fold higher risk for developing T2D, these public health measures may help reduce T2D risk across generations.
Complications

All types of diabetes put people at risk for the same complications. Dangerous glucose highs and lows. Heart attack, stroke, kidney failure, blindness, amputation. Complications are persistent dangers for people with diabetes.

Historically, heart attack has been the most common complication of diabetes.

TODAY... As we have better treatments and information about the value of tight blood glucose control, fewer people with diabetes are suffering complications like heart attack, stroke, end-stage kidney disease and amputations.

IMAGINE... The American Diabetes Association is focused on a future where diabetes medications do more than treat diabetes. Research advances have recently shown that some diabetes drugs help reduce heart attack, too. The American Diabetes Association’s Standards of Medical Care in Diabetes were updated this year to advise health care providers on which patients will benefit most from these therapies.

How do our bodies detect low blood glucose?

Elizabeth R. Seaquist, MD, is a past-President, Medicine and Science, for the American Diabetes Association. She is based at the University of Minnesota and was recipient of an American Diabetes Association clinical science grant to investigate a condition called “hypoglycemia unawareness” in people with T1D. This condition causes patients to lose their ability to detect low blood glucose, which worsens until they become too confused to help themselves. This year, Dr. Seaquist published a study in the journal Frontiers in Neuroscience that showed that T1D patients who suffer from hypoglycemia unawareness have reduced brain volumes. This is the first report that structural changes in the brain may be responsible for hypoglycemia unawareness.

The implications? With this understanding, scientists can begin to explore what is behind these differences in the brain and try to find new ways to prevent the serious condition of hypoglycemia unawareness.

How does kidney disease influence glucose control?

Chronic kidney disease (CKD) is a common complication of diabetes that is also associated with increased risk of cardiovascular disease. CKD leads to changes in how glucose levels can be measured and in how the body processes different medications. The result is increased potential for unstable glucose control and risk for severe hypoglycemia.

Ian De Boer, MD, MS, at the University of Washington, has an American Diabetes Association grant, supported by Boehringer-Ingelheim, to study rates of hypoglycemia, risk factors for hypoglycemia, and new measures of glucose control in individuals with diabetic kidney disease.

What’s next? The goal of this study is to improve health outcomes for people with diabetes and CKD. As the study progresses, we will learn the scope of hypoglycemia in these individuals and how to measure it. We will also have better information on which diabetes medications may be most effective in these patients.

Can we save limbs in people with diabetes?

One in four people with diabetes suffers from chronic wounds that don’t heal, leading to infection, and, in severe cases, lower-limb amputations. Orhan K. Oz, MD, PhD, at the University of Texas Southwestern Medical Center at Dallas, started an American Diabetes Association grant this year to study an imaging technique that uses the patient’s own white blood cells to visualize infection. He is testing whether this technique can help diagnose bone infection and assess wound treatment success.

What does this mean? The results of this study could provide your doctor with an easier, less invasive method for monitoring foot ulcers. The hope is that improved diagnosis and treatment of these wounds will help prevent amputations.
Innovation Improves Lives

Having diabetes before the discovery of insulin meant resorting to measures such as “starvation dieting”—repeated fasting and prolonged undernutrition.

TODAY... Because of research efforts over the past 100 years, we have realized dramatic improvements in treatment options, health outcomes, and quality of life for people with diabetes.

IMAGINE... In science, important discoveries often come from unexpected places. For example, one of today’s most effective diabetes medications came from studies of Gila monster saliva! By supporting scientific exploration and innovation today, we continue to imagine a brighter tomorrow, free from the burdens of diabetes.

What if diabetes is neither T1D nor T2D?

In rare cases, diabetes results from a mutation in a single gene. This type of diabetes, called “monogenic” diabetes, is often misdiagnosed as either T1D or T2D, though it is quite different. Learning more about the different forms of diabetes is critical to getting the right patient on the right treatment. In 2011, the American Diabetes Association funded a grant to Louis Philipson, MD, PhD, FACP, at the University of Chicago, to help launch a website to promote awareness and outreach for monogenic diabetes. Dr. Philipson is the American Diabetes Association’s incoming President-Elect for Science and Medicine. This year, his team filled a healthcare gap by providing free, research-based genetic testing for 243 people with atypical diabetes who could not get insurance coverage for testing.

What does this mean? A diagnosis of monogenic diabetes has direct implications for patients and their families. For some, it may mean the difference between insulin treatments and a once-a-day oral medication. The diagnosis also indicates that there may be other family members with the same mutation who could benefit from genetic screening.

Does diabetes develop in the womb?

Our bodies are programmed during prenatal development in ways that are independent of our DNA composition, but affect the way that genes are turned on and off. Maureen Charron, PhD, at Albert Einstein College of Medicine, has an American Diabetes Association grant to study this prenatal programming, seeking to understand how risk for T2D and obesity is set up in the womb. This year, she published a study that identified how a high-fat diet during pregnancy influences which genes are activated from fetal life through adulthood in laboratory mice. These changes are associated with development of obesity and diabetes—a risk that can be transmitted to future generations, as well.

What's next? This study provides a proof of principle for human studies in babies born to obese and overweight mothers. These human studies are ongoing at Dr. Charron’s institution. By better understanding early risk factors for diabetes, researchers may be able to find new approaches to preventing the disease in future generations.

How is a new diabetes medication developed?

Scientists have uncovered many pieces of the complex puzzle of what goes wrong in diabetes, but the picture is far from complete. For example, a protein called PTP1B is known to be a critical activator that regulates how insulin works. Many past attempts have focused on making medications that act on this protein, to no avail. However, Wolfgang Peti, PhD, at the University of Arizona, is working with an American Diabetes Association Pathway to Stop Diabetes® Visionary Award to better understand how this protein works. This year, he published the first molecular picture of how PTP1B activity is regulated.

The implications? These discoveries are paving the way for the discovery of new PTP1B inhibitors that could serve as new, safer, more effective medications for diabetes.
By the Numbers

$807.4M invested in research since 1952

4,700+ research projects funded by the American Diabetes Association since 1952

$37.4M+ made available for research in 2017 alone

Every $1 = $7 in additional funds to extend the research

More than 99% of researchers we fund remain committed to diabetes research careers for at least 5 years

341 funded scientists at 140 institutions across the United States in 2017

371 research projects supported in 2017

>9 OUT OF 10 of our researchers secure additional funding within five years to expand their work

Every 24/7...
Imagine a future without diabetes. Support research to get there.

In science, we never know where the next breakthrough will arise. That’s why it’s critical that we support the exploration of as many good ideas as possible. Scientists are hard at work for you. Let’s keep them working to turn their ideas into lifesaving discoveries.

Help us fund more research for a future free of diabetes and all its burdens.

Donate at diabetes.org/researchsupport or call 1-888-700-7029.

Why I Give: For a Long, Productive Life with Diabetes

“The American Diabetes Association has come a long way in erasing the myth that diabetes is a dreadful disease, and anyone who has it is doomed. Thanks to research, there are many people that have lived long productive lives by properly managing the disease. I am quite impressed by the depth and breadth of research that is funded by the Association and the different ways they are attacking the disease.”

— Sally Edwards, Philanthropic Supporter
“We are proud to support the American Diabetes Association Research Foundation. We understand the critical roles that young scientists and other diabetes researchers play in addressing this global epidemic. The philanthropic role that our Foundation plays is vital to the advancement of diabetes treatments to help people with diabetes live longer, healthier lives. We are proud to partner with the Association to end diabetes once and for all.”

— J. T. Tai & Co. Foundation, Inc., Philanthropic Supporter