New Studies Test Artificial Pancreas for Type 1 Diabetes

What if eating were a balancing act, every meal, every day? This is indeed the case for people with Type 1 diabetes, because they must adjust their insulin very carefully so their glucose levels don’t go too low or high. People with Type 1 diabetes must manage their disease 24 hours a day, seven days a week, testing blood glucose levels and administering insulin vigilantly multiple times a day while determining correct doses with diet and activity.

In exciting new studies funded by JDRF, Benaroya Research Institute at Virginia Mason (BRI) is testing an artificial pancreas that automatically dispenses insulin based on real-time changes in blood glucose levels. The hope is this would relieve adults, children and their families from the arduous 24/7 manual maintenance of their diabetes. Upcoming clinical trials with pizza and exercise will further test the device. This past year, BRI tests of the artificial pancreas showed that blood glucose levels under highly controlled conditions could be better managed through the artificial pancreas than participants could likely do on their own. Most patients with diabetes cannot achieve tight glucose control with traditional diabetes tools and spend less than half of their days at healthy glucose levels. Studies show that tight control of levels significantly reduces or delays the development of complications.

The artificial pancreas combines a continuous glucose monitor with an insulin pump and a computer software program. The monitor and pump are devices worn on the outside of the body and contain a tube or sensor that goes inside the body. The monitor provides real-time information on the body’s blood glucose levels and reports this to the computer software program. When the program determines insulin is needed, it sends a message to the insulin pump to provide a certain amount of insulin.

“If this device is successful, people can reduce the constant monitoring of their disease and relieve a huge mental burden,” says BRI Director of the Diabetes Research Program Carla Greenbaum, MD. “This type of system would also keep blood glucose levels much tighter, reducing diabetes complications, which can be very serious. While we search for new methods to prevent and even cure diabetes, we need to provide better ways to improve the lives of people who currently have diabetes.”

While other systems are being tested at selected locations worldwide, BRI is the only center nationally testing this unique software program for the artificial pancreas. The program was developed by Richard Mauseth, MD, a long-time Pacific Northwest pediatric endocrinologist, currently at Seattle Children’s, and two Boeing software engineers, Robert Kircher and Don Matheson. Their software program applies “fuzzy logic” to the glucose data to direct appropriate amounts of insulin to be delivered.

Clark Webber, a participant in the artificial pancreas clinical research trial, wears an insulin pump on his arm and a continuous glucose monitor on his abdomen. His glucose information is relayed by the sensor to a computer. The hopes are that the computer software can eventually be contained in a smaller device such as a smart phone. Clark was diagnosed with Type 1 diabetes at age 12 and is now 23. “The artificial pancreas looks to be the next big, decisive innovation in diabetes management and care,” says Clark. “It will bring a newfound level of freedom to people with diabetes.” Carla Greenbaum, MD, (right) is principal investigator of the BRI artificial pancreas studies.
Summer Engler has very subtle bends in her fingers due to autoimmune diseases. She cannot fully extend these fingers due to scleroderma, which causes a stiffening of her skin. One would never know that Summer also experiences pericarditis (inflammation of the sac surrounding the heart), interstitial lung disease, and muscle weakness, all resulting from a combination of lupus, scleroderma, and Lambert-Eaton myasthenic syndrome, each one an autoimmune disease.

It is not uncommon for someone to suffer from more than one autoimmune disease. But Summer must deal with three diseases while working in the Intensive Care Unit at Virginia Mason Medical Center as a general internal medicine intern.

Summer plans to become a rheumatologist—specialists who treat musculoskeletal diseases like hers; diseases for which there are no cures. At the urging of her own rheumatologist, Jeff Carlin, MD, Summer enrolled in the rheumatic diseases biorepository at Benaroya Research Institute. She joined more than 200 scleroderma patients who have donated their blood to be studied by BRI scientists. The goal of this research is to better understand the normal immune response and how the immune system fails in autoimmune diseases.

Summer acknowledges how her own circumstances inspire her career. “I was so pleased with my care at Virginia Mason that I really wanted to train here for residency.”

“My ultimate goal is to provide compassionate care for patients with complex rheumatology diseases in my home state of Alaska,” she says. Summer knows firsthand the need for specialists in Alaska, a state with only three rheumatologists. “They say they’re just waiting for me to get home,” she laughs. They will be lucky to have her back.

For more information on rheumatology and biorepositories, visit BenaroyaResearch.org.
Illuminations Luncheon Supports Autoimmune Disease Research

More than 250 guests attended the second annual Illuminations Luncheon held on Nov. 2 to learn about life-changing autoimmune disease research taking place at BRI. Steve Raible, KIRO 7 Eyewitness News anchor, hosted the successful fundraising event that featured a researcher, a patient and BRI Director Gerald Nepom, MD, PhD. The luncheon raised more than $86,000.

Physician scientist James Lord, MD, PhD, shared the exciting advances in the diagnosis, disease management and treatment of autoimmune diseases, as highlighted by his current research in inflammatory bowel disease (IBD).

Ross Morris, a Virginia Mason patient, shared his lifelong battle with autoimmune disease and how BRI research has helped him in his daily life. For more than 50 years, BRI has conducted innovative research that improves the lives of people like Ross.

Thank you to the sponsors, donors, volunteers and Illuminations Chair Jessica Muffett for supporting the Illuminations Luncheon and autoimmune diseases research.

Collaborative Grant Looks for Genetic Roots of Type 1 Diabetes

In a new $4.3 million grant from the National Institutes of Health, scientists from Benaroya Research Institute, Seattle Children’s Research Institute and University of Virginia are joining forces to combine their expertise in three different areas of research in order to determine how genes contribute to the development of Type 1 diabetes.

“This research is targeted at understanding the genetic causes of Type 1 diabetes,” says Jane Buckner, MD, principal investigator of the study and associate director of Benaroya Research Institute. “This is fundamental to being able to predict disease and develop interventions (therapies) that can treat, cure and we hope prevent Type 1 diabetes.” Dr. Buckner’s co-investigators on the grant are David Rawlings, MD, director of the Center for Immunology and Immunotherapies at Seattle Children’s Research Institute and Patrick Concannon, PhD, professor of Biochemistry and Molecular Genetics at University of Virginia (UVA).

“These studies will not only lead to understanding how an individual gene may lead to Type 1 diabetes, but they will also identify immunologic pathways that are involved in the disease,” says Dr. Buckner. These pathways can then be targeted for diagnosis and therapy.

“Collaborative Grant Looks for Genetic Roots of Type 1 Diabetes

Jane Buckner, MD, is principal investigator for the grant combining three different areas of Type 1 diabetes research.

Type 1 diabetes is an autoimmune disease in which the body’s immune system mistakenly attacks and destroys the cells that make insulin. People with this disease must take insulin in order to stay alive. They must also balance their food intake and exercise.
**A3 Grapevine Awards Event Honors Gerald Nepom, MD, PhD**

Autoimmune Advocacy Alliance (A3) held its first Grapevine Awards and Wine Event on Oct. 28 at Januik Winery in Woodinville, Wash. BRI Director Gerald Nepom, MD, PhD, received the first “Jerry Award,” named in his honor, for exceptional contributions in the field of autoimmunity. A3 was established in 2011 as a collective effort to achieve clarity, understanding and support for the needs of those living with autoimmune diseases.

**World Diabetes Day Lights Up Puget Sound**

On Nov. 14 for World Diabetes Day, 12 Puget Sound area buildings, including the arches at the Pacific Science Center, Cheney Stadium, Century Link Field and BRI, were lit blue to raise awareness for diabetes. This worldwide movement, started in 2007 by the International Diabetes Federation, illustrates how combined efforts worldwide can generate attention to the growing diabetes epidemic.

To further mark this event, 18 diabetes organizations, including Novo Nordisk, American Diabetes Association and Swedish Medical Center, joined BRI at an event at the South Lake Union Discovery Center to celebrate advancements that have been made and to unite around the work that still needs to be done. BRI Director Gerald Nepom, MD, PhD, keynoted the event. For the past two decades, BRI has served as a worldwide leader in research to prevent, treat and cure Type 1 diabetes. BRI scientists have accounted for several of the substantial discoveries in the field, including the identification of diabetes susceptibility genes.

**Life Sciences Research Weekend Engages Parents and Kids**

BRI teamed up with the Northwest Association for Biomedical Research and the Pacific Science Center at the 6th Annual Life Sciences Research Weekend Nov. 2 - 4 held at the Seattle Center. This event provided an opportunity for the public to learn more about the world of life sciences research and the role it plays in our daily lives. The event showcased innovative research and talented scientists in our community and presented engaging activities for visitors of all ages.

**Step Out Walkers Support Diabetes Research**

Although the weather was cold and rainy for both the American Diabetes Association Step Out Walk in Tacoma and Seattle on Sept. 29 and Oct. 13, it didn’t stop more than 2,000 people from showing up to support the effort to “stop diabetes.” Family, friends, dogs and Red Striders (those living with diabetes) put on rain jackets and smiles, knowing that their participation and fundraising will make a difference in the lives of people who have Type 1 and Type 2 diabetes. Many people stopped by the BRI display to learn about Type 1 diabetes research and how to get involved. For a list of diabetes research studies available at BRI, please visit BenaroyaResearch.org/diabetes-research/find-study.
Dr. Gerald Nepom, director of Benaroya Research Institute, was recently the first recipient of the “Jerry Award,” named after him. The award from the Autoimmune Advocacy Alliance (A3) honors him for exceptional contributions in the field of autoimmunity. 2012 marks Dr. Nepom’s 40th year in immunology research.

About Dr. Nepom

Dr. Nepom (“Jerry” to everyone at BRI) has taken a career path that reflects the history of bench-to-bedside translational immunology. His initial studies on how genes control the immune response led directly to identification of genetic susceptibility traits for diseases including rheumatoid arthritis and juvenile diabetes. This was followed by work using the properties of these genes to develop an understanding of how autoimmune diseases develop, and how this enables opportunities for better and safer therapies.

Although his research contributions include over 300 scientific papers and several patents, Dr. Nepom is also known in scientific circles for his leadership role in the translational immunology research community. He is the past-president of FOCIS, the Federation of Clinical Immunology Societies, where he led programs to build educational bridges for physicians and scientists across multiple clinical disciplines impacting immune-mediated and autoimmune diseases. He also has chaired multiple National Institutes of Health (NIH) committees and advisory groups, including the original NIH strategic plan for autoimmune diseases, and continues to serve on advisory boards for numerous non-profit and academic research organizations. Among the many forms of recognition Dr. Nepom has received for this work are the Distinguished Alumni Award from the University of Washington School of Medicine and the Rumbough Award for Scientific Excellence from the Juvenile Diabetes Research Foundation (JDRF).

About BRI

In 1985, Dr. Nepom initiated the immunology and diabetes research programs that have now grown into a prominent team of outstanding scientists at BRI. This long-standing commitment to immunology and molecular medicine continues to be a major strength of BRI and a magnet for research collaborators from other organizations. “One of our core achievements has been to foster a culture of shared vision and shared success amongst investigators,” says Dr. Nepom. “The questions needing answers are too vast for an individual lab in isolation and are best addressed by scientific partnering between smart, creative people.”

About ITN

In 2010, NIH began looking for a new leader for the Immune Tolerance Network (ITN) and turned to Dr. Nepom and BRI. “This was an incredible opportunity to guide the use of large federal resources toward high-impact clinical trials and clinical research in our field,” he notes. “While the breadth of the ITN programs encompasses transplantation, allergy, autoimmunity and diabetes, it is the common immune elements in each of these fields that create the potential for transformative interventions.” The ITN conducts studies in nearly 200 sites worldwide. Over the last two years several additional BRI laboratories, as well as clinical trial groups, have become increasingly involved in ITN studies performing biomarker discovery, immune monitoring, and functional analysis of cells from clinical research participants receiving experimental therapies.

About the Future of Immunology Research

“Our view of the immune system continues to evolve,” Dr. Nepom stresses. “Although we now understand much of the mechanics, we continue to be surprised by the complexity of the blueprints. The good news is that there are multiple opportunities for targeted intervention — for disease prediction, prevention, intervention, and therapy — based on the knowledge we gain. It is very rewarding to work in an environment where hallway discussions can address both the basic science issues and the clinical applications, for that is the best way to design studies with the highest potential for success.” What does Dr. Nepom see ahead, from his perspective of 40 years as a research immunologist? “It’s all good,” he notes. “Many patients with autoimmune diseases diagnosed today have a portfolio of options that immensely improve their prognosis, often including choices of several immunological therapeutics. This has already transformed the landscape for people with Type 1 diabetes, rheumatoid arthritis and multiple sclerosis. And there has been growth in resources and collective will among the research community, enabling us to start new clinical trials that attempt to provide even more dramatic benefits to our patients.”
Join Us for a Tour of BRI – Science Fridays 2013

Mark your calendars to attend a Science Friday, where you can learn about the remarkable discoveries taking place at Benaroya Research Institute. The free event from 8:00 to 9:30 a.m. includes a light breakfast and conversation with a BRI principal investigator along with a laboratory tour with BRI scientists. Sign up for one of these Science Friday dates — Jan. 25, March 29, May 24, June 21, Sept. 20 or Oct. 18 — by contacting Rachel Martin at (206) 342-6519 or rmartin@benaroyaresearch.org.

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