Overview

The Scientific Sessions featured more than 800 invited speakers, nearly 400 oral presentations and more than 2,000 poster presentations. Social media was buzzing, and there were more than 5,000 news reports of breakthroughs presented at the meeting reaching more than 270 million impressions within just the first week following the meeting, putting diabetes front and center in conversations around the globe. The numbers are impressive, but the real power of the Scientific Sessions lies in the unique opportunities that it provides for scientists, clinicians, health care providers and industry representatives to make important connections to advance science. The opportunities to learn and connect with colleagues range from large sessions with 6,000 attendees to intimate one-on-one conversations at a poster board.

Beyond the official scientific program, the Association took full advantage of the opportunity this gathering of experts provided to give back to the community that hosted us and to invest in the next generation of diabetes professionals. At three hotels in New Orleans, the Association offered Diabetes Day events, featuring cooking demonstrations, diabetes education and opportunities for hotel staff to ask experts their diabetes-related questions. The Diabetes is Primary program offered information and tools to more than 160 local primary care providers to improve patient outcomes. A two-day workshop called Focus on Fellows brought together 186 endocrinology fellows from across the United States for career development, networking and small-group discussions. A major objective of this program is encouraging young doctors to dedicate their careers to diabetes research and practice. Scientific Sessions makes all of this possible and reminds us all why we do what we do for people with diabetes each day.
The 76th Scientific Sessions featured an impressive breadth and depth of research and clinical topics. Here, just a few of the presentations are highlighted to provide an overview of some of the exciting breakthroughs presented at this year’s meeting.

Association Presidents Call for Immediate Action to Fight Diabetes and Improve Lives

Margaret A. Powers PhD, RD, CDE, President, Health Care & Education, called on the diabetes community to advocate for access to diabetes self-management and support. Dr. Powers focused on the benefits to people with diabetes that can be realized through diabetes self-management education (DSME). In a passionate speech, she highlighted the exceedingly small population (fewer than seven percent) of people with diabetes who receive DSME in the first year after diagnosis. In an enlightening assessment, she compared the benefits and side effects of DSME to metformin, the typical first-line therapy for type 2 diabetes, and noted that DSME has equal or greater beneficial effects and no side effects. She posed the question to the audience: If DSME were a pill, would you prescribe it? And she effectively made the case that advocacy is essential to increase access to the education and support that people with diabetes need in order to make daily self-management decisions.

Desmond A. Schatz, MD, President, Medicine & Science, demanded activism and advocacy for diabetes research and innovation. Dr. Schatz described diabetes as an invisible epidemic. He noted that, while public advocacy efforts have led to significant government funding gains for diseases like HIV and cancer, diabetes continues to impact more and more lives around the world. It is constant and deadly. And yet, federal funding for diabetes research in the U.S. amounts to less than $35 per person affected. Compare that to nearly $400 for cancer and $2,500 for HIV/AIDS. He highlighted how the fear, stigma, denial, isolation, ignorance and inaccessibility that initially surrounded HIV/AIDS were overcome through a sense of urgency and funding to lead to transformational change. In a rousing call for action, Dr. Schatz outlined a series of complementary advocacy, education and research approaches that are required to overcome these barriers to cures and prevention for diabetes, and he asked the people in the room to be the change agents that turn the tide on this disease.

Two Type 2 Diabetes Medications Show Cardiovascular and Kidney Benefits

SGLT-2 inhibitor Empagliflozin Slows Progression of Kidney Disease
In 2015, results of a large cardiovascular outcomes study (EMPA-REG) demonstrated that the type 2 diabetes drug empagliflozin significantly reduced cardiovascular events in patients with type 2 diabetes, marking the first time any cardiovascular benefit had been reported with a diabetes drug. A new analysis of the EMPA-REG study data presented in New Orleans examined the effects of the drug on kidney disease. These data showed a 39% reduction in progression of nephropathy and a 55% reduction in the initiation of renal replacement therapy, suggesting that empagliflozin may fill a critical unmet need for patients who have diabetes and chronic kidney disease, a patient population with limited current treatment options.

GLP-1 Agonist Liraglutide Lowers Risk for Cardiovascular Complications, Kidney Disease and Death
Results from the LEADER trial, a major cardiovascular outcomes study of the type 2 diabetes drug liraglutide, were announced for the first time. These data showed that liraglutide can reduce the risk of cardiovascular death, non-fatal heart attacks and strokes, all-cause mortality and diabetic kidney disease in people with type 2 diabetes. After empagliflozin, this is only the second medication for type 2 diabetes that has shown cardiovascular benefits. The results from these two studies have important implications for people with type 2 diabetes as medications with these types of benefits will likely have a significant impact on treatment and patient care in the future.
Researchers Describe Critical Advances Relevant to Type 1 Diabetes

Artificial Pancreas
The development of the Artificial Pancreas (AP), a technology that pairs insulin pumps with continuous glucose monitors using a computer algorithm, has been a major research focus for many years. Recent advances in technologies, therapeutics and computing are moving us ever closer to the AP becoming a reality for patients.

However, one of the concerns with AP technologies that have used insulin alone has been hypoglycemia (low blood glucose). Edward R. Damiano, PhD, at Boston University showed that a “bi-hormonal” AP technology that uses both insulin and glucagon effectively lowered average blood glucose in adults and also reduced hypoglycemia. Importantly, these studies were conducted on people in a home setting, with no restrictions on diet and exercise. Courtney Balliro, RN, of Massachusetts General Hospital examined a glucagon-only AP that was added to self-administered insulin in a home setting. It significantly reduced hypoglycemia during the day and overnight. Overnight hypoglycemia is particularly dangerous and is often cited as a limiting factor in treatment intensification. Together, these results suggest that including glucagon in an AP has the potential to solve some of the biggest concerns for people with diabetes, including reducing the daily burden of diabetes management and avoiding hypoglycemia.

Continuous Glucose Monitoring
Most of the previously reported studies on continuous glucose monitoring (CGM) technologies have been conducted in people using insulin pumps. At this year’s Scientific Sessions, researchers reported outcomes for CGM use in people with type 1 diabetes using multiple daily injection (MDI) insulin therapy. The study examined Dexcom’s CGM equipment compared to usual care for people using MDI over the course of six months. Results showed that people assigned to CGM exhibited significantly reduced A1C, with an additional hour per day spent within glycemic target range, less time in mild and dangerous hypoglycemia, and less glycemic variability. The results suggest a benefit of CGM for all people with type 1 diabetes who have not attained their glycemic goals. CGM technologies have dramatically improved over recent years and are now more accurate, more reliable and easier to use. Results like these suggest that this technology allows people to reduce A1C while experiencing fewer hypoglycemic events.

Beta Cell Replacement
Transplantation of pancreatic islets can restore insulin independence in people with diabetes. However, limited availability of islets restricts the use of this approach. Once islets are transplanted, there are additional barriers to the success of this treatment option, including the need to prevent immune rejection of the transplant. As technologies for developing beta cells from stem cell sources have advanced, increasing the likelihood of having a stable source of beta cells for transplant, many investigators have turned to focus their research efforts on overcoming the additional barriers to transplant success.

Chad A. Cowan, PhD, from Harvard University shared exciting details about a new procedure he is developing to produce a line of stem cells that could serve as “universal donors.” This “udPSC” cell line is generated using a new “gene editing” technology, by which his team is removing the proteins that identify cells as “self” or “not self.” They have shown in laboratory mice that these engineered cells do not provoke the immune rejection response. He likened these udPSC’s to the O-negative “universal donor” blood type and described the hopeful goal of using udPSCs for cell-based transplantation therapies in all patients, without immune rejection. This work could have an enormous impact by providing an unlimited source of beta cells that could be used on-demand to treat patients suffering from diabetes.
To drive innovation in diabetes research, the American Diabetes Association began awarding substantial, long-term Pathway to Stop Diabetes grants in 2014. A total of 17 currently funded awardees are bringing new perspectives to diabetes research and are already making substantial contributions. All of the Pathway awardees gave presentations during the meeting. Here are a few highlights.

**Zhen Gu, PhD, and the Smart Insulin Patch**
Dr. Gu is an associate professor in the joint department of biomedical engineering of the University of North Carolina at Chapel Hill and North Carolina State University. He has designed a thin silicon patch, loaded with tiny microneedles, that uses a novel technology to sense blood glucose levels and release insulin only when blood glucose levels are too high. The “smart insulin” patch has been effective in initial testing in laboratory mice and holds promise for providing closed-loop insulin delivery in a fast and safe manner.

**Stephen C.J. Parker, PhD, and Linking Genetics to Type 2 Diabetes Risk**
Dr. Parker is an assistant professor of computational medicine and bioinformatics and of human genetics at the University of Michigan. His Pathway project seeks to better understand common differences in DNA that have already been linked to type 2 diabetes risk. Surprisingly, most of these DNA changes occur outside of genes—in the parts of DNA called “regulatory elements” that control when, where and how much a gene is turned on. Dr. Parker is taking an innovative approach at identifying which genes are controlled by these alterations in regulatory elements. Once he does this, it is likely that we’ll have new information on pathways to target for development of new diabetes medications and new DNA tests to identify people likely to develop type 2 diabetes.

**Michael D. Dennis, PhD, and the Search for Better Ways to Prevent Blindness in Diabetes**
Dr. Dennis is an assistant professor of cellular and molecular physiology at Pennsylvania State University, Hershey. His Pathway project is focused on understanding how diabetic retinopathy develops in order to identify ways to prevent blindness. Current therapies for diabetic retinopathy are used only after vision loss begins, and new treatment approaches are needed to preserve sight. Dr. Dennis has made some key discoveries identifying which molecules in the eye change as a result of high blood glucose levels. He hopes that he will identify targets for new medications that address what goes wrong at an early stage to allow intervention before blindness develops in people with diabetes.
Major Award Lectures Highlight Cutting Edge Science Relevant to Type 2 Diabetes

Adipose Tissue and Type 2 Diabetes
The Banting Medal for Scientific Achievement is the Association's highest honor. This year's recipient, Barbara Kahn, MD, of Harvard Medical School and Beth Israel Deaconess Medical Center is a world-renowned physician-scientist who has made seminal contributions to understanding obesity and type 2 diabetes. At the beginning of her career, adipose tissue was thought to primarily be a storage depot for fat. Dr. Kahn's research findings helped to identify many additional functions of adipose tissue, demonstrating how it acts as an important regulator of metabolism through its endocrine, metabolic, and inflammatory functions. In her award lecture, she highlighted the complexity of adipose tissue by describing her recent discovery of a set of novel lipids that are normally produced in fat tissue. High levels of these lipids are associated with insulin sensitivity in humans, and low levels of the lipids are associated with insulin resistance. In other words, the more of these lipids you have in your body, the more efficiently your body metabolizes glucose. These novel lipids are a very exciting new drug target, as it seems that replenishing levels of these lipids in insulin resistance and diabetes could improve glucose metabolism.

Metabolism and the Brain
The Outstanding Scientific Achievement Award is a prestigious award recognizing the contributions of an investigator under the age of 50 years. Tamas Horvath, PhD, DVM, of Yale University was this year's recipient. In his award lecture he explained the central role of the brain in food intake and hunger, as well as in health and longevity. He described a tiny set of as few as 800 cells in the brain that are critical to regulating hunger and feeding. Using state of the art technology to manipulate the function of these brain cells in mice, his laboratory was able to demonstrate that these neurons not only altered feeding behaviors, but also controlled non-feeding behaviors, such as anxiety, compulsion and interest in novelty. In addition, his team showed that manipulating the function of these neurons also impacted other body functions like bone quality, immune responses, fat tissue metabolism, and, ultimately, even lifespan. These far-reaching effects of hypothalamic neurons involved in feeding control are changing the way that we think about the relationship between the brain and the body. These data suggest that hunger and metabolism may affect brain function and overall health in ways we had not previously imagined, potentially opening up new ways to understand and combat chronic diseases like diabetes.

Summary
The Scientific Sessions attracts diabetes professionals from around the world each year. Virtually all of the experts and thought leaders in diabetes research and care assemble at one place and time to share information and discuss the best ways to fight this disease. They tend to come year after year—several individuals have attended for as many as 50 years in a row! Young researchers in training join their mentors and integrate into this extraordinary community of experts. There is always something special about this event, and this year in New Orleans was no different. Several attendees remarked that this year’s program was the best of the many Scientific Sessions they’ve attended. The power of information exchange and personal connection excites and energizes diabetes researchers and clinicians to explore more and better ways to do their work when they return home. We look forward to another opportunity to bring these incredible people and ideas together next year in San Diego!