

JUST THE FACTS

MORE THAN
30M

Americans have diabetes¹

ROUGHLY
208,000

Americans under age
20 have diabetes²

DIABETES IS THE
7th

leading cause of
death in the U.S.²

\$245B

the cost of diagnosed
diabetes in the U.S.²



MEDICINES IN DEVELOPMENT FOR DIABETES

A REPORT ON DIABETES AND RELATED CONDITIONS

More Than 170 Medicines for Diabetes and Diabetes-Related Conditions in Development

The U.S. diabetes epidemic affects millions of Americans, with 1.4 million new cases diagnosed each year.² For many patients, a diabetes diagnosis affects nearly every aspect of their life, including special dietary concerns and other lifestyle changes, as well as daily medicines to help manage their blood glucose levels.

Diabetes is a general term for a chronic condition where there is too much glucose (sugar) in the blood. Normally, the pancreas makes insulin to help glucose enter the body's cells where it is used for energy. In diabetes, the body either does not make enough insulin or none at all, or does not use it properly, leading to high blood glucose levels. Uncontrolled diabetes with persistent high blood sugars can lead to serious health complications, such as heart disease, blindness, lower-extremity amputations and kidney disease or failure.

There are two main kinds of the disease, type 1 and type 2. Type 1 diabetes is an autoimmune disease where the body does not produce insulin as a result of the immune system attacking the insulin-producing cells of the pancreas. Type 1 diabetes, which is usually diagnosed in children and young adults, requires lifelong insulin treatment for survival. In type 2 diabetes, the body is resistant to the action of insulin. To combat this resistance, the pancreas makes even more insulin until it fails to produce enough insulin to overcome the resistance, causing blood glucose levels to be higher than normal. About 5 percent of diagnosed diabetes cases are type 1, and 90-95 percent are type 2.²

Today, more than 30 million Americans are affected by diabetes, including

7 million people who are unaware they have the disease.¹ Another 86 million Americans have prediabetes, which can lead to type 2 diabetes.² Prediabetes is a condition where blood sugar levels are higher than normal, but not high enough for a diagnosis of diabetes.²

According to the U.S. Centers for Disease Control and Prevention (CDC), while the rate of new diabetes cases diagnosed each year is beginning to decrease, the numbers are still too high.

Building on the progress made to date, and to help meet the continual challenges posed by diabetes, biopharmaceutical research companies are working to develop innovative options for patients. Today there are 171 medicines³ currently in development for type 1 and type 2 diabetes and diabetes-related conditions, such as chronic kidney disease and failure due to diabetes, and painful diabetic neuropathy. All of the medicines are in clinical trials or awaiting review by the U.S. Food and Drug Administration (FDA).

Biopharmaceutical researchers are persistent in their efforts to develop novel therapies to treat this complex and challenging illness and to improve the quality of life for diabetes patients. The potential medicines in the pipeline offer hope to the millions of patients who struggle to successfully manage their diabetes.

Diabetes Medicines in the Pipeline

Researching and developing new medicines for diabetes is particularly difficult, with scientific and regulatory challenges introducing unique hurdles for researchers to navigate. Still, biopharmaceutical research companies continue to explore different approaches to fight diabetes and its related conditions. Among the 171 medicines in the development pipeline today, some potential innovations include:

TYPE 1 AND TYPE 2 DIABETES

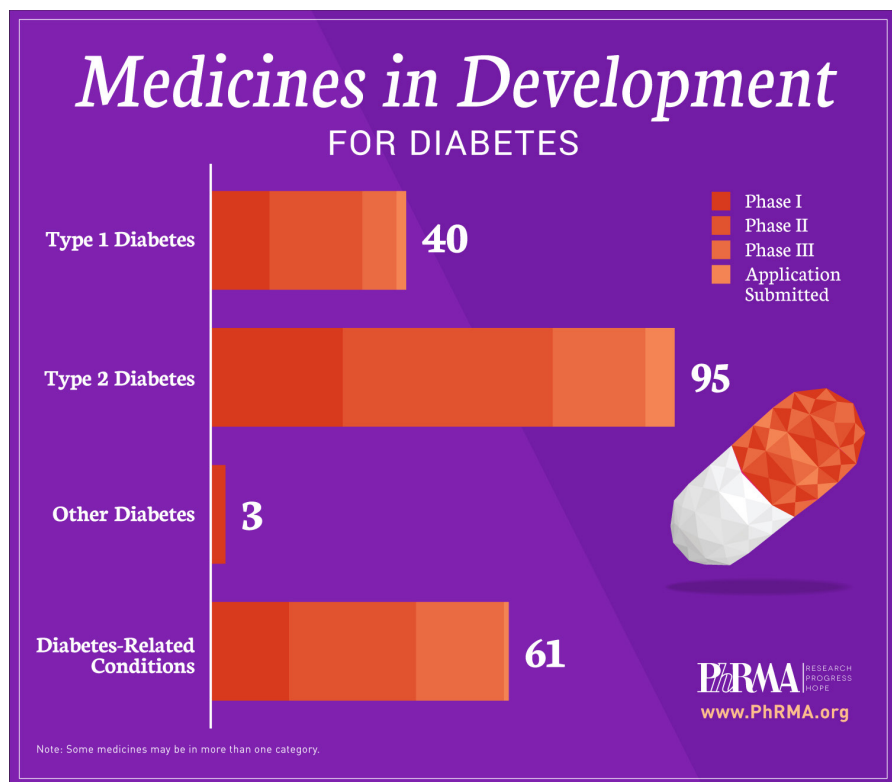
A potential first-in-class oral medicine in development provides a new way for addressing type 1 and type 2 diabetes by acting on two different targets in the body. It works by inhibiting both sodium-glucose co-transporter types 1 and 2 (SGLT1 and SGLT2), molecules that also help move glucose in and out of the body's cells, independent of insulin. This is important for the absorption of glucose in the body, one by the intestine, with glucose absorption from food and the other by the kidney, which determines how much glucose leaves the body via urine.

TYPE 1 DIABETES

A fully recombinant monoclonal antibody is in development for treating patients with newly diagnosed type 1 diabetes. The medicine targets the protein interleukin-21 (IL-21), which is involved in communication between cells and plays a role in regulating the immune system. In type 1 diabetes, the immune system mistakenly attacks beta cells in the pancreas. These cells normally produce insulin, which allows the body to use energy from food and helps control blood sugar levels. Targeting IL-21 provides a mechanism to modify the immune system, which may help mitigate the attack on the pancreas and preserve beta cells.

DIABETIC KIDNEY DISEASE

A medicine in development for diabetic nephropathy is a selective endothelin-A receptor antagonist. Diabetic nephropathy is a complication of type 1 or type 2 diabetes and is caused when the small blood vessels that make up the kidney's filtering system are damaged due in large part to increased blood sugar. This progressive kidney disease can lead to kidney failure or irreversible end-stage kidney disease. The medicine works by blocking the effects of endothelin-1, a peptide that signals blood vessels to constrict or dilate. This signaling system is important for normal kidney function and health. When it functions abnormally, kidney damage and failure can occur. The medicine has been shown to reduce albuminuria (abnormal levels of the plasma protein albumin in the urine) in patients with diabetic nephropathy. Abnormal levels of albumin in the blood can both predict early diabetic nephropathy and serve as a marker for progression of the disease.



“IT’S BEEN A ROUGH ADJUSTMENT FOR [MY SON], AND FOR FAMILY. IT’S A CHALLENGING DISEASE, ESPECIALLY FOR KIDS – IT DEMANDS CONSTANT VIGILANCE AT AN AGE WHERE THEY SHOULD BE CAREFREE.”

**STEPHEN J. UBL, PhRMA
PRESIDENT & CEO
PARENT OF A TYPE 1
DIABETES PATIENT**

For a complete list of the 171 medicines in development, please visit:
<http://phrma.org/files/dmfile/mid-diabetes-drug-list.pdf>



Interview with Dr. Chin

William “Bill” Chin, MD, is the chief medical officer and an executive vice president at

Pharmaceutical Research and Manufacturers of America. Dr. Chin leads the organization’s continuing efforts in advocacy in the drug discovery and development ecosystem.

Describe your role as chief medical officer at PhRMA.

The chief medical officer makes sure that the voice of the patient is heard in all that we do, and seeks to articulate clearly the key work of the industry in science and medicine in the development of innovative therapies.

You have a personal connection to diabetes. Can you share how diabetes came into your life?

I’m an endocrinologist, which means that I have had the opportunity to take care of patients with endocrine disorders, including type 1 and type 2 diabetes. When my son Danny was 15 years old, I actually diagnosed him with type 1 diabetes.

I’ll never forget that morning when my son told me, “Dad, you’ve got to help me. What’s going on? I’m thirsty all time. I’m going to the bathroom all the time. I know I’ve been working out. I’m a baseball player, and I’ve been playing all spring season, so what do I have?” I said, “Well, you must just be working out too much. Now, of course, you might have diabetes, but you can’t have diabetes.” And my son says, “Why can’t I have diabetes?” And I said, “Because I’m an endocrinologist. It’s not possible that you have the disease.”

When I tested Danny, I knew immediately, however, that he had type 1 diabetes. When he heard this diagnosis, we both cried. Danny was understandably upset and worried about his ability to play baseball. As it turns out, though, his coach was immensely supportive and knew everything about diabetes because his roommate in college had type 1. Not only did Danny continue to play baseball, the team had a glorious season.

Putting aside your training as an endocrinologist, as a father hearing that diagnosis and seeing your child realize he’s going to have this condition for the rest of his life, how did that make you feel?

I don’t think any parent is ever prepared to learn that one of our kids has developed a disease, particularly one that will be chronic. In many ways it’s forever, but the good news is we have great therapies that actually will allow a patient with diabetes to live a full and completely normal life if it’s well managed.

Can you talk a little bit about the role collaboration plays in the diabetes space?

Collaboration is incredibly important in the understanding and development of new treatments for diabetes. We still don’t truly understand what causes type 1 or type 2 diabetes, so we are continually seeking to advance our understanding of the disease. This can only be achieved by having academic scientists and physician scientists working closely with scientists in the biopharmaceutical industry. We need to have a much deeper understanding of this complex disease, and this can only be achieved by having more brains working together. Academics are often great at identifying initial ideas, but really don’t – and they’re not set up to – translate these ideas into medicines. Biopharmaceutical scientists are perfect and necessary partners as they can translate these ideas effectively into new medicines.

Diabetes Medications – Improving Adherence

While healthy eating and exercise can help prevent and manage type 2 diabetes, medicines play a key role in helping to treat and reduce the risk of the disease. Patient adherence to diabetes medications can lead to better health outcomes and reduced health care costs. One study estimates that improved adherence to diabetes treatment could avoid 341,000 hospitalizations and 699,000 emergency department visits annually in the United States.⁴

Improved adherence can also create efficiencies in the health care system. Private health insurance plans with low adherence metrics could save \$19 billion annually by improving adherence of their enrollees with diabetes.⁵ A study of Medicare patients with diabetes showed good adherence was associated with nearly \$5,000 in reduced medical spending and \$4,000 in total Medicare spending per patient for these therapeutic areas, over two years.⁶

Adherence to treatment can also positively affect diabetes-related complications, including heart attack, amputation, vision impairment and blindness.⁷

Risk Factors for Type 2 Diabetes

Unlike type 1 diabetes, type 2 diabetes can be prevented or delayed. According to the CDC, major risk factors for type 2 diabetes include being overweight, being age 45 or older, having a family history of type 2 diabetes, being physically active less than three times a week and either having gestational diabetes (when pregnant women who do not have diabetes but have high blood glucose levels during pregnancy) or giving birth to a baby who weighed more than nine pounds. Key strategies for lowering the risk of type 2 diabetes include staying at a healthy weight, eating well and being physically active. Additionally, people with prediabetes can cut their risk of developing type 2 diabetes by as much as 58 percent by making key lifestyle changes to their diet and physical activity levels, according to the CDC.

Diabetes and Minorities in the United States

Racial and ethnic minority populations in the United States are disproportionately affected by diabetes. According to the American Diabetes Association, compared to non-Hispanic whites, the risk of being diagnosed with diabetes is 1.7 times higher among Hispanic adults and non-Hispanic black adults and 1.2 times higher among Asian Americans.

In addition, these populations have a higher risk of complications of diabetes, such as lower-limb amputations, retinopathy and kidney failure, than non-Hispanic whites.

According to the CDC, of adults diagnosed with diabetes, 7.6 percent are non-Hispanic whites, while 9 percent are Asian Americans, 13.2 percent are non-Hispanic blacks, 12.8 percent are Hispanics and 15.9 percent are American Indians/Alaska Natives.

Then and Now: Improving Diabetes Treatment

Expanded treatment options over the past decade have reduced barriers to patient compliance and helped patients better manage diabetes and enjoy a better quality of life.

THEN:

A number of insulin options were available to patients, as well as oral and injected antidiabetic medications to help manage both type 1 and type 2 diabetes. Successful management of diabetes required constant and diligent monitoring, multiple daily injections and/or the coordination of multiple oral medicines alongside a patient's carefully planned daily routine to avoid serious disease complications.

NOW:

A new wave of treatments is offering patients better or more sustained glycemic control, reduced pill burden, more convenient delivery mechanisms, less frequent injections or simplified daily routines. Careful monitoring and treatment are still needed, but current medicines in development offer a promising future for diabetes patients. Medicines in the pipeline may also address diabetes-related complications that affect the kidneys, blood vessels and eyes.

Sources:

1. IHS Life Sciences analysis based on CDC data
2. American Diabetes Association
3. Number of medicines obtained through government and industry sources, and the Springer "AdisInsight" database. Current as of October 12, 2016
4. "Greater adherence to diabetes drugs is linked to less hospital use and could save nearly \$5 billion annually," Health Affairs, 2012
5. "Medication Adherence and Measures of Health Plan Quality," The American Journal of Managed Care, 2015
6. "Does good medication adherence really save payers money?" Medical Care, 2015
7. "Cost sharing, adherence, and health outcomes in patients with diabetes," American Journal of Managed Care, 2010

