Overview

Continuing a long tradition of excellence, the American Diabetes Association’s 77th Scientific Sessions convened the world’s leading diabetes researchers, educators, and health care experts for 5 days of presentations, discussions, and analyses. The program covered the latest research on all types of diabetes and related conditions, risk factors for developing diabetes, and new approaches, medications, and technologies for diabetes prevention and treatment. The meeting drew more than 16,000 participants, including nearly 13,000 clinicians, scientists, and educators from 112 countries and all 50 states.

The program featured nearly 900 speakers and more than 2,150 poster presentations, including 50 moderated poster discussions. Social media was buzzing, and there were nearly 300 news reports of breakthroughs presented at the Scientific Sessions, with press releases, original news articles, and preview coverage of the meeting reaching a total potential audience of more than 560 million, putting diabetes front and center in conversations around the globe. Although the reach of the meeting was impressive, the real power of each year’s Scientific Sessions goes beyond the numbers. This annual meeting provides unique opportunities for diabetes professionals to make important connections that advance science. The program ranges from large sessions with 6,000 attendees to intimate one-on-one conversations at a poster board. Old colleagues reconnect, and new personal and professional connections are made at every corner of the convention center. These relationships and exchanges are crucial to advancing the field of diabetes research.

The Association took full advantage of the opportunity this gathering of experts provided to expand diabetes education to primary care providers and to invest in the next generation of diabetes professionals. The Diabetes is Primary program offered information and tools to 150 primary care providers to improve patient outcomes. In addition, a two-day workshop called Focus on Fellows brought together about 150 endocrinology fellows 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.

During the meeting, more than 4,300 professional members of the Association visited the member lounge, which offered dedicated space for networking. For the first time this year, a new interest group representing women in diabetes research convened for a networking meeting spearheaded by President-Elect, Medicine & Science, Jane Reusch, MD, of the University of Colorado, Denver. Ninety women scientists, clinicians, and fellows attended—a remarkable turnout for the group’s inaugural gathering. The Scientific Sessions makes such events possible by bringing so many diabetes professionals together in one place each year.

This year’s Scientific Sessions featured a tremendous breadth of research and clinical topics. Following are just a few of the meeting’s highlights, which serve as examples of the many exciting breakthroughs presented at the meeting.
American Diabetes Association Presidents Elevate Advocacy Efforts

Brenda Montgomery, RN, MSHS, CDE, President, Health Care and Education, hailed discovery, advocacy, and education as pillars of prevention. Ms. Montgomery focused her presidential address on the successes of American Diabetes Association advocacy efforts—including in the passage of the Diabetes Prevention Act in 2010. As a result of this component of the Patient Protection and Affordable Care Act, Medicare will begin coverage for the Diabetes Prevention Program (DPP) starting in January 2018. Ms. Montgomery shared the history of the DPP, which started in 1996, by recruiting people disproportionately affected by diabetes—older people, women and racial and ethnic minorities. Results have shown that lifestyle changes and metformin significantly reduce the risk of developing diabetes in people at high risk. More than 20 years later, results from the DPP Outcomes Study support the long-term effects of DPP interventions. Based on these findings, the American Diabetes Association has worked to educate, disseminate, and advocate for adoption of DPP at the community level to promote diabetes prevention. DPP demonstrates how modest lifestyle changes can make a real difference for people with diabetes.

Alvin C. Powers, MD, President, Medicine and Science, rallied the diabetes community to defend science and support research. Dr. Powers urged the diabetes community to raise their collective voices in defense of science. Highlighting the challenges to improving lives for people with diabetes, he enumerated several stark truths: we do not know what causes type 1 diabetes or type 2 diabetes; we do not know how many types of diabetes exist; we cannot classify hyperglycemia intelligently; we do not have effective strategies for sustained weight loss or behavior modification; funding for diabetes research does not match the scope of the problem; and clinical care is often inadequate or unaffordable. With fulfillment of the objectives outlined in the American Diabetes Association’s new strategic plan—to drive discovery, raise voice, and support people—we will be poised to combat these challenges. Dr. Powers called upon the diabetes community to join together and dedicate themselves to science and advocacy, and to reject pervasive and dangerous misinformation about diabetes.

Positive Cardiovascular Outcomes Reported for Several Diabetes Drugs

New, Long-Acting Insulin Demonstrates Cardiovascular Safety, Reduces Hypoglycemia Risk. Results from the DEVOTE cardiovascular outcomes trial showed that insulin degludec, an ultra-long-acting, once-daily basal insulin, does not increase risk for cardiovascular events in subjects with type 2 diabetes at high cardiovascular risk compared to those assigned to insulin glargine treatment. Furthermore, individuals on insulin degludec reported significantly fewer severe and nocturnal hypoglycemia events.

SGLT-2 Inhibitor Shown to Reduce Cardiovascular Events. Results from the CANVAS trial showed that canagliflozin, an SGLT2 inhibitor that works by stimulating the kidneys to expel more glucose in urine, reduces the risk for heart attack, stroke, and cardiovascular event death by 14% in people with type 2 diabetes. The drug also showed potential kidney benefits. However, canagliflozin was associated with a nearly twofold increased risk for lower limb amputations. This study complements the cardiovascular benefits seen with empagliflozin, another SGLT2 inhibitor drug, supporting the notion that this class of medication improves cardiovascular outcomes in people with diabetes who are at high risk of cardiovascular events.

Follow-Up Analyses Affirm Cardiovascular and Kidney Benefits of GLP-1 Receptor Agonist. New analyses from the LEADER cardiovascular outcomes trial for the GLP-1 receptor agonist liraglutide affirmed renal benefit and robust cardiovascular benefit for people with diabetes and high cardiovascular risk.
Researchers Describe Advances Relevant to Type 1 Diabetes

Progress Toward an Artificial Pancreas
In a joint American Diabetes Association/JDRF Symposium, expert presenters discussed studies focused on hybrid closed-loop insulin delivery systems. Trials at the University of Cambridge in the United Kingdom, presented by Roman Hovorka, PhD, demonstrated an increased time in target A1C range and a reduction in hypoglycemia incidents. In a meta-analysis of several randomized clinical studies, there were differences in these outcomes, indicating the importance of the algorithms employed by insulin delivery systems. Eda Cengiz, MD, MHS, FAAP, from Yale University in New Haven, Conn., noted that clinical studies provide strong evidence that hybrid closed-loop systems outperform standard-of-care diabetes management. However, negotiating multiple devices, carbohydrate counting, and manual bolus entries for mealtime excursions remain burdensome. Stuart A. Weinzimer, MD, also of Yale University, highlighted the crucial need for clinicians to choose systems carefully and thoroughly educate their patients about them. Richard M. Bergenstal, MD, of the International Diabetes Center, in St. Louis Park, Minn., discussed helping patients find a balance while pursuing the shared goals of improved quality, better patient experience, and reduced cost.

β-Cell Replacement Versus Technology
In a debate about the future face of diabetes care, Jeffrey R. Millman, MD, of Washington University School of Medicine, in St. Louis, Mo., and Aaron J. Kowalski, PhD, of JDRF, compared the emerging prospects of managing diabetes with β-cell replacement therapy versus closed-loop pump technology. Although the ideal approach will almost definitely revolve around β-cell replacement and preservation, it seems that technological advances are nearer to bringing closed-loop insulin delivery to patient care than biological therapies. Although several companies are working to commercialize closed-loop technologies, there remain challenges to widespread adoption of such technologies, including the burden of wearing a device, individual patient variability, and managing exercise. The Association and other diabetes research funders are supporting a wide range of projects pursuing both β-cell replacement and advanced technologies that may be able to overcome these challenges. In short, research and development advances are poised to make diabetes management significantly easier in the very near future.

Examining Type 2 Diabetes Medications in the Treatment of People With Type 1 Diabetes
Results from clinical trials of sotagliflozin, an SGLT1/2 inhibitor, in people with type 1 diabetes were reported by John Buse, MD, PhD, of the University of North Carolina, Chapel Hill. The data indicated that more than twice as many individuals achieved an A1C <7% with no severe hypoglycemia or diabetic ketoacidosis when assigned to the high-dose sotagliflozin group compared to placebo. In addition, significant weight loss was noted among patients taking sotagliflozin compared to those in the placebo group, who, on average, gained weight. Another study reported by Thomas Dejgaard, MD, of Copenhagen University Hospital in Denmark, described a trial adding liraglutide, a GLP-1 receptor agonist approved for type 2 diabetes and obesity, to insulin pump therapy for people with type 1 diabetes. Individuals assigned to liraglutide saw significant improvements in A1C, weight loss, and time spent in the normoglycemic range compared to placebo. There was no significant difference in hypoglycemia between the two groups. Among others, these studies suggest that therapies once thought to be appropriate only for type 2 diabetes may also improve outcomes for people with type 1 diabetes. As such studies are followed up over the long term, it will be important to determine whether adding some of these therapies to insulin may also reduce the burden of diabetes complications in people with type 1 diabetes.
Pathway to Stop Diabetes® Awardees Report Recent Results

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 23 scientists have been awarded Pathway grants to date and are already making significant contributions in diabetes research. Here are a few highlights.

Daniel J. Ceradini, MD, FACS, Presents a Novel Approach to Wound Healing
Dr. Ceradini is an assistant professor of plastic surgery at New York University School of Medicine. His Pathway project aims to improve tissue regeneration in the setting of diabetes to enhance wound healing and avoid amputation. In San Diego, Dr. Ceradini presented the results of a promising study in mice that supported the role of antioxidant networks in wound repair. By using a nanoparticle vehicle to deliver a molecular therapy to wound tissue, he observed enhanced expression of antioxidant genes and improved wound healing. Dr. Ceradini hopes to quickly translate these findings for clinical use.

Joshua P. Thaler, MD, PhD, Uncovers Pathway Required for Diet-Induced Obesity
Dr. Thaler is an associate professor in the department of medicine at the University of Washington. His Pathway project explores the role of the brain in the development of obesity. This year, Dr. Thaler presented data from genetic mouse studies that suggest that activation of a particular cell type in the brain, called astrocytes, is required for high fat diet-induced overeating. When a genetic component of the inflammation signal in astrocytes was eliminated, mice ate less and increased energy expenditure in the presence of a high-fat diet. These results suggest that targeting astrocyte inflammation may be an effective obesity therapy.

Praveen Sethupathy, PhD, Describes How Diet-Induced Obesity Disrupts Intestinal Stem Cells
Dr. Sethupathy is an associate professor at Cornell University College of Veterinary Medicine. The goal of his Pathway project is to identify how intestinal cells respond to microorganisms in diet-induced obesity. The intestine is critical in absorbing and responding to nutrient intake to maintain energy homeostasis. In San Diego, Dr. Sethupathy presented a study that uncovers a key molecular pathway that responds to high-fat diet and induces insulin resistance in the gut. This line of work may lead to new approaches to enhance insulin sensitivity and prevent or treat diabetes by protecting intestinal function.

Kathleen A. Page, MD, Links Children’s Health Outcomes to Gestational Diabetes
Dr. Page is an assistant professor and practicing endocrinologist at the Keck School of Medicine at the University of Southern California. Her Pathway project aims to characterize how maternal obesity or diabetes influences the brain pathways responsible for body weight and blood glucose control in offspring. At the 77th Scientific Sessions, she reported data showing that central adiposity in children is independently associated with exposure to gestational diabetes and the mother’s pre-pregnancy BMI. This result begins to explain the transgenerational risk of diabetes and obesity, which will help define prevention interventions.
**Phillip J. White, PhD, Identifies Nutrient Processing Pathways Key to Healthy Metabolism**

Dr. White is a senior research associate at Duke University. His Pathway project is focused on how circulating levels of branched chain amino acids (BCAAs), which come from certain proteins in our diets, are linked to glucose and lipid metabolism in the liver. This year, he reported results of a study in rats that helped tease out how improper processing of BCAAs underlies glucose and lipid metabolism pathology. With continued study, this information is expected to identify where new drug development efforts may be focused to treat prediabetes, fatty liver disease and type 2 diabetes.

**Zhen Gu, PhD, Describes Advances in Engineering a 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 advanced several complementary approaches to engineering glucose-responsive insulin delivery systems that mimic a healthy pancreas. In San Diego, he reported results on a study in mice that showed that the vesicles he engineered to respond to glucose levels and release insulin through a microneedle patch were effective. He recently launched a startup company that aims to translate this technology for clinical use.

**2017 Pathway to Stop Diabetes Awardees Describe Projects, Meet Mentors, Association Leadership and Program Sponsors and Donors**

The fourth class of awardees began their Pathway grants in January 2017. These six stellar scientists had the opportunity to present their Pathway project plans and early results to a private audience, including Pathway Mentor Advisory Group members, corporate sponsors, individual donors, American Diabetes Association leadership, and the Pathway scientists who were awarded in previous years. Collectively, this new group of awardees impressed the audience with their innovative approaches to understand, treat, and prevent diabetes. Among the new projects added to the portfolio are a chemist’s approach to reversing diabetes complications; novel techniques to explore the brain’s control of glucose metabolism; new approaches to treat or prevent hypoglycemia; examination of the role of fat-derived factors on glucose levels; exploration of how gut microbes might trigger the autoimmunity that causes type 1 diabetes; and a mechanical engineer’s approach to developing a wearable continuous glucose monitoring patch. Each project was presented to much acclaim at the symposium. The innovative proposals have high potential for improving the lives of people with diabetes. And the scientists supported through the Pathway program are joining an exceptional network of rising stars in diabetes research committed to changing the trajectory of diabetes and diabetes complications.

The 77th Scientific Sessions brought these individuals together for several days of unparalleled scientific exchange that will help them improve and refine their studies, build and leverage collaborations, and succeed in their ultimate goals to provide solutions that will make a difference for people with diabetes.

For more detail on all of the Pathway scientists and their accomplishments, visit diabetes.org/pathway/recipients.
Major Award Lectures Feature Cutting-Edge Science and Predict Future Treatments

Reprogramming Cells to Conquer Diabetes

The Banting Medal for Scientific Achievement is the Association’s highest honor. This year’s recipient, Domenico Accili, MD, of Columbia University is a world-renowned physician-scientist who has made paradigm-shifting discoveries that hold promise for translating to novel approaches for diabetes prevention and care. Perhaps his most important contributions to date have been in the area of pancreatic beta cell biology, and specifically in the demonstration that beta cell failure, long held to be a consequence of cell death, can result from a dedifferentiation process, whereby beta cells lose the ability to make insulin, revert to a progenitor stage, and then convert to types of cells that produce different hormones. This work comprised a significant portion of his award lecture, which concluded that, with more research to provide a comprehensive picture of the beta cell, we should be able to identify actionable targets for new drug intervention to restore beta cell function. These exciting studies were complemented by Dr. Accili’s presentation of data that show that intestinal cells can be reprogrammed to produce insulin. This intriguing result may lead to a new way to treat type 1 diabetes with the patient’s own cells, in a way that may be safe from autoimmunity and immune destruction.

Targeting the Body’s Fuel Gauges to Treat Diabetes

The Outstanding Scientific Achievement Award is a prestigious award recognizing the contributions of an investigator under the age of 50 years. Gregory R. Steinberg, PhD, of McMaster University, was this year’s recipient. In his award lecture, Dr. Steinberg explained how energy sensors inside cells measure the status of nutrients and regulate energy use and storage. His laboratory has discovered how exercise, cold temperature, and the diabetes drug metformin act inside muscle, adipose, or liver cells, respectively, to activate a molecule called AMP-kinase. When activated, AMP-kinase informs the body that its fuel level is low. Alternatively, when the body’s energy level is high, synthesis of peripheral serotonin is increased and AMP-kinase activity is suppressed. This switch can be triggered by obesity or high-fat diets and promotes fat storage. Results from Dr. Steinberg’s work suggest that we may be able to develop new therapies to treat type 2 diabetes by activating AMP-kinase and inhibiting peripheral serotonin, and that these new medications may act in concert with metformin to further improve diabetes-related outcomes.

Summary

The American Diabetes Association’s Scientific Sessions attracts diabetes professionals from around the world, assembling virtually all of the experts and thought leaders in diabetes research and care at one place and time to share data and ideas and discuss the best ways to fight diabetes. Researchers in training join their mentors and integrate into this extraordinary community of experts. The power of information exchange and personal connection excites and energizes diabetes researchers and clinicians to explore different and better ways to do their work when they return home. This year’s meeting in San Diego achieved all of these lofty goals. Planning for the next opportunity to bring these incredible people and new ideas together is well underway for next year’s meeting in Orlando, Fla!