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Letter from the Executive Director

Dear Colleagues and Friends,

It is an exciting time for diabetes research and for the Barbara Davis Center in particular. The dedication and hard work of our faculty and staff have resulted in accomplishments I am extremely gratified to be able to share. In partnership with our generous benefactor the Children’s Diabetes Foundation, successes in faculty recruitment, historic milestones in clinical care, and new initiatives in research are paving the way to future years of opportunity and achievement.

We have substantially increased the capacity of our organization through successful faculty recruitment, highlighted by the appointment of Lori Sussel, PhD as Director of Basic and Translational Research Division. Joining us from the Naomi Berrie Diabetes Center at Columbia University Medical Center, Dr. Sussel’s exceptional scientific accomplishments and vision for the Research Division impressed everyone on the recruitment committee. Upon arriving at the BDC, Dr. Sussel lost no time in expanding the breadth of talent at the BDC with the successful recruitment of Holger Russ, PhD (special interest in stem cell biology).

To meet the demand of our increasing patient population, we have added three exceptional physicians: Shideh Majidi, MD (special interest in treating depression associated with diabetes), Gregory Forlenza, MD (interest in artificial pancreas and islet transplantation) and Kimber Simmons, MD (interest in clinical immunology of autoimmune disease). We also welcomed Kimberly Driscoll, PhD, assistant professor in clinical psychology, to meet important needs of our patients and their families struggling with adjustment to diabetes.

In testament to the hard work of junior faculty and leadership from our senior faculty, I am very proud to announce the 2016 promotion of 5 of our faculty members. Unanimous decisions of approval at every level of review speak highly of the excellence of our faculty across several dimensions.

Our partner, the Children’s Diabetes Foundation (CDF) has also profited from new leadership. Dana Davis became the interim and now Executive Director of CDF. Her frequent presence in the Barbara Davis Center is inspiring and our entire staff are energized by the CDF’s devotion to the cause and their creativity and enthusiasm in the execution of philanthropic programs.

In research, the highly publicized Food and Drug Administration (FDA) approval of the first hybrid closed-loop (“artificial pancreas”) system was extremely rewarding to the dozens of BDC clinicians and staff who conducted the pivotal studies and continue to test and refine artificial pancreas systems. Also extremely gratifying, JDRF, Janssen R&D and the Helmsley Charitable Trust have jointly funded the Autoimmunity Screening for Kids (ASK) program with the long term goal of screening all Colorado children for early diabetes and celiac disease to be certain all kids are diagnosed before they get sick.

There are so many new developments, I could continue indefinitely. Suffice it to say, I am proud to be a member of such a strong team dedicated to finding a cure for diabetes and looking forward to another productive year.

Sincerely,

Marian Rewers, MD, PhD
Executive Director
Mission

Our mission is to provide state-of-the-art care to children and adults with type 1 diabetes and to teach our patients how to prevent or delay complications. Our research is devoted to finding prevention, cure, and most effective treatment of diabetes and associated disorders.

Overview

The Barbara Davis Center for Diabetes (BDC) specializes in type 1 diabetes research and care for children and adults. Clinicians, clinical researchers, and basic biomedical scientists collaborate at the BDC to find the most effective treatment, prevention, and cure for type 1 diabetes. The BDC was founded by Marvin and Barbara Davis in 1978 and is currently one of the largest diabetes institutes in the world. Housed in a dedicated building on the Anschutz Medical Campus in Aurora, Colorado, the Center is an independent institute within the University of Colorado School of Medicine.

The Center provides state-of-the-art diabetes care to over 7,000 children and adults with diabetes as well as provides inpatient care to patients with any type of diabetes who are seen at the Children’s Hospital Colorado. Center clinical faculty members teach medical, physician assistant, nursing, and dental students on campus. Residents and endocrinology fellows receive critical training at the leading edge of diabetes clinical care and research.

The Center is also a consistent incubator for novel ideas and discoveries in the immunology, genetics, and cell biology of diabetes. BDC scientists have developed diagnostic assays now standard in diabetes research. Basic science faculty members provide training to pre-doctoral students and mentor post-doctoral fellows as they transition from fellowships to independent faculty or research appointments with independent competitive research funding.

The Barbara Davis Center is generously supported by the Children’s Diabetes Foundation (CDF). [Link]

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State of the Center

The past several years have been a time of tremendous growth for the Barbara Davis Center. Our staff has increased 22% since 2014 to meet the demands of increased clinical care and the productivity of our research projects. Research grants awarded to faculty exceeded $26.5 million (direct costs) in fiscal years 2015 and 2016 and we are on track to further increase in 2017. The NIH, JDRF and the Helmsley Trust have been primary sources of funding. We also have many strong partnerships with industry sponsors to test new technology and therapies to improve the daily lives of our patients living with type 1 diabetes.

As the population of Colorado continues to grow, so does our patient population. Our clinics provided care to > 7,000 patients in the past year and our clinicians saw a record number of new patients (722 children and 317 adults). Importantly, clinical outcomes have improved as well. For instance, average HbA1c has improved, the number of visits per child has increased, and the wait time for children receiving insulin pumps was cut in half.

The BDC Keystone Conference has achieved international recognition as perhaps the best meeting in clinical type 1 diabetes including pediatric and adult diabetes topics. It has also remained the cornerstone of our continuing medical education.

Faculty

Our faculty currently includes 23 assistant, associate and full professors. New hires have expanded the breadth of experience and scientific inquiry at the Barbara Davis Center. Full biographies can be found in the faculty section but it would be remiss not to mention a few key appointments here.

Lori Sussel, PhD joined the BDC as Director of the Basic and Translational Research Division on April 1, 2016. She comes to the BDC from the Naomi Berrie Diabetes Center at Columbia University Medical Center where she was the co-director of the Integrated Program of Cellular, Molecular Biomedical Science Graduate Program, co-PI of the NIDDK funded Endocrinology Training Grant, and interim co-director of their Stem Cell Program. Her scientific vision and leadership are highly valued and under her direction the BDC basic research team is quickly expanding productivity in new avenues of research towards finding a cure for type 1 diabetes.

Additional key Assistant Professor appointments since July 2014 bring expertise in behavioral and psychosocial aspects of T1D care (Kimberly Driscoll, PhD and Shideh Majidi, MD), diabetes technology including pumps, continuous glucous monitor, and artificial pancreas (Gregory Forlenza, MD), clinical immunology of autoimmune disease (Kimber Simmons, MD), and diabetes stem cell research (Holger Russ, PhD).

R. Paul Wadwa, MD was appointed Medical Director, Pediatric Diabetes Division in 2016. Dr. Wadwa is well known for his leadership in telemedicine and is now directing our pediatric studies of closed-loop (‘artificial pancreas’) systems.

As evidence of the quality of individual scholarship and engaged mentorship by senior BDC faculty, five BDC faculty members received promotions July 1, 2016:
- Brian Bucca, OD, FAOO - to Associate Professor
- David Maahs, MD, PhD – to Professor
- Aaron Michels, MD – to Associate Professor
- Maki Nakayama, MD, PhD – to Associate Professor
- Andrea Steck, MD – to Associate Professor
**Challenges & Opportunities**

Many of the Center’s challenges have not changed. These include the large numbers of under-insured patients who require subsidized care and the highly competitive research funding and philanthropic environment.

Spurred by the rapid growth of the BDC in every area from clinical care to basic research, a shortage of space is quickly becoming one of the more pressing challenges. The success of our faculty in research is creating additional pressure on office and laboratory space. BDC clinics saw a record number of new patients in 2016. The incidence of type 1 diabetes increases by 3-5% per year. In the population of the same size, the number of new patients doubles every 20 years. In addition, Colorado’s population increases by ~100,000 people a year and the trend is expected to continue. If we are going to be able to continue servicing the growing patient population, the BDC will require additional clinical space.

Colorado community and health providers are insufficiently aware of signs and symptoms of childhood diabetes. The proportion of children hospitalized with life-threatening diabetic ketoacidosis (DKA) at the diagnosis of diabetes has increased from 30% to 46% (compared with <20% in Canada and Scandinavia). In October of 2016, a 7 year old boy died of DKA when the diagnosis came too late. This was the first such instance in Colorado in nine years and a painful reminder how dangerous diabetes is and how critical that we redouble our efforts to increase diabetes awareness. A large-scale screening for pre-symptomatic type 1 diabetes, the Autoimmunity Screening in Kids (ASK) Program will begin in 2017 to gather evidence for a routine universal screening.

These challenges have not dampened our commitment to excellence in seeking advances in diagnosis, treatment, and prevention of type 1 diabetes. There is a renewed focus on improvements in efficiency, access, and outcomes of care. BDC clinics are employing strategies to reduce appointment cancellations and no shows and expand access to care via telemedicine and outpatient clinics in south Denver, Colorado Springs, Durango, and Fort Collins. Among many reasons to be optimistic looking into the future, health outcomes of our patients are improving, including HbA1c levels, rates of severe hypoglycemia and long-term complications. We have intensified screening for depression, retinopathy, kidney disease, dyslipidemia, celiac and thyroid disease.

In 2015-16, the Center continued strengthening the foundation necessary to increase our research productivity. Increased breadth of expertise and resources associated with hiring the new Director of Basic and Translational Research has energized our basic scientists and increased our capacity to capitalize on new opportunities. Recent FDA approval of the first hybrid closed-loop system will provide increased funding opportunities towards further development and refinement of ‘artificial pancreas’ systems. The experience and leadership role the BDC has played in the development and testing of artificial pancreas systems makes the BDC exceptionally well positioned to expand this important work. Finally, the completion of a ~1,000 sq. ft. biorepository in the basement of the BDC provides space for our growing research base and enables the Center to expand the Diabetes Research Center Biobank. Investments in research infrastructure will enable us to establish or accelerate studies of:

- the role of the immune system both in the destruction of pancreatic beta cells and as a pathway to assessing risk and developing preventive vaccines;
- the potential of stem cells or artificially grown insulin cells to replace lost pancreatic cells and restore functionality;
- new drugs to improve glycemic control, together with new and more reliable means of insulin delivery and monitoring;
- the development of next-generation treatments, e.g., artificial pancreas, and preventive strategies;
- earlier identification and counteractive therapies for vascular damage leading to eye, kidney and heart complications.
These aspirations are attainable owing to the advantages of our location at the Anschutz Medical Campus. Our state-of-the-art facility, opened in 2005, contains the Center’s clinical and research programs in a single dedicated building that optimizes interface and efficiency. A particular strength of the programs is the partnership of the pediatric and adult professionals and their close links with the basic science researchers and schools and hospitals across the campus. The collaborations allow for a continuum of care throughout a patient’s lifetime, and support the Center’s capabilities in the areas of inpatient care, outreach, telemedicine, and training new diabetes care providers.

**Vision for the future**

In the next decade, the Center aspires to maintain its preeminence and accelerate its work towards prevention, cure and artificial pancreas. Through excellence in research, patient care and education, our efforts will not cease until prevention and durable cure are widely available.

**Immediate Goals**

- Improve outcomes of diabetes through reduction of acute and long-term complications.
- Significantly reduce the daily burden of diabetes to the affected individuals and their families.
- Through education and telemedicine, provide access to modern diabetes care to underserved populations in the U.S. and in developing countries.
- Add testing for diabetic retinopathy and other complications to our telemedicine services.
- Expand our education activities by adding to the number of staff responsible for intake and assessment, transition from pediatric to adult care, and support for patients with learning or mental disabilities.
- Educate a new generation of diabetes care providers and researchers.
- Broaden our clinical specialization to develop centers of excellence in cardiovascular screening and care and in genetic counseling.
- Develop and validate new technologies for diabetes care that are effective and easier to use.
- Enhance the caliber of discoveries in diabetes/metabolism research at the AMC through collaborative efforts.
- Provide a stimulating and rewarding professional environment to faculty and staff of BDC.

**Transformative goals**

- Find the environmental triggers of autoimmunity that cause type 1 diabetes (T1D).
- Develop primary prevention for T1D, e.g., vaccine.
- Advance primary prevention of type 1 diabetes to the public health domain and eradicate the disease.
- Develop immunomodulation therapy to control or reverse pre-diabetic autoimmunity.
- Harness stem cell technology to provide unlimited supply of insulin-making cells for transplantation and cure.
- Develop artificial pancreas to eliminate long-term vascular complications of diabetes while vastly improving life quality of patients and their families.
STRUCTURE

The Center consists of Pediatric and Adult Diabetes Divisions, Basic & Translational Research Division, Eye Clinic and Clinical Epidemiology Program.

Senior Leadership

Marian Rewers, MD, PhD, Executive Director
Robert Slover, MD, Director, Pediatric Diabetes Division
Satish Garg, MD, MBBS, DM, Director, Adult Diabetes Division
Lori Sussel, PhD, Director, Basic & Translational Research Division
Judith Baxter, MA, & Janet Snell-Bergeon, PhD, Co-Heads of Clinical Epidemiology
Brian Bucca, OD, FAAO, Head, Eye Clinic
Allison Reeds, MBA, Central Administrator

Figure 1. Barbara Davis Center organization
(FTE = full time effort)
BDC Scientific Advisory Board

Richard S. Abrams, MD
Director, Colorado Preventive Medicine, Rose Medical Center; Clinical Professor of Medicine, UCD

Mark Atkinson, PhD
Professor of Pathology & Pediatrics, Director, University of Florida Diabetes Institute

Ezio Bonifacio, PhD
Professor for Preclinical Approaches to Stem Cell Therapy, Ctr for Regenerative Therapies, Dresden, Germany

Robert Eckel, MD
Professor of Medicine, Physiology and Biophysics, University of Colorado School of Medicine

Matthias Hebrok, PhD
Professor in Residence and Director, Diabetes Center, University of California, San Francisco

Steven Kahn, MB, ChB
Professor of Medicine, Director of the Diabetes Research Center, University of Washington

Rudolph Leibel, MD
Professor of Pediatrics and Medicine, Co-Director, Naomi Berrie Diabetes Center, Columbia University

Alvin Powers, MD
Professor of Medicine, Molecular Physiology/Biophysics, Division Director, Vanderbilt University

William Tamborlane, MD
Professor of Pediatrics, Yale University School of Medicine
CLINICAL CARE

The Center provides state-of-the-art diabetes care to >7,000 active patients: 4,200 children and 2,900 adults with diabetes from the Rocky Mountain Region as well as receiving national and international referrals. We provide inpatient care to patients with any type of diabetes who are seen at the Children’s Hospital Colorado. We serve remote areas of the Rocky Mountain Region through our telemedicine program. The division also features clinical epidemiology studies including multicenter studies and trials with partners around the world.

Completing more than 18,000 ambulatory encounters per year, BDC is the largest outpatient clinic for patients with type 1 diabetes in the U.S. and possibly in the world. BDC professionals include physicians, nurses, dieticians, social workers, and a pharmacist dedicated to the special needs of pediatric and adult patients.

Figure 2. Outpatient volume.

Center-wide Clinical Programs

Quality Improvement Program
The Quality Improvement Program aims to improve access and quality of diabetes care delivered at BDC, focused on patient outcomes and satisfaction. The BDC quality improvement team, led by Dr. Todd Alonso, Assistant Medical Director for Quality, works with the Institute for Healthcare Quality, Safety, and Efficiency at the University of Colorado Anschutz Medical Campus to improve the quality and efficiency of care delivery in BDC by designing workflow interventions to target specific metrics. BDC has been selected to participate in the T1D Exchange Quality Improvement Initiative and development of the T1D Exchange Collaborative Improvement Network.

Medical Informatics Program
The goal of the BDC Medical Informatics Program is to improve the quality and use of electronic medical records (EMR) for both clinical care and research studies. In 2011, our center moved from its own EMR database to Epic. The Program, led by Drs. Andrea Steck, Todd Alonso and Mary Norbury-Glaser, continues to customize Epic for diabetes care both locally with the Children’s Hospital Epic team and the Children’s Physicians Advisory Council as well as nationally with the Pediatric Endocrinology Specialty Steering Board. This program has developed customized tools such as templates, alerts and doc flowsheets in order to facilitate faster and more accurate collection of structured data.

Clinical Data Warehouse hosted and managed at the BDC includes electronic records of 20,000 patients served by the BDC since 1980. Key data have been cleaned and normalized in a research-quality database that is used extensively in research and administrative projects at the Center.
**Diabetes Management Technology Program**

The BDC has been a driving force in diabetes care in the development of new technology for insulin delivery systems and blood glucose monitoring with the goal of constantly improving the management of type 1 diabetes (T1D) in children and improving long term outcomes in patients worldwide. Pediatric and Adult Diabetes Divisions of BDC collaborate and share resources in a number of clinical trails, educational programs and translation to clinical care.

**Figure 4.** Technological progress in management of type 1 diabetes

<table>
<thead>
<tr>
<th>Urine Sugar</th>
<th>Blood Sugar</th>
<th>MDI /Analogs</th>
<th>Continuous</th>
<th>Hybrid Closed Loop</th>
</tr>
</thead>
</table>

**Type 1 Diabetes Prevention Trials Program**

Since 1990, BDC investigators and resources have been essential to the NIH-sponsored Diabetes Prevention Program Type 1 (DPT-1), Immune Tolerance Network (ITN) and Type 1 Diabetes TrialNet clinical trial (p 42) consortia as well as multi-center trials sponsored JDRF and the Helmsley Foundations. This is a shared effort of the Pediatric and Adult Diabetes Divisions of BDC, currently led by Drs. Peter Gottlieb and Andrea Steck.

**The Core Laboratory**

The Autoantibody/HLA Service Center laboratory in the Research Division measures islet autoantibodies at diagnosis of diabetes in all BDC patients to correctly classify the type of diabetes. The laboratory measures serological markers of other autoimmune disorders, including celiac and Addison's disease as part of BDC standards of care. These assays can also be performed on patients’ relatives to determine those who are at risk for developing these diseases. Elevated specific autoantibodies typically precede clinical development of type 1 diabetes, celiac disease and Addison's disease. Early detection of autoimmune diseases such as type 1 diabetes dramatically decreases the risk of early and acute complications.
Clinical Care for Pediatric Patients
The BDC Pediatric Diabetes Division provides families and patients with an understanding of type 1 diabetes and encourages their confidence in its day-to-day management. Present evidence strongly suggests that consistent blood sugar control greatly diminishes the chances of long-term eye and kidney complications. The Pediatric Clinic offers complete education and support for children and adolescents with type 1 diabetes. The expectation is that by the time patients are ready to leave home for college or the workforce, they will have the ability to manage their own blood sugars.

The clinic is certified by the American Diabetes Association, and our nurses, dietitians, nurse practitioners, physician assistants and social workers are Certified Diabetes Educators. Our pediatric endocrinologists also participate in studies that strive to advance and improve glucose monitoring and closed loop technology through observational studies and clinical trials at our Center.

Specific Services
New Onset Classes
Newly diagnosed patients are referred to the Barbara Davis Center from all over Colorado, adjacent states and the Rocky Mountain region. They and their families are given intensive and comprehensive individual and group training, care and counseling on a day-to-day basis with the clinical care team members from the Center. In addition, newly diagnosed patients continue to be followed intensively with daily contact if need be until the patient and family are comfortable with their care and in good control. Most patients will eventually be seen routinely four times a year. However, providers and help are available 24 hours a day for changes in regimens, emergencies and illnesses. All newly diagnosed patients and their families receive a free copy of Understanding Diabetes – 13th Edition (the Pink Panther book) written by Dr. Peter Chase and Dr. David Maahs.

Psychosocial Support / Mental Health
Our clinical social workers meet with each new onset family in order to help them adjust to the diagnosis of diabetes. They are available to help families and kids with diabetes related issues at any time, both during clinic visits and outside of regularly scheduled appointments. Drs. K. Driscoll and S. Majidi have implemented an innovative screening, evaluation and treatment program for depression in pediatric patients with diabetes.

Nutrition
Our dietitians meet with each new onset or new to clinic family to teach them how to adjust diet to insulin delivery. They are also available to all patients during scheduled visits, individual nutrition visits and by telephone.

Pumps and Sensors
The pediatric clinic has a comprehensive program for helping patients initiate insulin pump therapy and/or continuous glucose monitoring. Certified trainers are available on site, and all pump and sensors training is done in the outpatient setting. Understanding Insulin Pumps & Continuous Glucose Monitors, written by Dr. Peter Chase and Laurel Messer, RN, MPH, serves as the textbook.

Dedicated Hispanic/Latino Diabetes Care Program
The BDC currently serves over 800 Latino/Hispanic pediatric patients diagnosed with type 1 diabetes and their families. We have seen difficulties in achieving the same level of diabetes care goals in this population. This is likely related to language barriers, but more importantly to cultural barriers and limited Spanish speaking staff.
and resources to adequately provide the same level of care and communication. In an effort to overcome these challenges and maximize resources, Dr. Andrea Gerard Gonzalez with a grant from the Helmsley Charitable Trust, has launched a unique and innovative model of family style shared medical appointments.

**Transition Program**

In a collaborative effort between the BDC Pediatric and Adult Clinic as well as the Adolescent Medicine Program at the Children’s Hospital Colorado, the BDC has developed a novel approach to transitioning adolescents with T1D from pediatric to adult diabetes care. This program is focused on patient education and empowerment through shared medical appointments and peer interactions.

**Special Courses**

The Pediatric Clinic encourages opportunities for continuing education, participation in local support groups, special outings and parties arranged by the Guild of the Children’s Diabetes Foundation, and attendance at annual summer camps sponsored by the Colorado American Diabetes Association. With the JDRF Rocky Mountain Chapter, we jointly organize the annual ‘Type One Nation Summit’ educational program for pediatric patients and their families. Indeed, many of our clinicians and other employees who have type 1 diabetes themselves volunteer to staff the camps and other special events each summer.

**Telemedicine**

Investments in staff and technology are providing access to care to a greater number of people needing our expert services. In collaboration with Children’s Hospital of Colorado, Dr. Paul Wadwa has developed a model telemedicine program providing residents in Wyoming and remote parts of Colorado with access to our services. Wyoming has >150 youth with T1D but NO pediatric endocrinologists and only 2 endocrinologists for adults in the state. The program is expanding across the Rocky Mountain region. Since the start of the program in May 2012, over 500 clinic visits have been conducted.

- 2012 – Cheyenne, WY
- 2013 - Jackson Hole, WY
- 2014 – Durango, CO
- 2016 – Rifle and Grand Junction, CO

Data from the telemedicine program has been presented at the ATDC conference in 2014 and published in 2016.
ADULT DIABETES DIVISION
Director: Satish Garg, MD, MBBS, DM
Professor of Pediatrics & Medicine

The adult clinic was created more than 20 years ago to answer the major need of adolescents and young adults with diabetes for smooth transition from pediatric to adult specialty care. Under the leadership of Dr. Satish Garg, the adult clinic has become one of the top teams worldwide in clinical trials of insulin analogues and novel methods of insulin delivery (pens, pumps, inhaled, and now close-loop ‘artificial pancreas’ systems).

In its everyday operation the adult clinic continues to strive for excellence in diabetes care serving approximately 2,900 patients ages 18-75. Diabetes education is extremely vital, whether the patient is newly diagnosed or has had diabetes for over 50 years. As knowledge of type 1 diabetes expands and changes, it is our commitment that our patients share in that knowledge also. Each of our patients is seen by at least one educator while he or she sees the physician. This approach allows the patient to learn about improved therapies for diabetes care, as well as comprehensively address specific issues such as hypoglycemia, diet, or exercise.

Services
The clinic provides access to clinical social workers, a pharmacist, nurses, as well as dieticians, who are Certified Diabetes Educators. These professionals work with patients on how to effectively self-manage their diabetes and to troubleshoot obstacles they may face in their health. Our clinic has seen tremendous success with classes featuring carbohydrate counting instruction, insulin pump training, and continuous glucose monitor training. The book, Management of Diabetes in Adults, published by Drs. Garg and Chase in 2013, provides synopsis of the following courses:

- Introduction to Pump Therapy
- Carbohydrate Counting
- Continuous Glucose Monitoring
- Pregnancy and type 1 diabetes

Clinical Trials
The Barbara Davis Center has played a critical role in trials to provide new therapies and devices to our patients. Dr. Satish Garg, Director of the Adult Diabetes Division has headed many important studies including the groundbreaking world’s first hybrid closed loop system (for more information on ‘artificial pancreas’ research, see page 43). For many years prior to this, the adult clinic has been instrumental in the approval and advancement of Continuous Glucose Monitoring systems currently available to help patients manage their diabetes.

The Adult Clinic also participates in many industry sponsored and investigator initiated clinical trials to prevent and reverse type 1 diabetes. These include studies involving new long acting basal insulins, inhaled insulin and rapid acting insulins that have changed ways to deliver and offer more choices for patients to manage their diabetes. The Adult Clinic has also been involved in studies of non insulin therapies for glucose management in type 1 diabetes such as DPP-IV inhibitors, bile-acid sequestrants and SGLT1 and/or 2 inhibitors (all approved for type 2 diabetes management). Additional investigator-initiated trials include AAT and methylodopa. BDC investigators are also taking leading roles in industry partnerships such as Neurocrine’s insulin peptide B9-23 APL trial and Bayhill Therapeutics trial of a Proinsulin DNA Vaccine.

Diabetes in pregnancy
The Adult Diabetes Division offers special care for women with diabetes (pre-existing or gestational) to actively manage glucose levels throughout pregnancy. Women progress from insulin sensitivity in the first trimester to progressive insulin resistance in the second and third trimesters to insulin sensitivity once again in the early
post-partum period. This includes the care of women on multiple daily injections of insulin, continuous subcutaneous insulin infusion therapy, and/or continuous glucose monitoring therapy. Adult clinic providers proactively monitor for progression of diabetic complications that may occur during pregnancy, such as eye and kidney disease and hypertension. Additional services include:
- Pre-conception counseling visit
- Educational pregnancy handouts tailored to patients with pre-existing diabetes
- In-person clinic visits at least once monthly for glucose management during pregnancy
- Interim management of insulin doses through My Chart or by phone in between clinic visits
- Post-partum follow-up visit

**EYE CLINIC**

**Head: Brian Bucca, OD, FAAO**

**Associate Professor of Pediatrics and Ophthalmology**

The specialized Eye Clinic monitors BDC patients’ eye health. Diabetic retinopathy can be associated with serious or complete loss of vision; therefore, early detection and determination of severity of lesions is critical. The Eye Clinic employs digital imaging of retina photographs to aid early detection and treatment of vision-threatening lesions. Our goal is to provide access to annual retinopathy screening for every patient who is ten years of age or older and have had diabetes for at least 3 years. Depending on the severity of eye disease, the Clinic provides treatment or refers patients to the Department of Ophthalmology in the School of Medicine. The Eye Clinic partners with several major multicenter studies in research into prevention and early detection of diabetic eye disease. Impressive thorough
The Clinical Epidemiology program at the Barbara Davis Center encompasses a group of prospective observational research studies focused on the etiology and complications of type 1 diabetes, as well as other autoimmune diseases. Currently the Clinical Epidemiology Program includes the efforts of 5 Barbara Davis Center faculty investigators and over 40 research staff, adult and pediatric research clinics, and a shared research laboratory.

The Clinical Epidemiology program houses several large studies on the epidemiology of type 1 diabetes. The Diabetes Autoimmunity Study in the Young (DAISY) study was the first Clinical Epidemiology project at the Barbara Davis Center. Funded in 1993 and continuously supported through 2020 by the National Institutes of Health (Dr. Rewers, PI), the DAISY study strives to find the cause of type 1 diabetes by observing the natural history of islet-cell autoimmunity and progression to diabetes in children at high genetic risk. This study examines the effects of gluten-free diet on growth and bone development in children with celiac disease detected through a routine screening. Building from the DAISY cohort, other studies have been funded including the C-peptide in the Young PREServation Study (CYPRESS) that follows participants who have been diagnosed with type 1 diabetes (Dr. Steck, PI) and the Infant Vitamins in the Young (IVY) and IVY’omics studies (Dr. Norris, PI). Celiac disease occurs in 10% of patients with type 1 diabetes and 1-2% of children from the general population. The CEliac Disease Autoimmunity Research (CEDAR) study began in 1995 to examine celiac disease occurrence in patients with type 1 diabetes, their relatives and the public (Dr. Rewers, PI.)

The multi-center The Environmental Determinants of Diabetes in the Young (TEDDY) study was funded in 2003, with a clinical center in Colorado (Dr. Rewers, PI). To identify the environmental triggers of type 1 diabetes, TEDDY screened 423,000 newborns and is following 8,676 high-risk children at six centers in the U.S., Sweden, Finland and Germany. A follow-up of TEDDY subjects who have been diagnosed with T1D has been funded by JDRF (Dr. Steck, PI).

In 2016, the Clinical Epidemiology program received joint funding from the Juvenile Diabetes Research Foundation (JDRF), the Helmsley Charitable Trust (HCT), and the Janssen Research & Development for the Autoimmunity Screening for Kids (ASK) program. ASK will launch a large scale screening initiative to identify children who have pre-symptomatic T1D or celiac disease. Following the initial planning phase, the program will conduct a 3-year mass screening of 50,000-70,000 Denver metro children ages 2-17 with the long term goal of providing strong evidence for adding screening for T1D and CD to routine pediatric practice. Clinical trials aimed at preventing progression from pre-symptomatic to symptomatic T1D will also be carried out in the ASK participants.

The Clinical Epidemiology program has a robust research program investigating predictors of complications of type 1 diabetes. In 2000, the Coronary Artery Calcification in Type 1 Diabetes (CACTI) study began, with the purpose of examining risk factors and incidence of cardiovascular complications (Dr. Rewers, PI). The study has since added assessments for other complications, including diabetic nephropathy, retinopathy and neuropathy (Dr. Snell-Bergeon, PI). In addition, several ancillary studies related to the CACTI cohort are ongoing at the Barbara Davis Center, including a JDRF funded study called “Models predicting accelerated cardiorenal complications of type 1 diabetes” (Dr. Rewers, PI). With American Diabetes Association funding, Dr. Snell-Bergeon has initiated a study examining the mechanisms through which young women with type 1 diabetes lose the cardiovascular risk protection that is typical during the premenopausal years in non-diabetic women. She is also investigating novel proteomic, metabolomic and lipidomic markers of diabetic kidney disease, HDL function in cardiovascular disease risk among adults with type 1 diabetes, and how reproductive hormones affect vascular and bone health in women with type 1 diabetes.
The BDC Research Division gains insight into the pathogenesis of type 1 diabetes defined at the cellular and molecular level. A biomedical resource core services the basic and clinical research to monitor the effectiveness of therapeutic interventions and disease recurrence. These interventions are/will be based upon a mechanistic understanding of immune-based therapies and will work synergistically with the basic investigation of T-cell function incorporated into many of these studies. A major strength of the BDC is the breadth of work studying T-cell recognition and biology, genetics and the biology of inflammatory cytokine mediators. These studies are greatly strengthened by the unique clinical resource of ongoing studies of newborns from the general population and relatives of patients with type 1 diabetes who are evaluated prospectively for the development of the antibodies associated with type 1 diabetes and the development of clinical diabetes as well as the great number of new onset patients willing to participate in research (>300/yr). Ongoing trials implement antigen-specific therapies, including the use of small molecules aimed at restoration of immune tolerance.

**Dr. Lori Sussel Laboratory’s** primary focus is to understand the complex transcriptional networks that regulate development, differentiation and function of the pancreas. Dr. Sussel’s early studies led to the ground-breaking discovery that a ghrelin-producing “epsilon” cell population normally resides in the fetal islet, and that a close lineage relationship exists between the islet beta and epsilon cell populations. The Sussel lab went on to identify several novel regulatory pathways that are essential for islet lineage specification, normal pancreas development and the maintenance of beta cell maturation. More recently the lab’s research is addressing issues relating to the regulation of alpha and beta cell identity and function with a specific focus on transcription factors and long non-coding RNAs. At the Barbara Davis Center Dr. Sussel’s lab has joined an outstanding team of scientists and clinicians dedicated to finding treatments and cures for type 1 diabetes. In this rich research environment, the lab will continue to explore novel transcriptional regulatory mechanisms that will promote islet cell development survival and function in normal and pathophysiological conditions such as diabetes.

**Dr. Richard Benninger Laboratory** explores the dysfunction of the islet of Langerhans during the development of diabetes. There are 4 main ongoing projects within the lab; 1) Understanding emergent multicellular properties of the islet and how sub-populations of cells exert disproportionate control over the regulation of insulin secretion, including exacerbating the action of gene mutations that cause neonatal diabetes; 2) Understanding the interactions between islet function and islet autoimmunity during the development of type 1 diabetes, to protect the islet against immune-mediated decline; 3) Understanding the disruption to multicellular properties of the islet, with a focus on gap junction channels, during the development of type 2 diabetes; 4) Developing new imaging approaches to non-invasively quantify the decline in islet function and beta cell mass during the development of type 1 diabetes, allowing early clinical interventions and monitoring.

**Dr. Howard Davidson Laboratory** has a long-standing interest in the molecular cell biology of insulin secretion and the biochemical composition and the process of biogenesis of the insulin granule. Many proteins involved in insulin secretion are also autoantigens in type 1 diabetes (eg IGRP, IA-2, phogrin, and ZnT8) and are being studied in both contexts. In particular the laboratory is interested in determining how the functional and cell biological properties of IA-2, IA-2ß (phogrin), IGRP and ZnT8, might contribute to their being targeted by the immune system, and whether post-translational modifications unique to the beta cell create “neo-antigens” from them that are not subject to central tolerance. There is also a long-standing research interest in the basic cell biology of antigen processing and presentation, particularly in B lymphocytes, and how this might be harnessed for the development of novel antigen-specific therapies that might be applicable to the treatment and/or prevention of type 1 diabetes.

**Dr. Peter Gottlieb Laboratory** is focusing on improving our ability to detect and understand human immune responses in T1D. Central to this work has been the use of ELISPOT analysis to characterize the antigen specificity and inflammatory potential of these responses. He has been a member of the IDS T Cell Workshop.
Steering Committee and has collaborated to improve detection of antigen-specific CD4 and CD8 T cell responses using ELISPOT, tetramers and other methodologies. His work focuses not only on using existing technology, but also collaborating with Drs. Love and Wucherpfennig to examine T cell response using unique microwell systems, which can detect single cell response and interrogate them in multiple assays simultaneously. Lastly, Dr. Gottlieb collaborates with Dr. Danny Zipris to understand the role of the microbiome in human T1D as well as of the innate immune system which appears to be activated early in disease and may be contributing to the world-wide rise in T1D. He also has initiated studies on the role of B lymphocytes in human T1D with Dr. Cambier which have detected a loss in anergic B cells during the development of autoimmune diabetes.

**Dr. John Kappler Laboratory** is currently pursuing studies of the trimolecular complex (MHC-TCR-autoantigen) in the pathogenesis of type 1 diabetes in humans. Dr. Kappler and his wife Philippa Marrack, PhD, were the first to isolate the T cell receptor and together have contributed extensively to our understanding of the nature of antigen processing and major histocompatibility comple (MHC)-restricted peptide presentation. Dr. Kappler works closely with the Michels and Nakayama laboratories on the nature of the peptide/MHCII complexes that drive islet autoimmunity leading to type 1 diabetes.

**Dr. Aaron Michels Laboratory** develops technology to prevent or cure diabetes in man through a precise knowledge of pathogenesis in animal models. Their studies indicate that insulin is the primary autoantigen whose targeting by the immune system leads to diabetes. Thus eliminating this abnormal response to insulin will be key for prevention. Trials with molecules such as the B:9-23 peptide require a more basic understanding of the cells mediating disease, as we now know that administration of B:9-23 dependent upon the route of administration can either prevent or inhibit development of diabetes.

**Dr. Maki Nakayama Laboratory** explores antigen specificity and function of autoreactive T cells. It also studies the role of T cells expressing specific TCRs in the development of T1D using an animal model and more recently human T cells isolated from pancreas and lymph nodes. It pursues the potential of TCR sequences to be used as T cell biomarkers to predict the development of type 1 diabetes as well as recurrence of hyperglycemia after clinical therapeutic trials. They also explore the mechanism of transplantation failure in T1D patients.

**Dr. Holger Russ Laboratory** is interested in elucidating the underlying mechanisms that lead to the development of diabetes in humans. One specific focus of the lab is to investigate and elucidate molecular mechanisms that govern human beta cell development, maturation, replication, and function under steady state conditions and response's to stress(es). Dr. Russ' lab was among the first three groups demonstrating the generation of functional beta cells from human pluripotent stem cells under cell culture conditions. It is now possible to generate patient specific cell lines with the ability to differentiate into any cell type thus enabling the study of beta cell function in a specific genomic context. The Russ lab is taking advantage of recent breakthroughs in genome editing technology to establish different inducible CRISPR/Cas9 systems to facilitate rapid and precise gene modification of pluripotent stem- and its differentiated cell derivates. While the pancreatic beta cell is key to glucose homeostasis, the thymus gland also plays a critical role in the development of T1D. The Russ lab was the first to demonstrate the successful generation of human embryonic stem cell-derived thymic epithelial cells (TECs) by directed differentiation. Moving forward, the lab is determined to combine in vitro derived thymic epithelium with human T-cell progenitors either in vitro or in vivo to study diverse aspects of autoimmunity in a strictly human context.

**Dr. Liping Yu Laboratory** is the international reference laboratory for measurement of islet autoantibodies. It serves as the core laboratory for Type 1 Diabetes TrialNet, The Environmental Determinants of Diabetes in the Young (TEDDY) and the Immune Tolerance Network (ITN) consortia. ITN solicits, develops, implements and assesses clinical strategies and biological assays for the purpose of inducing, maintaining, and monitoring tolerance for kidney and islet transplantation, and autoimmune diseases. Dr. Yu Laboratory also develops technology to predict diabetes in humans. In collaboration with the DAISY study, the laboratory has defined the
genes associated with childhood diabetes. Type 1 diabetes is associated with other autoimmune diseases, mostly thyroid, celiac and Addison’s disease. This laboratory helps to routinely screen all BDC patients for the associated autoimmune conditions.

**Dr. Danny Zipris Laboratory** is focused on understanding how microbial infections and the innate immune system promote the development of type 1 diabetes. The lab is testing the hypothesis that upregulation of proinflammatory pathways shortly after virus infection plays a crucial role in islet destruction. We have identified a number of innate immune modulators, such as steroids, antibiotics, and blockers of IL-1 and histone deacetylases that can protect animals from beta cell destruction. The laboratory also pursues studies of the influence of gut microbiome on the innate and adaptive immune mechanisms involved in the pathogenesis of type 1 diabetes.

### FACULTY

**Excellence & Leadership**

**Richard Benninger, PhD**
2015 Biophysical Society ‘Young Fluorescence Investigator Award’

**Petter Bjornstad, MD**
2016 Society for Pediatric Research Fellow’s Clinical Research Award

**Satish Garg, MD**
2013-present Editor-in-Chief for Diabetes Technology and Therapeutics

**John Kappler, PhD**
2015 Wolf Prize in Medicine
George S. Eisenbarth Memorial Award at the Immunology of Diabetes Society 14th International Congress

**Peter Gottlieb, MD & Aaron Michels, MD**
2015 Launched a new biotech company, ImmunoMolecular Therapeutics, LLC

**David Maahs, MD, PhD**
2014-2016 Scientific Advisory Board, International Society of Pediatric and Adolescent Diabetes (ISPAD)
2016-2018 Elected Secretary-General for the International Society of Pediatric and Adolescent Diabetes (ISPAD) for 2016-18

**Maki Nakayama, MD, PhD**
2015 Spirit of nPOD Award

**Viralkumar Shah, MD**
2016 - Steering Committee member, T1D Exchange Clinic Registry

### PATENTS

**US Patent 9,023,984**
John Hutton, PhD, Janet Wenzlau, PhD, Jan Jensen, Howard Davidson, PhD - *Diagnostic and Therapeutic Target for Autoimmune Diseases and Uses Thereof*
**Faculty Expertise**

**PEDIATRIC DIABETES DIVISION**

**Guy Todd Alonso, MD, Assistant Professor of Pediatrics**  
**Assistant Medical Director for Quality**

Dr. Alonso joined the BDC faculty in 2013. He is the Director of Education for the pediatric service, chair of the BDC Quality Improvement Committee and represents the BDC on the Clinical Leadership Council. Since 2014, Dr. Alonso has served as Medical Director for Camp Colorado, the week long American Diabetes Association sponsored diabetes camp that the center supports. His areas of interest include improving the quality of outpatient care at the BDC, clinical informatics, and mentoring medical students, residents, and fellows.

**H. Peter Chase, MD, Professor of Pediatrics**  
**H. Peter Chase Chair in Clinical Research and Care**

Dr. Chase was the Center’s founding Clinical Director (1980-2000) and has served as Executive- and Pediatric Clinic- Director of the BDC. He was one of the 10 physicians that initiated the Diabetes Prevention Trial over 20 years ago and more recently was the PI for the TrialNet pilot study testing DHA as a means of prevention of the autoimmunity of T1D. He was the Colorado site PI on the DirecNet studies which were among the first to evaluate Continuous Glucose Monitor use in children with diabetes. His current major research focus is the JDRF/NIH Artificial Pancreas Project working on the closed-loop artificial pancreas. His work has resulted in over 300 peer-reviewed publications, five books (with 13 editions of two of the books) and 71 book chapters. His educational books for families with type 1 diabetes (available in English, Spanish, Arabic and Chinese) have reached over two million families, in addition to being used on-line for families in the Middle East (Arabic edition) and China. He has been a mentor for many pediatric diabetes investigators as well as instrumental in interesting medical students, residents and diabetes-endocrine fellows in a career in diabetes investigation.

**Kimberly A. Driscoll, PhD**  
**Assistant Professor of Pediatrics**

Dr. Driscoll joined the BDC in September of 2015 as an assistant professor and a licensed pediatric psychologist. Her patient-oriented clinical research addresses adherence to medical treatment regimens, with a specific focus on using technology to optimize adherence and health outcomes in type 1 diabetes. She received an NIH/NIDDK K23 Career Development Award aimed at providing longitudinal intervention to improve insulin pump adherence in adolescents with type 1 diabetes. She is a member of the Psychosocial Studies committee of TEDDY (The Environmental Determinants of Diabetes in the Young), is the consulting psychologist on Dr. Jennifer Raymond’s Team Clinic grant funded by the Helmsley Charitable Trust and on several artificial pancreas studies (PI: Dr. David Maahs). Before joining the Barbara Davis Center, she was faculty in the Florida State University College of Medicine and the Associate Director of the Florida State University Psychology Clinic.

**Gregory Forlenza, MD**  
**Assistant Professor of Pediatrics**

Dr. Forlenza joined the Pediatric Division of the BDC in 2015. His research focus is on development, refinement and testing of diabetes technology including insulin pumps, continuous glucose monitors and the artificial pancreas. He is interested in using technology to help patients better control their diabetes and reduce the burden of diabetes on children and their families. He is site Primary Investigator on several upcoming industry pivotal trials and co-Investigator on several JDRF and NIH funded projects with Dr. Paul Wadwa. He is also interested in islet transplantation as a potential cure for type 1 diabetes and was the co-PI for a project investigating combining islet transplantation with artificial pancreas technology. In addition, Dr. Forlenza is conducting research on the benefits of diabetes technology to minimize complications from hyperglycemia in children with cancer and children undergoing bone marrow transplantation. He is very passionate about the benefits of diabetes camps and have been volunteering at various camps for over 10 years.

**Brigitte Frohnert, MD, PhD, Assistant Professor of Pediatrics**
Dr. Frohnert joined the BDC faculty in 2014. Her primary research focus is in the area of prediction and prevention of type 1 diabetes. She has a PhD in Biochemistry and Molecular Biology and her prior research experience includes work examining the connection between obesity-related oxidative stress in adipocytes and the development of insulin resistance and type 2 diabetes. Her current research looks at the role of the environment in the development of type 1 diabetes. She has joined other BDC investigators in two large epidemiologic studies: DAISY (Diabetes Autoimmunity Study in the Young) and TEDDY (The Environmental Determinants of Diabetes in the Young). These studies seek to identify modifiable environmental factors, with the hope of decreasing incidence and progression of type 1 diabetes. Dr. Frohnert’s future goals include the use of ‘omics data in the analysis of large prospective cohort studies to better understand the development of autoimmunity in type 1 diabetes.

Andrea Gerard-Gonzalez, MD, Assistant Professor of Pediatrics
Dr. Gerard Gonzalez joined our faculty in 2013 as the Director of the BDC Spanish Language Program; she is bi-lingual and bi-cultural. She is focused on developing a cost effective program to improve the diabetes care delivery and outcomes of Latinos with type 1 diabetes. In the US, Hispanic children underutilize diabetes care technology and have higher HbA1c levels than non-Hispanic white children. The BDC bi-lingual and bi-cultural program includes improving communication with Latino families through training diabetes care providers and community-based efforts to improve the quality of life of Latino families living with type 1 diabetes.

Georgeanna J. Klingensmith, MD, Professor of Pediatrics
Dr. Klingensmith retired as a full time faculty member at the end of June 2016 but continues to work 1-2 days a week to mentor Junior Faculty and fellows, sit on Department of Pediatrics Committees and to assist in special projects for Dr. Slover. Dr. Klingensmith was awarded the ADA Outstanding Physician-Clinician Award in 2012. She has served on the committee to write ADA Standards for Pediatric Diabetes Care and on the editorial committee of the International Society for Pediatric and Adolescent Diabetes (ISPAD) Guidelines for Pediatric Diabetes Care. She was the initial PI on two BDC NIH grants to train both pediatric fellows and pediatric endocrinology faculty in diabetes research. Dr. Klingensmith was also the initial BDC Pediatric PI for the T1D Exchange, a study that has enrolled over 30,000 patients with type 1 diabetes from over 70 centers throughout the US. This clinical database is providing the opportunity to determine diabetes care practices in the US and what care practices yield the most optimal outcomes over the age spectrum. She continues to participate in the CDC funded, NIH supported SEARCH for Diabetes study, now in its fourth funding cycle. SEARCH has determined the change in incidence and prevalence rates of childhood diabetes in the US including the documentation of an increase of 2.7% per year in type 1 diabetes incidence in Colorado over the past 20 years. She continues as the vice chair for the Pediatric Diabetes Consortium, a large consortium evaluating care of children with type 2 diabetes in specialty centers and developing clinical trials to study new medications to treat youth with type 2 diabetes.

David Maahs, MD, PhD, Professor of Pediatrics
Dr. Maahs major research focus is on the artificial pancreas and clinical trials to prevent the long-term complications of diabetes. Having joined the faculty in 2006, he was a co-investigator of the Coronary Artery Calcification in Type 1 Diabetes (CACTI) Study with Drs. Marian Rewers and Janet Snell-Bergeon focusing on cardiorenal complications in young adults with type 1 diabetes. He was the Colorado PI for the Preventing Early Renal Decline (PERL) Study (http://perl-study.org/), the JDRF Genetics of Diabetic Nephropathy Consortium, and a JDRF Innovative grant on improving methods to measure GFR. He was co-PI with Dr Klingensmith on the BDC T32 grant in Pediatric Endocrinology. He collaborates with investigators at the University of North Carolina and Cincinnati Children's Hospital on a behavioral intervention to improve diabetes care in adolescents (Flexible Lifestyles 3mpowering Change, FL3X Study [https://type1fl3x.com/]). As a logical extension of this research to prevent the complications of type 1 diabetes, his research has increasingly focused on the development of the artificial pancreas since improved glucose control is the best proven method to prevent the complications of type 1 diabetes. Dr. Maahs recently moved to California where he has accepted the position of Division Chief, Pediatric Endocrinology at Stanford University.
Shideh Majidi, MD
Assistant Professor of Pediatrics
Dr. Majidi joined the Pediatric Division in 2015. Her primary clinical and research interests are in behavioral and psychosocial aspects of care in youth with type 1 diabetes. Dr. Majidi currently has an NIH/NIDDK K12 award and is conducting research in depression and improving high risk patient management, as well as working on a national level to improve behavioral health and high risk patient management in diabetes. For Dr. Majidi, one of the best parts of working in the diabetes field is being able to work with families and patients throughout their childhood. Each patient and family is unique, and her passion is to continuously strive to ensure her patients receive the best care possible for their individual and unique diabetes needs.

Jennifer Raymond, MD, MCR, Assistant Professor of Pediatrics
Dr. Raymond joined the faculty in 2012 with the goal of improving quality and satisfaction of life in her patients with type 1 diabetes and their families. Her main research interest is improving patient outcomes through novel clinical approaches and behavioral interventions in patients with type 1 diabetes, specifically adolescents and young adults. While at the BDC, Dr. Raymond received funding from the Helmsley Charitable Trust to investigate the use of shared medical appointments in adolescents and young adults with type 1 diabetes, in addition to exploring the completion of routine diabetes care visits with young adults from their homes through telehealth technologies. Dr. Raymond has recently accepted a position as Clinical Diabetes Director at Children’s Hospital Los Angeles.

Marian Rewers, MD, PhD, Professor of Pediatrics and Medicine
Executive Director of Barbara Davis Center
Abrams-Rewers Chair in Clinical Research
Dr. Rewers joined the faculty of Barbara Davis Center in 2000 as Director of Clinical Division; he has served as interim (2012-14) and now permanent Executive Director of the Center. His primary research is in the etiology/epidemiology of type 1 diabetes as well as insulin resistance and cardiovascular complications of both type 1 and 2 diabetes. Dr. Rewers has been the PI of several large NIH-funded projects: The Environmental Determinants of Diabetes in the Young (TEDDY), the Diabetes Autoimmunity Study in the Young (DAISY) and the Genetic and Environmental Causes of Celiac Disease (CEDAR). DAISY has been instrumental in expanding our knowledge of the causes and risks of diabetes. He has also studied the development of cardiovascular disease in T1D in a large longitudinal study – the Coronary Artery Calcification in Type 1 (CACTI). These studies have basic research ‘omics components evaluating the underlying pathophysiology of T1D and its complications as well as clinical translational and epidemiology components providing opportunities for investigation across the spectrum of type 1 diabetes research. Dr. Rewers has authored more than 340 peer-reviewed publications and has mentored over 40 physician-scientists as well as PhD and MS students. He received the Kelly West Award from the American Diabetes Association, one of the highest research awards given by the ADA. More recently, he received the Juvenile Diabetes Research Foundation’s prestigious Mary Tyler Moore and S. Robert Levine Award for Excellence in Clinical Research.

Kimber Simmons, MD, Assistant Professor of Pediatrics
Dr. Simmons joined the faculty in 2016 as a physician scientist studying the clinical immunology of autoimmune disease, with a focus on type 1 diabetes. Her current research interests are to screen children in the general population for islet autoantibodies (early T1D), hone techniques to study the immune cells that participate in the pathogenesis of T1D and participate as an investigator in prevention trials with the goal of finding an intervention that can modulate the autoimmune attack in the pancreas. She has received a JDRF Career Development Award to support this work and is an investigator on the ASK program (autoimmune screening for kids), which seeks to screen children in the general population for early T1D and celiac disease. To better understand the autoimmune process in T1D, Dr. Simmons is studying islet antigen-reactive B cells under the direction of Dr. John Cambier (PhD immunologist). She is also one of the Type 1 Diabetes TrialNet investigators.
at the Barbara Davis Center with a specific interest in following patients who are enrolled in immune prevention trials.

**Robert Slover, MD, Professor of Pediatrics**  
**Director of Pediatric Diabetes Division**  
**The Wagner Family Chair in Childhood Diabetes**

Dr. Slover rejoined the faculty of BDC in 2002 and became the Director of Pediatric Diabetes Division in 2010. His research work focuses in the area of insulin pump and sensor use, the use of sensor-augmented pump therapy, and the development of closed loop (artificial pancreas) systems. He is the PI of several studies at the BDC including the pivotal ASPIRE study, and the pre-pivotal and pivotal trials of hybrid closed loop systems in children from as young as age 8. This work has progressed through intensive hospital trials, and closely monitored off-site studies, to home use with extended periods of direct observation in group settings. Numerous publications attest to the success of this new technology. Dr. Slover uses his special expertise of diabetes technology use in children to assist in the development of appropriate diabetes modules to educate parents and families in the newest diabetes technology. He is an expert in the collection, review, analysis, and interpretation of continuous glucose monitor data including measurements of variability, analysis of glycemic variability, percent time spent in various glucose ranges, and other glycemic data outcomes. As the PI of many past and present studies, he has authored over 250 peer-reviewed publications.

**Andrea Steck, MD, Associate Professor of Pediatrics**

Dr. Steck joined the faculty of BDC in 2008. Her primary research area is epidemiology, prediction and prevention of type 1 diabetes (T1D). She has a background in pediatric endocrinology, with specific training and expertise in pediatric diabetes. Her research experience includes work with epidemiological studies such as DAISY (Diabetes Autoimmunity Study in the Young) and TEDDY (The Environmental Determinants of Diabetes in the Young). Dr. Steck is the PI for an ADA Career Development Award on Determinants of rate of progression to T1D in TrialNet subjects at high risk of developing diabetes as well as PI of the Twin Family Study. She is also the Colorado PI for several multisite research studies, including the TrialNet Pathway to Prevention Study, the TrialNet Oral Insulin Trial, the Exploring Immune Effects of Oral Insulin Trial and the LIFT (Long-Term Investigative Follow-Up in TrialNet) Study, as well as the JDRF Follow-up of Children Diagnosed with Diabetes Study, looking at preservation of C-peptide over time in children diagnosed with T1D through prospective studies such as TEDDY compared to T1D subjects from the community. Her goal is to further characterize staging of risk for T1D, pathophysiology and preservation of endogenous insulin secretion in collaboration with local and national colleagues. Dr. Steck is also the BDC Medical Informatics Officer overseeing electronic medical records improvement.

**R. Paul Wadwa, MD, Associate Professor of Pediatrics**  
**Medical Director, Pediatric Diabetes Division**

Dr. Wadwa joined the faculty of the BDC in 2003. He is the medical director of the pediatric clinic and director of the telemedicine program at the Barbara Davis Center. The goal of the telemedicine program is to deliver type 1 diabetes care to pediatric patients living at a distance from the center that makes regular follow up difficult. Over the coming years, the BDC telemedicine program plans to analyze telemedicine data to quantify long term benefits in glycemic control and rates of microvascular complications for patients requiring the use of telemedicine as a part of their diabetes care. Dr. Wadwa’s primary research focus is on the development of the artificial pancreas. He is involved in several clinical research studies with the goal of advancing artificial pancreas technology. Dr. Wadwa is also engaged in clinical trials of new therapeutic agents. The next decade will bring significant advances in delivery of diabetes care as well as in medications and devices used to care for patients with type 1 diabetes. Clinical trials in this area are crucial to bring the most advanced medical care to patients with type 1 diabetes. Dr. Wadwa is excited to be a part of these rapidly advancing areas of diabetes care and strives to improve the lives of people living with diabetes.

**Philippe Walravens, MD, Professor Emeritus of Pediatrics**
For many years, Dr. Walravens was the only BDC physician fluent in Spanish. During more than two decades of his service at the BDC, he has helped hundreds of Spanish-speaking families with type 1 diabetes. His research interests included the role of trace elements and antioxidants in diabetes, dyslipidemias, and the use of oral hypoglycemic agents and insulin sensitizers in type 1 diabetic patients.

**ADULT DIABETES DIVISION**

**Satish Garg, MD, MBBS, DM, Professor of Pediatrics and Medicine**
**Director of Adult Diabetes Division**

**Satish and Kavita Garg Barbara Davis Center Chair in Clinical Research**

Dr. Garg joined the faculty of Barbara Davis Center in 1992 to become the founder and director of BDC adult clinic. His research interests include the early detection and treatment of renal and retinal complications of type 1 diabetes, and the development of new diagnostic and therapeutic tools related to clinical diabetes management that include new insulin analogs and glucose sensors, artificial pancreas studies, evaluating accuracy of meters at high altitude, alternate ways to deliver insulin, adjunctive therapies for T1D etc. He has been part of several seminal multicenter studies that have brought technological breakthroughs to diabetes care including the recently FDA approved Medtronic MiniMed 670G hybrid closed-loop system. Dr. Garg is the Editor in chief of Diabetes Technology and Therapeutics Journal and Chair of the planning committee for Clinical Therapeutics and New Technology area for 2007 and 2008 Annual American Diabetes Associations meetings. He is the director of ATDC Keystone Diabetes conference since 2005. He is an international lecturer and speaker, and has published many chapters in the books, on the editorial boards for many of the diabetes journals globally and has published more than 250 original manuscripts in peer-review journals.

**Peter Gottlieb, MD, Professor of Pediatrics and Medicine**

Dr. Gottlieb joined the faculty of the Barbara Davis Center in 1994. His laboratory projects are designed to advance basic knowledge of the immune response to autoantigens in type 1 diabetes with the goal of designing immunotherapies for prediabetes and new onset type 1 subjects. Towards this end, Dr. Gottlieb seeks better understanding of the relationship of autoreactive vs. T regulatory cells, innate immunity, and microbiome in human diabetes. His aims are to better understand the pathogenesis and natural history of type 1 diabetes as well as to design clinical prevention trials based on rigorous immunological readouts of the disease process. He is the PI for the Colorado center of the NIH funded Type 1 Diabetes TrialNet effort. His research provides ‘bench to bedside’ research of the highest caliber. His work has resulted in over 130 peer-reviewed publications.

**Raymond Gutin, MD, Sr. Instructor of Pediatrics**

Dr. Gutin joined the adult clinic staff in April, 2003 after a long professional career in private practice in Denver. He is very active in direct patient care, and participates in clinical research for evaluation of new drugs and devices to treat Type 1 Diabetes.

**Aaron Michels, MD, Associate Professor of Pediatrics and Medicine**
**Frieda and George S. Eisenbarth Chair in Clinical Immunology**

Dr. Michels joined the faculty of Barbara Davis Center in 2010 as a physician scientist and practicing endocrinologist. His professional research career focuses on understanding the underlying immunology of autoimmune disorders with a focus on type 1 diabetes. Having lived with type 1 diabetes for more than two decades, it is his career goal to contribute to the prevention and ultimately a cure for the disease. His research focuses on understanding the role of HLA molecules in conferring diabetes risk and protection, as specific HLA genes contribute substantial risk for diabetes development as well as provide dominant protection. He discovered that small ‘drug-like’ molecules targeted to diabetes risk HLA molecules can block T cell responses and prevent diabetes onset in spontaneous animal models of autoimmune diabetes. The concept of blocking a specific HLA molecule, which represents personalized medicine, has been translated from bench to bedside. He completed a clinical trial using methyldopa (Aldomet) in patients with recently diagnosed diabetes to block a
specific HLA gene involved in diabetes development. Dr. Michels is also an enthusiastic mentor for basic investigation into the immunology of type 1 diabetes.

**Sarit Polsky, MD, MPH, Assistant Professor of Pediatrics**
Dr. Polsky joined the staff at the Barbara Davis Center for Diabetes in 2014. Her early research focused on risk factors for type 2 diabetes and obesity including bariatric surgery, which is most often sought by women. Since Dr. Polsky’s Internal Medicine residency training in the Women’s Health track, she maintained a clinical and research interest in women’s health. Dr. Polsky directs the pregnancy clinic at the Barbara Davis Center. She is interested in how diabetes affects women during the reproductive years, menopause, and post-menopausal stages. She is the Principal Investigator (PI) of a study investigating glucose control and pregnancy outcomes in women with Type 1 Diabetes (T1D) using a continuous glucose monitor with or without remote monitoring capabilities. Dr. Polsky is the site PI in the PERL Study (Preventing Early Renal Loss in Diabetes), an international, NIH-sponsored, multi-site randomized controlled trial investigating a new way to help prevent/decrease the progression of kidney problems in individuals with T1D. Dr. Polsky aims to obtain continuous independent funding examining strategies that improve glycemic control and prevent long-term complications in women with T1D.

**Viral Shah, MD, Assistant Professor of Pediatrics**
Dr. Shah joined BDC in December 2013. His current areas of research are to 1) improve bone health to prevent osteoporotic fractures in older adults with long standing type 1 diabetes, and 2) investigate newer therapies and technologies for better glucose control. He is well published with more than 60 publications including original manuscripts, reviews and chapters in textbooks. He serves as reviewer for many peer-reviewed journals ([https://publons.com/author/256576/viral-shah#profile](https://publons.com/author/256576/viral-shah#profile)) and grants. In addition, he serves as one of the Steering Committee Members for T1D Exchange Clinic Registry. His current research studies are funded by the T1D Exchange program (Clinical Trials.gov; NCT02258373, NCT02411578, NCT02523131) and the Center for Women’s Health Research at the University of Colorado (NCT02693964).

**EYE CLINIC**

**Brian Bucca, OD, FAAO, Associate Professor of Pediatrics**
**Head of Eye Clinic**
Dr. Bucca joined the BDC faculty in 2007 and has been dedicated to the field of diabetic eye disease for 15 years. His mission is to prevent diabetes-related eye disease and vision loss through accurate detection, comprehensive patient education and compassionate care. The Eye Clinic offers unparalleled quality of care and state-of-the-art diagnostic retinal imaging, which assists in the detection of the earliest stages of retinopathy and enables identification of patients with advanced eye disease necessitating treatment. Dr. Bucca also is the director of the Fundus Photography and Retinopathy Reading Center (FPRRC), which offers state-of-the-art retinal imaging services to research investigators thereby enabling local, national and industry-sponsored studies to measure retinopathy outcomes in their study participants.

**William Jackson, MD, Professor Emeritus**
Dr. Jackson joined BDC faculty in 1996, following eight years of part-time volunteer work, to become the first Director of the Eye Clinic at the BDC. He built up the Clinic’s instrumentation to provide state-of-the-art screening and laser treatment service. Dr. Jackson was honored with the Stapleton Award in 1998 and established an endowed chair in ophthalmology at the BDC. Through his relentless effort he has saved the vision of hundreds of the Center’s patients and left a lasting legacy of excellence in diabetic eye care and technological innovation.

**CLINICAL EPIDEMIOLOGY**

**Judith Baxter, MA, Associate Clinical Professor of Pediatrics**
**Co-Head of Clinical Epidemiology**
Ms. Baxter joined the BDC faculty in 2014, bringing over 30 years of scientific project management of large single and multi-center studies (San Luis Valley Diabetes Study, San Luis Valley Hispanic Health and Aging Study, Insulin Resistance and Atherosclerosis Study). Her research agenda has centered on planning, implementing, analyzing and sustaining population-based research studies designed to investigate the natural history and determinants of chronic disease in populations spanning the life course. Her primary foci have been 1) the investigation of social, cultural, and behavioral factors as they relate to type 1 and type 2 diabetes, aging-related outcomes, depression and quality of life; 2) ethnic differences in risk factors and 3) assessment of methods utilized in population-based research. Judy has been the Project Manager for the Colorado Clinical Center of the TEDDY (The Environmental Determinants of Diabetes in the Young) Study at the BDC since 2004. She serves as the Chair of TEDDY’s Coordinator Committee and as a member of the Psychosocial Scientific and Quality Assurance Committees. Most recently Judy has, together with Dr. Rewers and other investigators, led the development of the Autoimmunity Screening for Kids (ASK) Program funded in 2016 to screen and monitor children in the general population for the early detection of type 1 diabetes and celiac disease.

Janet Snell-Bergeon, PhD, Associate Professor of Pediatrics
Co-Head of Clinical Epidemiology
Dr. Snell-Bergeon joined the BDC faculty in 2008. Her area of interest is the complications of type 1 diabetes. As an investigator and current PI of the Coronary Artery Calcification in Type 1 Diabetes (CACTI) Study, she has contributed to understanding the mechanisms through which hyperglycemia and insulin resistance increase cardiovascular risk in type 1 diabetes and has recently examined insulin resistance in women with type 1 diabetes in relationship with measures of arterial stiffness in an American Diabetes Association (ADA) Junior Faculty Award. She is the PI of an ADA Career Development Award with the goal of examining how estrogen affects vascular health and complications in young women with T1D compared to non-diabetic women. She is the Denver site PI for a JDRF network grant investigating novel proteomic, metabolomic and lipidomic markers of diabetic kidney disease, and the Denver site PI for a study of HDL function in cardiovascular disease risk among adults with T1D. In collaboration with Dr. Irene Schauer, she is examining novel adjunct therapies to improve glycemic control in adults and adolescents with type 1 diabetes. She is mentoring Dr. Viral Shah on a pilot grant investigating bone health in postmenopausal women with and without T1D, and has just received a pilot grant to examine how reproductive hormones affect vascular and bone health in women with T1D. She is a co-investigator for the Diabetes Autoimmunity Study in the Young (DAISY), and has contributed to papers with The Environmental Determinants of Type 1 Diabetes (TEDDY) and SEARCH for Diabetes in Youth studies.

BASIC AND TRANSLATIONAL RESEARCH DIVISION

Lori Sussel, PhD
Professor of Pediatrics
Director, Basic and Translational Research Division
Dr. Sussel joined the BDC as the Director of Basic and Translational Research Division on April 1, 2016. The main focus of Dr. Sussel’s research is to understand the complex transcriptional networks that regulate development, differentiation and function of the pancreas. Her early studies led to the ground-breaking discovery that a ghrelin-producing endocrine cell population normally resides in the fetal islet and she further discovered several novel regulatory pathways essential for normal pancreas development and maintenance of beta cell identity. At the Naomi Berrie Center for Diabetes her research has addressed issues relating to the regulation of beta cell identity and function with a specific focus on transcription factors and long non-coding RNAs. Her goal is to master the process of in vitro and in vivo generation of beta cells and apply this knowledge in future trials of islet regeneration and transplantation. At the Barbara Davis Center she will join an established team of scientists dedicated to finding a cure for type 1 diabetes, facilitating new avenues of research dedicated to understanding the complex interactions between beta cells and the immune system.

Richard Benninger, PhD, Assistant Professor of Bioengineering and Pediatrics
Dr. Benninger joined the BDC faculty in 2011. Main goals of Dr. Benninger’s research include understanding novel signaling pathways in the islet of Langerhans that enhance the regulation of hormone secretion; how
disruptions to these signaling pathways cause islet dysfunction in diabetes; and how we can manipulate these signaling pathways to improve islet function towards developing new treatments for individuals with diabetes. He is utilizing state-of-the-art quantitative fluorescence microscopy, including two-photon microscopy, fluorescence lifetime imaging, polarization imaging and FRET in studying pancreatic islet dysfunction in diabetes. Dr. Benninger has developed an integrative model of how different cell-cell communication mechanisms dynamically interact within the islet. They have gained understanding into how this impact in-vivo islet function and glucose homeostasis and are now demonstrating that gap junction channels can be modulated to improve islet function and insulin secretion in models of diabetes. Overall his work applies sophisticated quantitative techniques and predictive quantitative models to link emergent multi-cellular properties of the islet of Langerhans to in-vivo physiology and diabetes, and test novel hypotheses regarding these properties that may be clinically important.

Howard Davidson, PhD, Associate Professor of Pediatrics and Immunology & Microbiology
Dr. Davidson joined the BDC faculty in 2002. The ultimate goal of Dr. Davidson’s research is to develop improved methods for measuring autoimmunity in type 1A diabetes, and to identify reagents that might have therapeutic utility for the prevention and/or treatment of this disease. Currently these studies focus principally on defining epitopes targeted by the cellular and humoral arms of the immune system in the major autoantigens zinc transporter 8 (ZnT8) and preproinsulin and developing improved bioassays for monitoring disease risk and therapeutic efficacy based upon this information. He also has a long-standing research interest in the basic cell biology of antigen processing and presentation, particularly in B lymphocytes, and is investigating how post-translational modifications to beta cell proteins influence how they are targeted by the immune system, and the roles that beta cell stress may play in the immunological events that eventually lead to the development of autoimmune diabetes.

Pamela Fain, PhD, Professor Emerita
Dr. Fain studied the genetics of type I diabetes, vitiligo and other autoimmune diseases with an emphasis on determining the relationship of these disorders with each other and with HLA, and other disease susceptibility genes. She served as the Director of Genotyping Mutation Screening Core Facility for the Human Medical Genetics Program. Dr. Fain has published more than 100 original articles in peer-review journals.

Niyun Jin, MD
Instructor of Pediatrics
Dr. Jin joined Dr. Kappler’s Laboratory in the Basic and Translational Research Division in September of 2015. Having worked with Dr. Kappler at National Jewish Health, Dr. Jin will continue work focused on the roles of pathogenic CD4 T cells in the development of type 1 diabetes (T1D) and how major histocompatibility (MHC) class II recognize antigenic peptides. She will also work on projects focused on preventing type 1 diabetes in nonobese diabetic (NOD) mice by vaccination with Chromogranin A mimetope.

John Kappler, PhD, Distinguished Professor of Immunology & Microbiology
Having collaborated with BDC investigators for many years, Dr. Kappler officially joined the BDC in March 2015 as Interim Scientific Director of the Research Division. He opened his laboratory at the BDC and has become the primary mentor for several BDC researchers. Dr. Kappler has been a Howard Hughes Medical Institute investigator since 1986 and a member of the National Academy of Sciences since 1989. In addition to directing a lab at the BDC, he co-directs the Kappler-Marrack Research Lab at the National Jewish Health with his wife, Philippa Marrack, PhD. The two have shared multiple discoveries over the years, including the first to isolate the T cell receptor. For the past six years, Dr. Kappler has collaborated with investigators at the Barbara Davis Center on the nature of the peptide/MHC Class II complexes that drive islet autoimmunity leading to type 1 diabetes. In addition to his own research and providing scientific direction to faculty and staff, Dr. Kappler played an active role in recruiting Lori Sussel, PhD, the new Director of the Division of Basic and Translational Research at the Barbara Davis Center.
Maki Nakayama, MD, PhD, Associate Professor of Pediatrics
Dr. Nakayama joined the BDC faculty in 2009. Her research strives to understand the mechanism of initiation of anti-beta cell autoimmunity. She focuses on the tri-molecular complex consisting of antigen, major histocompatibility complex (MHC), and T cell receptor (TCR) that could be a key component for the development of T1D. Her laboratory explores antigen specificity of autoreactive T cells having different functions (i.e. pathogenic vs regulatory T cells) that target pancreatic beta cells; the role of T cells expressing specific TCRs in the development of T1D using an animal model; the potential of TCR sequences to be used as T cell biomarkers to predict the development of type 1 diabetes as well as recurrence of hyperglycemia after clinical therapeutic trials; lastly, exploring the mechanism of transplantation failure in T1D patients. Dr. Nakayama has been part of the JDRF-Helmsley nPOD missions, which is an international network of characterizing pancreata from cadaveric organ donors with T1D.

Holger Russ, PhD, Assistant Professor of Pediatrics
Dr. Holger Russ joined the faculty of the Barbara Davis Center in 2016 and is also a member of the Gates Center for Regenerative Medicine. His research focuses on elucidating the underlying mechanisms that lead to the development of diabetes in humans. He was among the first three groups demonstrating the generation of functional beta cells from human pluripotent stem cells under cell culture conditions and the first to demonstrate the successful generation of human embryonic stem cell-derived thymic epithelial cells (TECs) by directed differentiation. Moving forward, Dr. Russ’ lab is determined to combine in vitro derived thymic epithelium with human T-cell progenitors either in vitro or in vivo to study diverse aspects of autoimmunity in a strictly human context.

Tomasz Sosinowski, PhD, Instructor of Pediatrics
Dr. Sosinowski’s research focuses on understanding the role T cells play in the development and progression of type 1 diabetes (T1D). Dr. Sosinowski studies immune responses to proinsulin, and in particular on the regions of the beta chain (residues 9-23) and C-peptide (residues 41-62) previously shown by others to be presented by HLA-DQ2, DQ8, and the DQ8/DQ2 trans-dimer. Currently he has two projects: 1) Development of a humanized Mouse Model for preclinical testing of agents that target components of human tri-molecular complexes (e.g. small molecules and antibodies); and 2) Creation of an improved Biomarker Assay based on standardized artificial Antigen Presenting Cells (aAPCs) that selectively and specifically enumerates T cells recognizing proinsulin-MHC complexes. Such improved biomarker assays are urgently needed for more accurate monitoring of therapeutic efficacy during clinical interventions.

Liping Yu, MD, Research Assistant Professor of Pediatrics
Dr. Yu joined the BDC faculty in 2011. He directs a clinical immunology laboratory which is NIH/NIDDK designated North America Autoantibody/HLA Core laboratory. Dr. Yu developed several autoantibody assays that demonstrate high sensitivity and disease specificity with applications in national/international type 1 diabetes clinical trials and screening projects. Dr. Yu also has studied celiac disease through transglutaminase autoantibody testing and Addison’s disease using 21-hydroxylase autoantibodies.

Danny Zipris, PhD, Associate Professor of Pediatrics
Dr. Zipris joined the BDC faculty in 2007. His laboratory investigates how microbial infections and the innate immune system promote the development of type 1 diabetes (T1D). Studies conducted in the BBDR and LEW1.WR1 rat models of Kilham Rat Virus (KRV)-induced diabetes have led to the hypothesis that the upregulation of proinflammatory pathways shortly after virus infection plays a crucial role in the course of islet destruction. A number of innate immune modulators have been identified, e.g., steroids, antibiotics, and blockers of IL-1 and histone deacetylases that can protect animals from beta cell destruction and are currently investigating mechanisms involved in disease amelioration. Dr. Zipris pursues also the interactions between the gut microbiota and the innate immune system in islet autoimmunity. These studies are likely to advance the knowledge about early disease mechanisms and may lead to prevention of human diabetes.
FINANCES

Fiscal year 2015 Budget:

Revenue Sources

<table>
<thead>
<tr>
<th>Research Grants (excluding philanthropic support)</th>
<th>14,013,580</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal Agencies, primarily NIH</td>
<td>7,379,844</td>
</tr>
<tr>
<td>Industry</td>
<td>3,194,032</td>
</tr>
<tr>
<td>JDRF</td>
<td>1,310,872</td>
</tr>
<tr>
<td>Helmsley Charitable Trust</td>
<td>1,037,611</td>
</tr>
<tr>
<td>ADA</td>
<td>269,991</td>
</tr>
<tr>
<td>Other</td>
<td>518,046</td>
</tr>
<tr>
<td>Indirect Cost Recovery</td>
<td>303,184</td>
</tr>
</tbody>
</table>

| Laboratory Service Income                        | 424,685    |
| Clinical Income (net of assessments)             | 5,311,240  |
| CME Income                                       | 80,000     |
| Philanthropy                                     | 1,912,270  |
| Children’s Diabetes Foundation                   | 1,402,000  |
| Guild of the CDF                                 | 60,000     |
| Research Trust                                   | 275,000    |
| Other Philanthropy                               | 175,270    |

| Children’s Hospital Colorado                     | 49,584     |
| School of Medicine Dean                          | 32,345     |
|                                                   | **21,823,704** |

Revenue Sources: FY 2015

- Research Grants: 64.2%
- Laboratory Service Income: 8.8%
- Clinical Income: 24.3%
- CME Income: 1.9%
- Philanthropy: 0.2%
- Children’s Hospital Colorado: 0.1%
- School of Medicine Dean: 0.4%
## FINANCES

Fiscal year 2016 Budget:

### Revenue Sources

**Research Grants** (excluding philanthropic support) &emsp; 13,251,145

- Federal Agencies, primarily NIH &emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp; 6,937,533
- Industry &emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp; 2,646,070
- JDRF &emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp; 1,036,434
- Helmsley Charitable Trust &emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp; 1,456,717
- ADA &emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp; 331,093
- Other &emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp; 477,385
- Indirect Cost Recovery &emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp; 365,913

**Laboratory Service Income** 588,933

**Clinical Income** (net of assessments) 5,653,991

**CME Income** &emsp; 240,000

**Philanthropy** 2,593,983

- Children’s Diabetes Foundation &emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp; 1,600,000
- Guild of the CDF &emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp; 60,000
- Research Trust &emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp; 309,369
- CU Foundation Endowments &emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp; 159,470
- Other Philanthropy &emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp; 465,144

**Children’s Hospital Colorado** 50,000

**School of Medicine Dean** &emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp; 600,488

**University of Colorado Hospital** &emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp; 198,360

**Total** &emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp;&emsp; 23,176,900
RESEARCH PROGRAMS
The Barbara Davis Center has served as a model for combining basic and clinical investigation. The Center has been a consistent incubator for novel ideas and discoveries in the immunology, genetics, and cell biology of diabetes that have developed into diagnostic assays now standard in diabetes research. BDC research goals include investigation of the causes of type 1 diabetes, the early detection of autoimmunity, prevention and early intervention. In addition we are developing new treatments, including a focus on the artificial pancreas, and prevention strategies for complications of both type 1 and type 2 diabetes, and the outcomes of care of type 1 diabetes. In these efforts we have strong collaborators at Children’s Hospital of Colorado, Departments of the SOM, Colorado School of Public Health and across the world through multicenter studies and trials including NIH funded clinical studies: TEDDY, DAISY, CACTI, CEDAR/ROSE, TrialNet, ITN, and the Artificial Pancreas Project. Additional ADA, JDRF, T1D Exchange funded through the Helmsley Foundation, and industry-sponsored studies offer opportunities for discovery and mentored research. BDC Principal Investigators have been awarded over $11 million/year (direct costs) since 2007.

New Grant Funding: FY2015 & FY2016

New Research Awards (Direct costs)

<table>
<thead>
<tr>
<th>Sponsor</th>
<th>FY2015</th>
<th>FY2016</th>
<th>Total (Direct Costs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>3,194,032</td>
<td>2,646,070</td>
<td>5,840,102</td>
</tr>
<tr>
<td>Federal</td>
<td>7,379,844</td>
<td>6,937,533</td>
<td>14,317,377</td>
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<td>JDRF</td>
<td>1,310,872</td>
<td>1,036,434</td>
<td>2,347,306</td>
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<td>ADA</td>
<td>269,991</td>
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<td>Helmsley Charitable Trust</td>
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<td>1,456,717</td>
<td>2,494,328</td>
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<tr>
<td>Other</td>
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<td>477,385</td>
<td>995,431</td>
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<tr>
<td>Indirect Cost Recovery</td>
<td>303,184</td>
<td>365,913</td>
<td>669,097</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14,013,580</strong></td>
<td><strong>13,251,145</strong></td>
<td><strong>27,264,725</strong></td>
</tr>
</tbody>
</table>
### Table 2. Grants and contracts in this list are funded to Principal Investigators with a primary appointment in the Barbara Davis Center. Funding amounts are direct costs.

<table>
<thead>
<tr>
<th>Project Name</th>
<th>PI Name</th>
<th>Direct Cost</th>
<th>Sponsor Name</th>
<th>FY</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDC Clinic Integration Fund</td>
<td>Alonso, Todd</td>
<td>15,500</td>
<td>Other</td>
<td>2016</td>
</tr>
<tr>
<td>Emergent multi-cellular properties regulating pancreatic islet function</td>
<td>Benninger, Richard</td>
<td>225,000</td>
<td>NIDDK/NIH/DHHS</td>
<td>2015</td>
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<tr>
<td>Interactions Between Islet Function and Beta Cell Autoimmunity During the Pathogenesis of Type 1 Diabetes</td>
<td>Benninger, Richard</td>
<td>136,364</td>
<td>Juvenile Diabetes Foundation</td>
<td>2015</td>
</tr>
<tr>
<td>Mapping the Histopathological Landscape of Type 1 Diabetes: A Pilot Study</td>
<td>Benninger, Richard</td>
<td>18,193</td>
<td>Mount Sinai School of Medicine</td>
<td>2015</td>
</tr>
<tr>
<td>Multicellular interactions and dynamics of pancreatic islet function in diabetes</td>
<td>Benninger, Richard</td>
<td>225,000</td>
<td>NIDDK/NIH/DHHS</td>
<td>2015</td>
</tr>
<tr>
<td>Non-invasive imaging of islet vascular dysfunction associated with the progression of type 1 diabetes</td>
<td>Benninger, Richard</td>
<td>72,495</td>
<td>Benaroya Research Inst at Virginia Mason</td>
<td>2015</td>
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<tr>
<td>Regulation of Islet Gap Junction Coupling and Function Under Inflammatory Conditions; Fellow: Farnsworth, Nikki L.</td>
<td>Benninger, Richard</td>
<td>53,282</td>
<td>NIDDK/NIH/DHHS</td>
<td>2015</td>
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<td>Multicellular Interactions and Dynamics of Pancreatic Islet Function in Diabetes</td>
<td>Benninger, Richard</td>
<td>225,000</td>
<td>NIH</td>
<td>2016</td>
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<td>Emergent Multi-Cellular Properties Regulating Pancreatic Islet Function</td>
<td>Benninger, Richard</td>
<td>225,000</td>
<td>NIH</td>
<td>2016</td>
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<tr>
<td>Reduction of Nocturnal Hypoglycemia and Daytime Glycemia</td>
<td>Chase, Howard P</td>
<td>165,787</td>
<td>Jaeb Center for Health Research</td>
<td>2015</td>
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<tr>
<td>In Home Closed Loop Reduction of Nocturnal Hypoglycemia and Daytime Hyperglycemia</td>
<td>Chase, Howard P</td>
<td>21,290</td>
<td>Jaeb Center for Health Research</td>
<td>2015</td>
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<tr>
<td>In Home Closed Loop Reduction of Nocturnal Hypoglycemia and Daytime Hyperglycemia</td>
<td>Chase, Howard P</td>
<td>96,315</td>
<td>Jaeb Center for Health Research</td>
<td>2016</td>
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<tr>
<td>Enhancement of Biomarkers for Type 1 Diabetes</td>
<td>Davidson, Howard</td>
<td>5,609</td>
<td>Baylor College of Medicine</td>
<td>2015</td>
</tr>
<tr>
<td>BRIT-CELL/TYPE 1 DBTES (Project # 2561055)</td>
<td>Davidson, Howard</td>
<td>22,727</td>
<td>Benaroya Research Inst at Virginia Mason</td>
<td>2015</td>
</tr>
<tr>
<td>Using Insulin B: 9-23 Register 3 Specific Chimeric Antigen Receptor (CAR)-Redirected T Cells to Modulate T1D (Co-PI: Li Zhang)</td>
<td>Davidson, Howard</td>
<td>50,000</td>
<td>Juvenile Diabetes Foundation</td>
<td>2015</td>
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<tr>
<td>BioBanking of Samples for Cross-Comparison of T1D Biomarkers (Split with Peter Gottlieb)</td>
<td>Davidson, Howard</td>
<td>16,343</td>
<td>Juvenile Diabetes Foundation</td>
<td>2015</td>
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<tr>
<td>Pipkot award support study using multi-dimensional flow cytometry to monitor ZnT8 specific T-cells</td>
<td>Davidson, Howard</td>
<td>30,000</td>
<td>CHCRI</td>
<td>2015</td>
</tr>
<tr>
<td>Biobanking of samples for cross-comparison of T1D biomarkers</td>
<td>Davidson, Howard</td>
<td>27,731</td>
<td>Juvenile Diabetes Foundation</td>
<td>2016</td>
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<tr>
<td>T cell recognition of modified epitopes as a mechanistic contributor and biomarker of progression in T1D</td>
<td>Davidson, Howard</td>
<td>22,728</td>
<td>Benaroya Research Inst at Virginia Mason</td>
<td>2016</td>
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<tr>
<td>Using insulin B: 9-23 register 3 specific chimeric antigen receptor [CAR]-redirected T cells to modulate T1D</td>
<td>Davidson, Howard</td>
<td>15,079</td>
<td>Baylor College of Medicine</td>
<td>2016</td>
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<td>Evaluate the Efficacy and Safety of Dapaglifozin in T1D</td>
<td>Garg, Satish</td>
<td>94,804</td>
<td>Bristol Meyers Company</td>
<td>2015</td>
</tr>
<tr>
<td>Dario BGMS at High Altitude</td>
<td>Garg, Satish</td>
<td>48,341</td>
<td>LabStyle Innovation, Ltd.</td>
<td>2015</td>
</tr>
<tr>
<td>A Phase 3, Randomized, Double-blind, Placebo-controlled, Parallel-Group, Multicenter Study to Evaluate the Efficacy, Safety, and Tolerability of LX4211 in adult Patients with Type 1 Diabetes</td>
<td>Garg, Satish</td>
<td>427,409</td>
<td>Lexicon Pharmaceutical, Inc.</td>
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<td>Project Name</td>
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<td>Mellitus Who Have Inadequate Glycemic Control with Insulin Therapy</td>
<td>Garg, Satish</td>
<td>251,840</td>
<td>Merck, Sharp and Dohme Corp</td>
<td>2015</td>
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<td>Safety and efficacy of MK-1293 compared to Lantus</td>
<td>Garg, Satish</td>
<td>138,945</td>
<td>Medtronic Minimed, Inc.</td>
<td>2015</td>
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<td>MMI OVERNGT CLOSE LOOP.CT (Project #2560962)</td>
<td>Garg, Satish</td>
<td>184,321</td>
<td>Medtronic Minimed, Inc.</td>
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<td>CEP294- Safety Evaluation of the Hybrid Closed Loop (HCL) System in Type</td>
<td>Garg, Satish</td>
<td>192,632</td>
<td>Medtronic Minimed, Inc.</td>
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<td>1 Diabetes Study</td>
<td>Garg, Satish</td>
<td>138,945</td>
<td>Medtronic Minimed, Inc.</td>
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<td>Cep273 In-Clinic Closed Loop</td>
<td>Garg, Satish</td>
<td>90,495</td>
<td>Medtronic Minimed, Inc.</td>
<td>2015</td>
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<td>Post Approval Stdy of the TS (Treshold Suspend)</td>
<td>Garg, Satish</td>
<td>184,321</td>
<td>Medtronic Minimed, Inc.</td>
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<td>CEP273 In-Clinic Closed Loop</td>
<td>Garg, Satish</td>
<td>192,632</td>
<td>Medtronic Minimed, Inc.</td>
<td>2015</td>
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<td>Sanofi EFC12619</td>
<td>Garg, Satish</td>
<td>258,710</td>
<td>Sanofi US Services, Inc.</td>
<td>2015</td>
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<td>MK-1293-003-0030: &quot;A Phase III Clinical Trial to Study the Safety and</td>
<td>Garg, Satish</td>
<td>397</td>
<td>Merck Sharp &amp; Dohme Corp</td>
<td>2016</td>
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<td>1 mellitus</td>
<td>Garg, Satish</td>
<td>75,911</td>
<td>LabStyle Innovation Ltd</td>
<td>2016</td>
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<td>A Randomized, 2X4 Week, Active-Controlled, Open-Label, 2-Treatment Arm,</td>
<td>Garg, Satish</td>
<td>85,491</td>
<td>Lexicon Pharmaceutical, Inc.</td>
<td>2016</td>
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<td>Used in Continuous Subcutaneous Insulin Infusion (CSII) in Adult Patients</td>
<td>Garg, Satish</td>
<td>31,500</td>
<td>Medtronic Minimed, Inc.</td>
<td>2016</td>
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<td>with Type 1 Diabetes Mellitus (T1DM)*</td>
<td>Garg, Satish</td>
<td>6,100</td>
<td>Medtronic Minimed, Inc.</td>
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<td>USER PERFORMANCE EVALUATION FOR DARIO™ BLOOD GLUCOSE MONITORING SYSTEM</td>
<td>Garg, Satish</td>
<td>592</td>
<td>Sanofi US Services, Inc.</td>
<td>2016</td>
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<td>(BGMS)</td>
<td>Garg, Satish</td>
<td>254,878</td>
<td>Leona M. and Harry B. Helmsley Charitable Trust</td>
<td>2015</td>
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<td>A Phase 3, Randomized, Double-blind, Placebo-controlled, Parallel-group,</td>
<td>Garg, Satish</td>
<td>348,246</td>
<td>Leona M. and Harry B. Helmsley Charitable Trust</td>
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<td>Multicenter Study to Evaluate the Net Clinical Benefit of Sotagliflozin as</td>
<td>Garg, Satish</td>
<td>11,856</td>
<td>Benaroya Research Institute @ Virginia Mason</td>
<td>2015</td>
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<td>Adjunct to Insulin Therapy in Type 1 Diabetes</td>
<td>Garg, Satish</td>
<td>16,343</td>
<td>Juvenile Diabetes Foundation</td>
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<tr>
<td>A Phase 3, Randomized, Double-blind, Placebo-controlled, Parallel-group,</td>
<td>Garg, Satish</td>
<td>2,910</td>
<td>Leona M. and Harry B. Helmsley Charitable Trust</td>
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<td>Multicenter Study to Evaluate the Net Clinical Benefit of Sotagliflozin as</td>
<td>Garg, Satish</td>
<td>195,141</td>
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<td>Adjunct to Insulin Therapy in Type 1 Diabetes</td>
<td>Garg, Satish</td>
<td>254,878</td>
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<td>SAFETY EVALUATION OF THE HYBRID CLOSED LOOP (HCL) SYSTEM IN TYPE 1</td>
<td>Garg, Satish</td>
<td>348,246</td>
<td>Leona M. And Harry B. Helmsley Charitable Trust</td>
<td>2015</td>
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<td>DIABETES STUDY-first Amendment</td>
<td>Garg, Satish</td>
<td>11,856</td>
<td>Benaroya Research Institute @ Virginia Mason</td>
<td>2015</td>
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<td>Post Approval Study of the TS (Threshold Suspend) Feature with a Sensor</td>
<td>Garg, Satish</td>
<td>16,343</td>
<td>Juvenile Diabetes Foundation</td>
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<td>Augmented Pump System</td>
<td>Garg, Satish</td>
<td>2,910</td>
<td>Leona M. and Harry B. Helmsley Charitable Trust</td>
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<td>EFC12619 Six month, randomized, open-label, parallel-group Comparison of</td>
<td>Garg, Satish</td>
<td>195,141</td>
<td>NIDDK/NIH/DHHS</td>
<td>2015</td>
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<td>SAR342434 to Insulin Lispro in T1d</td>
<td>Garg, Satish</td>
<td>254,878</td>
<td>NIDDK/NIH/DHHS</td>
<td>2015</td>
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<td>Novel Education and Diabetes Pilot Prog for Latinos at the BDC</td>
<td>Gerard-Gonzalez,</td>
<td>254,878</td>
<td>Leona M. and Harry B. Helmsley Charitable Trust</td>
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<td>NOVEL EDUCATION AND DIABETES PILOT PROGRAM FOR LATINOS AT THE BARBARA</td>
<td>Gerard-Gonzalez,</td>
<td>348,246</td>
<td>Leona M. And Harry B. Helmsley Charitable Trust</td>
<td>2015</td>
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<td>DAVIS CENTER FOR CHILDHOOD DIABETES.</td>
<td>Andrea</td>
<td>11,856</td>
<td>Benaroya Research Institute @ Virginia Mason</td>
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<td>Inducing Remission in New Onset T1DM with Alefacept</td>
<td>Gottlieb, Peter</td>
<td>16,343</td>
<td>Juvenile Diabetes Foundation</td>
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<td>BioBanking of Samples for Cross-Comparison of T1D Markers (Split w/</td>
<td>Gottlieb, Peter</td>
<td>2,910</td>
<td>Leona M. and Harry B. Helmsley Charitable Trust</td>
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<td>Howard Davidson)</td>
<td>Gottlieb, Peter</td>
<td>195,141</td>
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<td>Reversing Type 1 Diabetes After it is Established - Follow Up</td>
<td>Gottlieb, Peter</td>
<td>254,878</td>
<td>Leona M. and Harry B. Helmsley Charitable Trust</td>
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<td>Trialnet: Diabetes Type 1 Prevention (Split w/ Andrea Steck)</td>
<td>Gottlieb, Peter</td>
<td>348,246</td>
<td>Leona M. And Harry B. Helmsley Charitable Trust</td>
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<td>Gottlieb, Peter</td>
<td>188,898</td>
<td>NIDDK/NIH/DHHS</td>
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<td>GLEEVEC</td>
<td>Gottlieb, Peter</td>
<td>66,366</td>
<td>University of South Florida</td>
<td>2015</td>
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<td>Bydureon in Patients with Established T1D (M14R11877)</td>
<td>Gottlieb, Peter</td>
<td>76,400</td>
<td>Yale University</td>
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<td>ABATE Follow up</td>
<td>Gottlieb, Peter</td>
<td>18,195</td>
<td>Yale University</td>
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<td>Phase II Trial of Bydureon in Patients with Established Type 1 Diabetes</td>
<td>Gottlieb, Peter</td>
<td>54,545</td>
<td>Yale University</td>
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<td>USF Patient Capitation account</td>
<td>Gottlieb, Peter</td>
<td>63,713</td>
<td>University of South Florida</td>
<td>2016</td>
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<td>NIDDK Type 1 Diabetes TrialNet Data Coordinating Center, Grant No: 1UC4DK097835-01</td>
<td>Gottlieb, Peter</td>
<td>3,910</td>
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<td>TrialNet: Diabetes Type 1 Prevention (Split w/ Steck)</td>
<td>Gottlieb, Peter</td>
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<td>NIDDK/NIH/DHHS</td>
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<td>Reversing Type 1 Diabetes After it is Established</td>
<td>Gottlieb, Peter</td>
<td>5,250</td>
<td>University of Florida/FL</td>
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<td>Reversing Type 1 Diabetes After it is Established</td>
<td>Gottlieb, Peter</td>
<td>36,364</td>
<td>University of Florida/FL</td>
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<td>Immunotherapeutic Intervention in the Treatment of Type 1 Diabetes Mellitus</td>
<td>Gottlieb, Peter</td>
<td>284,591</td>
<td>Nova Pharmaceutical Corporation</td>
<td>2016</td>
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<td>Abate Follow Up study</td>
<td>Gottlieb, Peter</td>
<td>3,211</td>
<td>Yale University</td>
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<td>Gleevec-Imatinib Mesylate</td>
<td>Gottlieb, Peter</td>
<td>27,626</td>
<td>University of South Florida</td>
<td>2016</td>
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<td>K12 Career Development</td>
<td>Klingensmith, Georgeanna</td>
<td>498,680</td>
<td>NIDDK/NIH/DHHS</td>
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<td>Summer 2015 NIDDK Medical Research Student Program at BDC</td>
<td>Klingensmith, Georgeanna</td>
<td>14,416</td>
<td>Georgia Regents Research Institute, Inc.</td>
<td>2015</td>
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<td>T1D Exchange Clinic Registry Celiac Disease Addtl Data Collection</td>
<td>Klingensmith, Georgeanna</td>
<td>15,000</td>
<td>Jaeb Center for Health Research</td>
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<td>Pediatric Diabetes Consortium (PDC) - PDC Vice Chair</td>
<td>Klingensmith, Georgeanna</td>
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<td>T32 NIH Diabetes Training Program (63007994)</td>
<td>Klingensmith, Georgeanna</td>
<td>211,810</td>
<td>NIDDK/NIH/DHHS</td>
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<td>T1D Exchange Clinic Registry (63001229)</td>
<td>Klingensmith, Georgeanna</td>
<td>90,715</td>
<td>Jaeb Center for Health Research</td>
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<td>Training Program in Diabetes Research</td>
<td>Klingensmith, Georgeanna</td>
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<td>K12 Career Development</td>
<td>Klingensmith, Georgeanna</td>
<td>341,297</td>
<td>NIDDK/NIH/DHHS</td>
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<td>JDC CT OF GFR LOSS (Project # 2561000)</td>
<td>Maahs, David</td>
<td>60,000</td>
<td>Joslin Diabetes Center</td>
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<td>JOSLIN PERL.CT.FC (Project # 2560967)</td>
<td>Maahs, David</td>
<td>288,412</td>
<td>Joslin Diabetes Center</td>
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<td>A Probabilistic Closed-Loop Artificial Pancreas to Handle Unannounced Meals</td>
<td>Maahs, David</td>
<td>43,375</td>
<td>Rensselaer Polytechnic Institute</td>
<td>2015</td>
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<td>Outpatient Closed-Loop Studies-ePIDs Controller</td>
<td>Maahs, David</td>
<td>206,589</td>
<td>Stanford University</td>
<td>2015</td>
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<td>UCB COLL: CNTRL ALGOR.FC (Project # 2561042)</td>
<td>Maahs, David</td>
<td>106,711</td>
<td>University of Colorado at Boulder/CU</td>
<td>2015</td>
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<td>Measures of Hypoglycemia and Glycemic Variability Using Continuous Glucose Monitoring in the FL3X Intervention for Youth with Type 1 Diabetes</td>
<td>Maahs, David</td>
<td>72,900</td>
<td>UNC at Chapel Hill</td>
<td>2015</td>
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<td>Genetics of the Decline in Glomerular Filtration Rate in Type 1 Diabetes</td>
<td>Maahs, David</td>
<td>52,693</td>
<td>Hospital for Sick Children</td>
<td>2015</td>
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<td>Predicting Infusion set and CGM Failure in Artificial Pancreas Systems</td>
<td>Maahs, David</td>
<td>51,743</td>
<td>Stanford University</td>
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<td>Predicting Infusion Set and CGM Failure in Artificial Pancreas Systems</td>
<td>Maahs, David</td>
<td>117,479</td>
<td>Stanford University</td>
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<td>A Probabilistic Close-Loop Artificial Pancreas to Handle Unannounced Meals</td>
<td>Maahs, David</td>
<td>51,790</td>
<td>Rensselar Polytechnic Institute</td>
<td>2016</td>
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<td>A probabilistic closed-loop artificial pancreas to handle unannounced meals</td>
<td>Maahs, David</td>
<td>36,103</td>
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<td>2016</td>
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<td>Predicting Infusion Set and CGM Failure in Artificial Pancreas Systems</td>
<td>Maahs, David</td>
<td>84,673</td>
<td>Roche Diagnostics Corporation</td>
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<td>Using a Closed-Loop System Plus Behavioral Supports in Preschoolers with Diabetes</td>
<td>Maahs, David</td>
<td>67,357</td>
<td>Stanford University</td>
<td>2016</td>
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<td>Day-and-night closed loop young people with type 1 diabetes - An open-label, multi-centre, randomised, single-period, parallel study to assess the efficacy, safety and utility of 12 month day-and-night automated closed-loop insulin delivery under free living conditions compared to conventional insulin pump therapy in children and adolescents with type 1 diabetes</td>
<td>Maahs, David</td>
<td>61,340</td>
<td>Cambridge University</td>
<td>2016</td>
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<td>Final Clinical Studies for Submission of a Pre-Market Approval Application to the FDA for a Bionic Pancreas that Automates Type 1 Diabetes Management</td>
<td>Maahs, David</td>
<td>110,000</td>
<td>Boston University</td>
<td>2016</td>
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<td>T1D Exchanges -Co-Chair Development and Publications</td>
<td>Maahs, David</td>
<td>37,763</td>
<td>Jaeh Center for Health Research</td>
<td>2016</td>
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<td>Clinical Acceptance of the Artificial Pancreas: The International Diabetes Closed Loop (IDCL)</td>
<td>Maahs, David</td>
<td>130,703</td>
<td>University of Virginia/VIRG</td>
<td>2016</td>
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<td>Using a Closed-Loop System Plus Behavioral Supports In Preschoolers with Diabetes</td>
<td>Maahs, David</td>
<td>155,455</td>
<td>Stanford University</td>
<td>2016</td>
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<td>T32 - Training Program in Diabetes Research</td>
<td>Maahs, David</td>
<td>146,314</td>
<td>NIDDK/NIH/DHHS</td>
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<td>T1D Exchanges -Co-Chair Development and Publications</td>
<td>Maahs, David</td>
<td>37,763</td>
<td>Jaeh Center for Health Research</td>
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<td>Effect of methyldopa o MHC antigen presentation in type diabetes</td>
<td>Michels, Aaron</td>
<td>136,364</td>
<td>Juvenile Diabetes Foundation</td>
<td>2015</td>
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<td>Small Molecules Targeting Allele Specific MHC II Autoantigen Presentation</td>
<td>Michels, Aaron</td>
<td>141,100</td>
<td>NIDDK/NIH/DHHS</td>
<td>2015</td>
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<td>nPOD Coordinating Center</td>
<td>Michels, Aaron</td>
<td>36,364</td>
<td>University of Florida/FL</td>
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<td>Methyldopa for the treatment of autoimmune diabetes</td>
<td>Michels, Aaron</td>
<td>100,000</td>
<td>ImmunoMolecular Therapeutics</td>
<td>2016</td>
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<td>Small Molecules Targeting Allele Specific MHC Class II Presentation</td>
<td>Michels, Aaron</td>
<td>141,100</td>
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<td>NPPOD COORDINATING CENTER</td>
<td>Michels, Aaron</td>
<td>36,364</td>
<td>University of Florida/FL</td>
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<td>Identify Antigens targeted by t-cells in the pancreatic islets</td>
<td>Nakayama, Maki</td>
<td>50,000</td>
<td>Peter J. Culshaw Family Jr. Investigator Award</td>
<td>2015</td>
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<td>Molecular Dissection of Insulin Targeting in Anti-Islet-Autoimmunity</td>
<td>Nakayama, Maki</td>
<td>217,500</td>
<td>NIDDK/NIH/DHHS</td>
<td>2015</td>
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<td>CHC G0100529 Pilot</td>
<td>Nakayama, Maki</td>
<td>30,000</td>
<td>Childrens’ Hospital Colorado Research Institute</td>
<td>2015</td>
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<td>Identification of T cell Autoantigens Critical for the Development of Human Type 1 Diabetes</td>
<td>Nakayama, Maki</td>
<td>60,000</td>
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<td>2016</td>
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<td>Identify Antigens targeted by t-cells in the pancreatic islets</td>
<td>Nakayama, Maki</td>
<td>50,000</td>
<td>Peter J. Culshaw Family Jr. Investigator Award</td>
<td>2016</td>
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<td>HIRN-CMAI Pilot - Characterization and in silico reconstruction of TCRs for modeling auto reactive T cells in T1D</td>
<td>Nakayama, Maki</td>
<td>7,369</td>
<td>City of Hope - Beckman Research Institute</td>
<td>2016</td>
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<td>Molecular dissection of insulin targeting in anti-islet autoimmunity</td>
<td>Nakayama, Maki</td>
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<td>Investigator-Initiated Pilot Perspective CGM Quality (QI) Improvement Project IIS-2015-016</td>
<td>Polsky, Sarit</td>
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<td>Dexcom, San Diego, CA</td>
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<td>Innovative Clin Care Approach for Young Adults with T1D</td>
<td>Raymond, Jennifer</td>
<td>254,385</td>
<td>Leona M. and Harry B. Helmsley Charitable Trust</td>
<td>2015</td>
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<td>Team Clinic: An Innovative approach to Care of Adolescents with Type 1 Diabetes</td>
<td>Raymond, Jennifer</td>
<td>419,723</td>
<td>Leona M. and Harry B. Helmsley Charitable Trust</td>
<td>2015</td>
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<td>Longitudinal Test of Adherence &amp; Control in Kids New to T1 Diabetes &amp; 5-9 Years Old</td>
<td>Raymond, Jennifer</td>
<td>37,669</td>
<td>University of Kansas Medical Center Research Institute</td>
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<td>Longitudinal test of Adherence &amp; control in kids new to T1 Diabetes &amp; 5-9 years old</td>
<td>Raymond, Jennifer</td>
<td>32,248</td>
<td>Leona M. And Harry B. Helmsley Charitable Trust</td>
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<td>Innovative Clinical Care Approach for Young Adults with Type 1 Diabetes: The DTC (Diabetes Telehealth Care Beyond)</td>
<td>Raymond, Jennifer</td>
<td>391,295</td>
<td>Leona M. And Harry B. Helmsley Charitable Trust</td>
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<td>PNNL PRTN MRKS TYP.1 DIABETES (Project # 2560977)</td>
<td>Rewers, Marian</td>
<td>10,742</td>
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<td>Development and Validation of Predictive Models of T1D Risk</td>
<td>Rewers, Marian</td>
<td>152,273</td>
<td>Juvenile Diabetes Foundation</td>
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<td>Models Predicting Accelerated Cardiorenal Complications of Type 1 Diabetes</td>
<td>Rewers, Marian</td>
<td>419,835</td>
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<td>THE ENVIRONMENTAL DETERMINANTS OF DIABETES IN THE YOUNG</td>
<td>Rewers, Marian</td>
<td>628,567</td>
<td>NIDDK/NIH/DHHS</td>
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<td>Natural History of Pre-Diabetic Autoimmunity (DAISY)</td>
<td>Rewers, Marian</td>
<td>421,435</td>
<td>NIDDK/NIH/DHHS</td>
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<td>Protein Markers to Type 1 Diabetes Progression</td>
<td>Rewers, Marian</td>
<td>11,590</td>
<td>University of North Carolina/NC</td>
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<td>Subaward Agrmnt for TEDDY STUDY</td>
<td>Rewers, Marian</td>
<td>1,077,840</td>
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<td>Proteomics Laboratory for TEDDY Study</td>
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<td>Subaward Agreement for TEDDY STUDY - Mod</td>
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<td>Development and Validation of Predictive Models of T1D Risk</td>
<td>Rewers, Marian</td>
<td>153,182</td>
<td>Juvenile Diabetes Foundation</td>
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<td>USF TEDDY Study.FP/FC (PBMC)</td>
<td>Rewers, Marian</td>
<td>641,029</td>
<td>University of South Florida</td>
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<td>Proteomics Laboratory for TEDDY Study</td>
<td>Rewers, Marian</td>
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<td>Battelle Memorial Institute, Pacific Northwest Lab</td>
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<td>Novel pathways to slow progression from islet autoimmunity to diabetes</td>
<td>Rewers, Marian</td>
<td>152,000</td>
<td>Leona M. And Harry B. Helmsley Charitable Trust</td>
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<td>Multiple Autoantigens, Multiple Epitopes of Type 1 Diabetes</td>
<td>Rewers, Marian</td>
<td>250,000</td>
<td>NIDDK/NIH/DHHS</td>
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<td>Natural History of Pre-diabetic Autoimmunity (DAISY)</td>
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<td>NIDDK/NIH/DHHS</td>
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<td>THE ENVIRONMENTAL DETERMINANTS OF DIABETES IN THE YOUNG</td>
<td>Rewers, Marian</td>
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<td>Replace Study: Comparing CGM with and without Routine Blood Glucose Monitoring</td>
<td>Shah, Viralkumar</td>
<td>104,460</td>
<td>Jaeb Center for Health Research</td>
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<td>&quot;Mini-Dose Glucagon for Adults with Type 1 Diabetes: A Study to Assess the Efficacy and Safety of Mini-Dose Glucagon for Treatment of Non-Severe Hypoglycemia in Adults with Type 1 Diabetes&quot; (&quot;Study&quot;)</td>
<td>Shah, Viralkumar</td>
<td>18,225</td>
<td>Jaeb Center for Health Research</td>
<td>2016</td>
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<td>MMI CEP287 TS.CT (Project # 2560999)</td>
<td>Slover, Robert</td>
<td>42,408</td>
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<td>MMI TS PUMP SYSTM.CT (Project # 2560982)</td>
<td>Slover, Robert</td>
<td>91,263</td>
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<td>CEP292: A Performance Evaluation of the Enlite 3 Sensor to Support a Full 240 hours of Use Study</td>
<td>Slover, Robert</td>
<td>189,612</td>
<td>Medtronic Minimed, Inc.</td>
<td>2015</td>
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<td>Safety Evaluation of the Hybrid Closed Loop (HCL System in Type 1 Diabetes Study)</td>
<td>Slover, Robert</td>
<td>177,749</td>
<td>Medtronic Minimed, Inc.</td>
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<td>CEP249: A PERFORMANCE EVALUATION OF THE ENLITE™ AND ENLITE 3 GLUCOSE SENSOR TO SUPPORT USE IN CHILDREN STUDY</td>
<td>Slover, Robert</td>
<td>1,250</td>
<td>Medtronic Minimed, Inc.</td>
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<td>CEP292: A PERFORMANCE EVALUATION OF THE ENLITE® 3 SENSOR TO SUPPORT A FULL 168 HOURS (7 DAYS) OF USE STUDY</td>
<td>Slover, Robert</td>
<td>2,500</td>
<td>Medtronic Minimed, Inc.</td>
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<td>CEP273: IN-CLINIC FEASIBILITY STUDY TO OBSERVE THE OVERNIGHT CLOSED LOOP SYSTEM</td>
<td>Slover, Robert</td>
<td>120,165</td>
<td>Medtronic Minimed, Inc.</td>
<td>2015</td>
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<td>RD002489: ACCU-CHEK® CONNECT AT SCHOOL (CATS) PEDIATRIC STUDY</td>
<td>Slower, Robert</td>
<td>58,333</td>
<td>Theorem Clinical Research</td>
<td>2016</td>
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<td><strong>CEP287</strong>: MULTI-CENTER, PROSPECTIVE, OBSERVATIONAL STUDY OF THE TX (THRESHOLD SUSPEND) FEATURE WITH A SENSOR-AUGMENTED PUMP SYSTEM IN PEDIATRIC PATIENTS WITH TYPE 1 DIABETES</td>
<td>Slover, Robert</td>
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<td>Medtronic Minimed, Inc.</td>
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<td><strong>CEP294</strong>: Safety Evaluation of The Hybrid Closed Loop (HCL System In Type 1 Diabetes Study</td>
<td>Slover, Robert</td>
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<td><strong>Mechanisms for the loss of premenopausal cardiovascular disease protection in women with type 1 diabetes</strong></td>
<td>Snell-Bergeon, Janet</td>
<td>134,991</td>
<td>American Diabetes Association</td>
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<td><strong>Complications and Comorbidities of Type 1 Diabetes</strong></td>
<td>Snell-Bergeon, Janet</td>
<td>487,647</td>
<td>National Heart, Lung, and Blood Institute/NIH/DHHS</td>
<td>2015</td>
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<td><strong>Advancing Novel Science in Women's Health Research (ANSWER) (R21)</strong></td>
<td>Snell-Bergeon, Janet</td>
<td>30,135</td>
<td>University of South Florida</td>
<td>2015</td>
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<td><strong>Biomarker Validation and Discovery in Diabetic Nephropathy</strong></td>
<td>Snell-Burgeon, Janet</td>
<td>45,455</td>
<td>University of California at San Diego</td>
<td>2016</td>
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<td><strong>Mechanisms for the loss of premenopausal protection from cardiovascular disease in women with type 1 diabetes</strong></td>
<td>Snell-Burgeon, Janet</td>
<td>149,988</td>
<td>American Diabetes Association, Inc.</td>
<td>2016</td>
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<td><strong>ApoC3, HDL function and cardiovascular complications of T1DM</strong></td>
<td>Snell-Burgeon, Janet</td>
<td>54,000</td>
<td>University of Washington/WA</td>
<td>2016</td>
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<td><strong>Roche Diagnostics Research Agreement</strong></td>
<td>Snell-Burgeon, Janet</td>
<td>41,400</td>
<td>Roche Diagnostics Corporation</td>
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<td><strong>Epicardial fat and inflammatory mediators in the excess risk of coronary artery calcification among women with type 1 diabetes</strong></td>
<td>Snell-Burgeon, Janet</td>
<td>31,105</td>
<td>University of South Florida</td>
<td>2016</td>
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<td><strong>Complications and Comorbidities of Type 1 Diabetes</strong></td>
<td>Snell-Burgeon, Janet</td>
<td>485,528</td>
<td>NIDDK/NIH/DHHS</td>
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<td><strong>Characterization of Insulin-Specific CD4+ T cells by Standardized ELISPOT Assay</strong></td>
<td>Sosinowski, Tomasz</td>
<td>100,000</td>
<td>Juvenile Diabetes Foundation</td>
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<td><strong>Trialnet: Diabetes Type 1 Prevention (Split w/ Peter Gottlieb)</strong></td>
<td>Steck, Andrea</td>
<td>195,141</td>
<td>NIDDK/NIH/DHHS</td>
<td>2015</td>
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<td><strong>Trialnet: Diabetes Type 1 Prevention (Split w/ Peter Gottlieb)</strong></td>
<td>Steck, Andrea</td>
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<td>Protocols 01-0394, 05-0701 &amp; 06-1084</td>
<td>Steck, Andrea</td>
<td>30,000</td>
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<td>Diabetes TrialNet DCC #06119-1144 (Capitation Acct. 63001401)</td>
<td>Steck, Andrea</td>
<td>27,315</td>
<td>NIDDK/NIH/DHHS</td>
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<td>Determinants of Rate of Progression to Type 1 Diabetes</td>
<td>Steck, Andrea</td>
<td>135,000</td>
<td>American Diabetes Association</td>
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<td>Follow-up of Children Diagnosed with Diabetes</td>
<td>Steck, Andrea</td>
<td>146,539</td>
<td>University of South Florida (JDRF)</td>
<td>2015</td>
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<td>JDRF/USF FOLLOW UP STUDY</td>
<td>Steck, Andrea</td>
<td>156,437</td>
<td>University of South Florida</td>
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<td>Determinants of Rate of Progression to Type 1 Diabetes</td>
<td>Steck, Andrea</td>
<td>150,000</td>
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<td>TrialNet: Diabetes Type 1 Prevention (Split w/ Gottlieb)</td>
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<td>USF Patient Capitation account</td>
<td>Steck, Andrea</td>
<td>179,747</td>
<td>USF</td>
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<td>Studies of diabetes development in initially discordant monozygotic twins</td>
<td>Steck, Andrea</td>
<td>45,901</td>
<td>Yale University</td>
<td>2016</td>
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<td>Single Cell Resolution Omics Analysis of T1D</td>
<td>Sussel, Lori</td>
<td>136,656</td>
<td>Battelle Memorial Institute, Pacific Northwest Lab</td>
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<td>A Phase 2 Multicenter Randomized, double-blind, Placebo-controlled, Parallel-group to evaluate the Efficacy and Safety of LX4211 In T1D young adults</td>
<td>Wadwa, Raj</td>
<td>118,433</td>
<td>Lexicon</td>
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<td>NN1250-3561 (NOVO T1D MELLITUS.CT)</td>
<td>Wadwa, Raj</td>
<td>229,069</td>
<td>Novo Nordisk</td>
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<td>Assessment of Intranasal Glucagon in Children and Adolescents with T1D</td>
<td>Wadwa, Raj</td>
<td>40,671</td>
<td>Jaeb Center for Health Research</td>
<td>2015</td>
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<td>NEMOURS PEDS DIABETES (Project # 2561083)</td>
<td>Wadwa, Raj</td>
<td>120,920</td>
<td>Nemours Foundation</td>
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<td>Open Label, Multicenter, Multiple Oral Dose Study - T2D</td>
<td>Wadwa, Raj</td>
<td>2,913</td>
<td>Janssen Research and Development, LLC</td>
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<td>Open-label, single-arm, multiple-dose, safety, titration, and pharmacokinetic trial of Afrezza® in pediatric patients ages 4 to 17 with type 1 diabetes mellitus</td>
<td>Wadwa, Raj</td>
<td>301,660</td>
<td>Sanofi US Services, Inc</td>
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<td>A Phase 2, Multicenter, Randomized, Double-blind, Placebo-controlled, Parallel-group to evaluate the Efficacy and Safety of LX4211 in Young Adult Patients with Type 1 Diabetes.</td>
<td>Wadwa, Raj</td>
<td>122,778</td>
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<td>A Phase 2, Multicenter, Randomized, Double-blind, Placebo-controlled, Parallel-group Study to Evaluate the Efficacy and Safety of LX4211 in Young Adult Patients with Type 1 Diabetes Mellitus and Elevated Hemoglobin A1C.</td>
<td>Wadwa, Raj</td>
<td>165,397</td>
<td>Lexicon Pharmaceutical, Inc.</td>
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<td>Initiation of Continuous Glucose Monitoring at Diagnosis of Type 1 Diabetes</td>
<td>Wadwa, Raj</td>
<td>142,550</td>
<td>Dexcom, San Diego, CA</td>
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<td>Immune Tolerance Network Fee for Service Proposal</td>
<td>Yu, Liping</td>
<td>16,430</td>
<td>Benaroya Research Institute @ Virginia Mason</td>
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<td>TEDDY</td>
<td>Yu, Liping</td>
<td>316,645</td>
<td>University of South Florida</td>
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<td>Antibody/HLA Core Lab TrialNet</td>
<td>Yu, Liping</td>
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<td>TrialNet Core Autoantibody and HLA/DNA Labs</td>
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<td>TEDDY</td>
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<td>21,280</td>
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<td>USF Gleevec T1D FC/Safety &amp; Efficacy of Imatinib for Preserving Beta-Cell function in New-Onset TID</td>
<td>Yu, Liping</td>
<td>2,500</td>
<td>University of South Florida</td>
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<td>GLEEVEC/Safety &amp; Efficacy of Imatinib for preserving beta-cell function in new-onset T1D</td>
<td>Yu, Liping</td>
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<td>University of South Florida</td>
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<td>Data Coordinating Center for the Consortium for Identification of Environmental Determinants of Diabetes in the Young (TEDDY)</td>
<td>Yu, Liping</td>
<td>246,877</td>
<td>University of South Florida</td>
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<td>USF TEDDY: Follow-up of Children Diagnosed with Diabetes</td>
<td>Yu, Liping</td>
<td>21,280</td>
<td>University of South Florida</td>
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<td>Anti-thymocyte Globulin (Rabbit) (Thymoglobulin) and Pegylated GCSF (Neulasta) in New Type 1 Diabetes Protocol TN-19</td>
<td>Yu, Liping</td>
<td>2,250</td>
<td>University of South Florida</td>
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<td>Immune Tolerance Network/Benaroya Research Institute at Virginia Manson</td>
<td>Yu, Liping</td>
<td>10,303</td>
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<td>TrailNet Core Autoantibody and HLA/DNA labs</td>
<td>Yu, Liping</td>
<td>717,292</td>
<td>University of South Florida</td>
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<td>Trialnet Core Autoantibody and HLA/DNA labs</td>
<td>Yu, Liping</td>
<td>118,233</td>
<td>University of South Florida</td>
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<td>A simple multiplex islet autoantibody assay for large-scale population screening</td>
<td>Yu, Liping</td>
<td>181,818</td>
<td>Juvenile Diabetes Foundation</td>
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<td>Host-Microbiota Interactions in Subjects at Risk for Type 1 Diabetes</td>
<td>Zipris, Danny</td>
<td>236,811</td>
<td>Juvenile Diabetes Foundation</td>
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<td>Host-Microbiota interactions in subjects at risk for type 1 diabetes</td>
<td>Zipris, Danny</td>
<td>236,811</td>
<td>Juvenile Diabetes Foundation</td>
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<td>Dr. Zipris Laboratory Research</td>
<td>Zipris, Danny</td>
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Selected Clinical Research Projects

The Environmental Determinants of Diabetes in the Young (TEDDY) Consortium

The Environmental Determinants of Diabetes in the Young (TEDDY) Study is a NIH-funded consortium and is currently one of the largest funded diabetes-research projects in the U.S. and the single largest diabetes project in Colorado. The Consortium includes centers from Colorado, Washington, Georgia/Florida, Germany, Finland, and Sweden. Dr. Rewers is heading the Colorado center as well as co-chairing TEDDY Steering Committee. This is the most comprehensive effort ever to identify environmental triggers of type 1 diabetes. Worldwide TEDDY screened 424,790 newborns to identify newborns at high genetic risk for type 1 diabetes. TEDDY enrolled 8,677 of those with the highest risk genes in a 15-year intensive follow-up. Of these participants 1374 are seen at the Colorado center. Thousands of blood and stool samples are now being analyzed by NIH-contracted world-leaders in metabolomics, metagenomics, genetics, genomics and proteomics.

Figure 4. The Environmental Determinants of Diabetes in the Young (TEDDY) Consortium: Goals and Design.

Diabetes Autoimmunity Study in the Young (DAISY)

DAISY is an observational study of the natural history of type 1 diabetes (T1D) that is now in its 21st year. The major goal of this study is to find the cause of childhood diabetes. The multicenter TEDDY study (above) has been modeled on DAISY design and DAISY is still serving as a vanguard for new TEDDY protocols. The study identified very young children who are at increased genetic risk for the development of T1D and follows them from infancy to adulthood for the development of islet-cell autoimmunity and subsequent progression to diabetes. DAISY collects data on genetic and environmental exposures that may be related to these outcomes. Dr. Rewers is the PI for DAISY, which has been continuously funded by the NIH since 1993 and awarded the distinction of a MERIT project during 2000-2010. DAISY is following 2542 children to understand why some children progress to diabetes while others are protected. DAISY has provided new data on the genetic and environmental risks for T1D by combining very basic and epidemiological translational research. DAISY has been an invaluable asset to our fellows, junior
faculty, MSPH students, PhD candidates and postdoctoral scholars by providing excellent teaching material and mentoring by local faculty in cutting edge epidemiological, immunological and genetic diabetes research. Jennifer Barker, M.D. and Andrea Steck, M.D., past endocrine fellows, used DAISY for their trainee research and for further career development supported by JDRF Career Development awards. Building from the DAISY cohort other studies have been funded including the C-peptide in the Young PREServation Study (CYPRESS) that follows participants who have been diagnosed with type 1 diabetes (Dr. Steck, PI) and the Infant Vitamins in the Young (IVY) study, a collaboration with the Dr. Norris in the Colorado School of Public Health. Major findings from the DAISY study are listed below.

- ~100% of children persistently positive for 2 islet autoantibodies will develop diabetes in the next 15 years
- Early childhood diet
  - Early exposure to cow’s milk does not predict T1D
  - Introduction of cereal too early or too late increases the risk
  - Omega free fatty acids appear protective
- Celiac disease is common in the U.S.
- Routine immunizations and their timing are unrelated to T1D
- Presence of enterovirus in blood predicts T1D
- Novel protective or high-risk gene variants found
- Risk is dramatically higher in siblings of children with diabetes than in general population with identical HLA-DR,DQ genotypes

**Coronary Artery Calcification in Type 1 Diabetes (CACTI)**

CACTI has followed 652 adults with T1D and 764 of their non-diabetic spouses/friends, since 2000, to better define the causes of premature heart disease and other long-term complications in patients with type 1 diabetes. CACTI has been funded by large grants from NIH (NIDDK, NHLBI), the JDRF and ADA. CACTI Study used electron beam computed tomography to detect and monitor progression of calcification of coronary arteries. This study has discovered a number of novel genetic, metabolic, and inflammatory factors of potential importance to prevention of diabetic complications. This project, initiated and led by Dr. Marian Rewers, has been the training grounds for a number of faculty from the BDC (Snell-Bergeon, Maahs, Wadwa, Naik), Medicine (Bergman, Schauer, Quaife) and Colorado SPH (Ogden). In 2013, Dr. Snell-Bergeon became the project principal investigator after leading a successful competing renewal application. She is continuing the 12 year follow up examination (Fig. 5, highlighted section) of the original CACTI cohort.

**Figure 5.** Coronary Artery Calcification in Type 1 (CACTI) Study.
Celiac Disease Autoimmunity Research (CEDAR)
In this first NIH R01 award for celiac disease research in the U.S., based on DAISY and funded since 1995, Dr. Rewers and his colleagues have dissected the occurrence of celiac disease in patients with type 1 diabetes, their relatives, and in the general population. This project has been a model of collaborative effort between the BDC faculty (Rewers, Eisenbarth, Klingensmith), Department of Pediatrics Gastroenterology faculty (Liu, Hoffenberg, Sokol) and Colorado School of Public Health (Norris, McFann).

Autoimmunity Screening for Kids (ASK)
ASK is a jointly funded research project from the Juvenile Diabetes Research Foundation (JDRF), the Helmsley Charitable Trust (HCT), and the Janssen Foundation in its first year. The study objectives include planning and launching a large scale screening initiative in children 2-17 in the planning phase, 1-year, to identify those at high risk for Type 1 Diabetes (T1D) and Celiac Disease (CD). Children who screen positive for pre-T1D or CD will be invited to participate in an education and monitoring intervention with the goal of preventing acute and long-term complications associated with diagnosis. If successful in the planning phase, a 3-year application to continue the program will be implemented. The 3-year mass screening will include 50,000-70,000 Denver metro children ages 2-17 and would likely provide strong evidence for adding T1D and CD tests to routine pediatric practice. Currently, there is no routine screening for pre-type 1 diabetes and celiac disease. This grant will allow a planning phase to explore promising locations for such screening including primary care pediatrics offices, hospital-based health care organizations, schools, state and local preventive services and community health centers. The Barbara Davis Center will collaborate with a network of Denver metro pediatricians, Children’s Hospital Colorado and community partners to launch an awareness campaign about childhood autoimmune disease and to build an effective screening program.

TrialNet
BDC investigators are leading the international TrialNet Prevention studies which have accelerated the design of safe interventions to prevent or slow the progression of type 1 diabetes. TrialNet studies the development of autoimmunity and its progression in family members of individuals with type 1 diabetes. Under Dr. Peter Chase and now Dr. Steck’s direction, the BDC follows more autoantibody positive subjects in the Pathway to Prevention Study than any other study center. Dr. Peter Gottlieb is the TrialNet PI, and leads the immuno-intervention trials of TrialNet at the BDC. He is the co-chair of the Science Working Groups and vice-chair of the Biomarkers and Mechanisms Panel. Other BDC co-investigators in TrialNet include Drs. Michels (immunogenetics), Steck (Oral Insulin, LIFT (Long Term Investigative Follow-Up), Gutin and Wadwa. The BDC has proposed 2 trials that have been completed and published, Dr. Gottlieb’s MMF/DZB study in new onset T1D which laid the groundwork for how all subsequent clinical trials have been run. The Nutrition Intervention to Prevent Type 1 DM (NIP) trial, an early dietary intervention in high-risk young children, was designed by Dr. Chase. TrialNet offers many opportunities for trainee participation and education in autoimmunity as well as excellent opportunities for further career development.

TrialNet Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathway to Prevention Study</td>
<td>Recruiting</td>
</tr>
<tr>
<td>The Oral Insulin for Prevention of Type 1 Diabetes Study</td>
<td>No Longer Recruiting</td>
</tr>
<tr>
<td>Anti-CD3 mAb (Teplizumab) for Prevention Of Diabetes In Relatives At Risk For Type 1 Diabetes Mellitus</td>
<td>Recruiting</td>
</tr>
<tr>
<td>CTLA4-Ig (Abatacept) for Prevention of Type 1 Diabetes in Relatives At-Risk</td>
<td>Recruiting</td>
</tr>
<tr>
<td>The Nutritional Intervention to Prevent Type 1 Diabetes Study</td>
<td>No Longer Recruiting</td>
</tr>
</tbody>
</table>
Studies for those recently diagnosed with type 1 diabetes (within 100 days):

<table>
<thead>
<tr>
<th>Study</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effects of Low Dose ATG (Thymoglobulin®) Used Alone or in Combination with GCSF (Neulasta®) in New Onset Diabetes</td>
<td>No Longer Recruiting</td>
</tr>
<tr>
<td>Anti IL-1Beta (Canakinumab) in Recent Onset Diabetes</td>
<td>No Longer Recruiting</td>
</tr>
<tr>
<td>Metabolic Control in New Onset Diabetes</td>
<td>No Longer Recruiting</td>
</tr>
<tr>
<td>CTLA-4 Ig (Abatacept) in Recent Onset Diabetes</td>
<td>Study Completed</td>
</tr>
<tr>
<td>GAD in New Onset Type 1 Diabetes</td>
<td>Study Completed</td>
</tr>
<tr>
<td>The Rituximab Study (Anti-CD20)</td>
<td>Study Completed</td>
</tr>
<tr>
<td>The MMF/DZB Study</td>
<td>Study Completed</td>
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</table>

Studies for participants previously enrolled in TrialNet Studies:

<table>
<thead>
<tr>
<th>Study</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-Term Investigative Follow-Up in TrialNet (LIFT) Study</td>
<td>Recruiting</td>
</tr>
</tbody>
</table>

Type 1 Diabetes TrialNet is collaborating with the following NIH-funded groups, also conducting type 1 diabetes research:

<table>
<thead>
<tr>
<th>Study</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1DCG</td>
<td>No Longer Recruiting</td>
</tr>
</tbody>
</table>

http://www.diabetestrialnet.org/studies/

New Technology Projects
The Barbara Davis Center helped paved the way for the historic breakthrough in artificial pancreas research, the 2016 Food and Drug Adminsitration (FDA) approval of the first hybrid closed-loop system. Closed-loop systems combine continuous glucose monitoring and insulin pump therapy with computer algorithms designed to adjust insulin delivery. In the approval of the Medtronic MiniMed 670G system, the FDA cites the BDC clinical trial led by Dr. Satish Garg. Designed to automate insulin dosing to reduce high blood sugar levels, clinical trial results showed the system kept participants within their desired blood sugar range 72% of the time vs. 67% without technology (day) and 75% vs. 67% (at night) without the technology. The system also demonstrated improvements in overall glucose control. Results summarizing the pivotal study leading to FDA approval are reported in JAMA (2016).

For the past 20 years, the Barbara Davis Center has played a critical role in trials to provide new devices to our patients. BDC clinics have been instrumental in the...
approval and advancement of Continuous Glucose Monitoring systems and insulin pump therapy currently available to help patients manage their diabetes.

BDC investigators continue to advance the field of closed-loop research: Peter Chase, Robert Slover, R. Paul Wadwa, David Maahs, Greg Forlenza and Satish Garg, PIs. Multiple past and current projects are advancing progress at multiple steps along the ‘Pathway to the Artificial Pancreas’ (Figure 6.). The ASPIRE at home study was one of the first studies in the approval process of the Artificial Pancreas. The ASPIRE study showed a decrease in nocturnal hypoglycemia when the pump suspended insulin delivery in response to preset lower limit on the glucose sensor. Two papers in Diabetes Care have reported on 5,000 nights of home-use of a predicted glucose suspend system in people ages 4-45 years; additional studies are testing an algorithm to minimize hyperglycemia, investigating the safety of software in artificial pancreas devices, as well as studies to identify and correct weak links in proposed artificial pancreas technology. The Barbara Davis Center is also investigating psychosocial aspects surrounding the adoption of new diabetes technologies. A current study investigates the application of behavioral support programs for families of children ≤ 6 years of age as they use diabetes technology.

Selected Basic Research Projects

Spatially organized sub-populations of cells control electrical activity and dynamics across the islets of Langerhans

Understanding how heterogeneous cells within a multi-cellular system interact and affect overall function is difficult without a means of perturbing individual cells or sub-populations. In an exciting study from the Benninger lab, they are applying optogenetics to understand how sub-populations of β-cells control the overall electrical response and insulin secretion dynamics of the islets of Langerhans. They spatiotemporally perturb the electrical activity in β-cells of channelrhodopsin2-expressing islets, then map the electrical response and correlate this with the cellular metabolic activity and an in-silico electrophysiology model. They discovered organized regions of metabolic activity across the islet, and these affect the way in which β-cells electrically interact. Specific regions acted as pacemakers by initiating calcium wave propagation. Their findings reveal the functional architecture of the islet, and show how distinct sub-populations of cells can disproportionally affect function. These results also show the way in which other neuroendocrine systems can be regulated, and demonstrate how optogenetic tools can discern their functional architecture.
**T cell antigen specificity in Type 1 diabetes**

Type 1 diabetes (T1D) is an autoimmune disorder resulting from insulin-producing beta cell destruction mediated by lymphocytic T cells. However, due to extremely limited access to pancreas samples, little is known about human antigenic targets for islet-infiltrating T cells. To overcome this limitation, the Nakayama laboratory has been exploring antigen specificity of T cells infiltrating pancreatic islets of T1D organ donors. They received cadaveric islet samples from the JDRF/Helmsley nPOD consortium as a member of the Pilot Islet Study group. Interestingly, they identified hundreds of T-cells from inflamed pancreatic islets of three young T1D organ donors with a short disease duration with high risk HLA genes using a direct T-cell receptor (TCR) sequencing approach without long-term cell culture. Among 85 selected CD4 TCRs tested for reactivity to preproinsulin peptides, one T cell recognized C-peptide amino acids 19-35, and two clones from separate donors responded to insulin B chain amino acids 9-23 (B:9-23), which is known to be a critical self-antigen driving disease progress in animal models of autoimmune diabetes (see Figure). These B:9-23-specific T-cells from islets responded to whole proinsulin and islets, while previously identified B:9-23 responsive clones from peripheral blood did not, highlighting the importance of proinsulin-specific T-cells in the islet microenvironment. The Nakayama lab study provides direct evidence that proinsulin peptides are the target of T cells infiltrating islets of T1D patients. Future studies will include exploring antigen specificity for the majority of remaining T cells, determining phenotypes of islet-infiltrating T cells, and identifying antigen specificity of T cells at the early stage of T1D are required towards the ultimate goal understanding pathogenesis of T1D development and developing robust immune therapy to prevent T1D.

![Graph](image1.png)

**Pancreatic beta cell identity requires continual repression of non-beta cell programs**

Recently, characterization of diabetic mouse and human islets have revealed that adverse metabolic conditions can compromise the differentiated state of the beta cell. The Sussel lab is exploring the mechanisms that sustain beta cell identity and have contributed one of three studies recently accepted to the Journal of Clinical Investigation that demonstrate the importance of maintained transcriptional pathways in the regulation of beta cell identity. Specifically, the Sussel lab has demonstrated that the transcription factor NKX2.2 is essential for the active maintenance of adult beta cell identity as well as function. Deletion of Nkx2.2 in beta cells caused rapid onset of a diabetic phenotype in mice that is attributed to loss of insulin and down-regulation of many beta cell functional genes. Concomitantly, Nkx2.2-deficient murine beta cells acquired non-beta cell endocrine features, resulting in populations of completely reprogrammed cells and bithormonal cells that displayed hybrid endocrine cell morphological characteristics. Molecular analysis in mouse and human islets revealed that NKX2.2 is a conserved master regulatory protein that controls the acquisition and maintenance of a functional, monohormonal beta cell identity by directly activating critical beta...
cell genes and actively repressing genes that specify the alternative islet endocrine cell lineages. This study demonstrates the highly volatile nature of the beta cell, indicating that acquiring and sustaining beta cell identity and function requires not only actively maintaining expression of genes involved in beta cell function, but also continual repression of closely related endocrine gene programs. Furthermore, these studies demonstrate that reprogramming is an important feature of beta cell dysfunction in patients with type 1 and type 2 diabetes.

**EDUCATION**

The Barbara Davis Center at the University of Colorado Denver is particularly well suited to train qualified individuals in clinical, epidemiological, behavioral, and basic research into the immunobiology of type 1 diabetes. The BDC has been successful in obtaining research support in many areas of diabetes investigation from basic molecular immunology to clinical translational research in new therapeutics for diabetes and prevention. This active research base combined with experienced mentors serves as a perfect setting to increase the number of academic physicians to meet the national need for endocrinologists trained in diabetes research. The BDC, through well-established collaborative networks, also provides opportunities for career development with mentors well recognized for excellence in examining and defining the abnormal pathophysiology which leads to type 2 diabetes.

BCD faculty play a very active role in training Pediatric Residents, Fellows in Endocrinology, Diabetes and Metabolism (Pediatrics and Medicine), medical, nursing physician assistant, and dental school students as well as a large group of visiting trainees at each level of health care education. The diversity, experience and success of the faculty are shown in the faculty short biographies. Their interests span the spectrum of diabetes investigation, including epidemiology, patient directed, and laboratory research. Many mentors also are involved in multi-site projects allowing trainees to network with diabetes investigators nation-wide as well as internationally. This prepares scholars to carry out relevant, high quality diabetes research through course work, seminars, and supervised laboratory and/or clinical research with increasing independence under the direction of skilled, experienced mentors.
Major Training Programs

T32 Pediatric Endocrinology Fellowship Training Program
The highly successful Pediatric Endocrinology Fellowship Program is jointly administered and funded by the Endocrinology Section of the Department of Pediatrics and the Barbara Davis Center. Under the successive leadership of Drs. Michael Kappy, Philip Zeitler and now Jennifer Barker, the program has grown from recruiting one fellow every other year (1990’s) to 2-3 fellows every year. The Children’s Hospital of Colorado Graduate Medical Education Office provides most of the funds for the 1st year fellows, while the NIH T32 training grant (Dr. Klingensmith, PI) has provided most of the funds for the 2nd and 3rd year fellows, since 2001. This allows the trainees to satisfy the American Board of Pediatrics requirements for a three year fellowship training program, with 11 months of clinical work and 22 months of research training, for 33 total months of training time. The CHCO and BDC are the practice sites for the fellows. The fellows and CHCO- and BDC-based faculty run a joint inpatient and after-hours service for endocrinology and diabetes. The joint program develops pediatric endocrinologists for the future by providing diverse opportunities for clinical training, educational opportunities in didactic learning, and diabetes research. This program provides a smooth transition for our trainees to junior faculty positions well prepared to compete for early career development awards.

The three major components to our T32 Training Program include: 1) a supervised research experience under the mentorship of an outstanding research mentor; 2) didactic training providing coursework; and 3) a mentoring system. Didactic training is selected as needed and appropriate, in basic and clinical research design, training in the ethical conduct of research and human subjects protection, clinical trial methodologies, professionalism, an introduction to medical writing including grant writing, biostatistics, genetics, epidemiology, cellular and molecular biology, genomics and proteomics, as well as bioinformatics. The mentoring system includes a careful selection of primary mentor responsible for the supervised research experience and an Individual Advisory Committee, to participate in the initial development and ongoing evaluation of individualized training. The great majority of our T32 trainees, 11 of 15, remain in academic medicine.

BDC Fellows 2015 – 2016

<table>
<thead>
<tr>
<th>Trainee</th>
<th>Faculty Member</th>
<th>Title of Research Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>P. Bjornstad, MD</td>
<td>M. Rewers, MD, PhD</td>
<td>Diabetic Nephropathy</td>
</tr>
<tr>
<td>C. Chambers, MD</td>
<td>A. Steck, MD</td>
<td>MODY (Maturity Onset of Diabetes in the Young) Study</td>
</tr>
<tr>
<td>C. Chan, MD</td>
<td>K. Nadeau, MD; G. Klingesmith, MD</td>
<td>Cystic Fibrosis Related Diabetes</td>
</tr>
<tr>
<td>S. Davis, MD</td>
<td>P. Zeitler, MD</td>
<td>Testicular Function in Klinefelter Syndrome; Autoimmunity in Down syndrome</td>
</tr>
<tr>
<td>S. Majidi, MD</td>
<td>P. Wadwa, MD; A. Steck, MD</td>
<td>Psychosocial factors and cardiovascular disease risk in adolescents with type 1 diabetes</td>
</tr>
<tr>
<td>N. Nokoff, MD</td>
<td>J. Snell-Bergeon, PhD</td>
<td>Trans Health: evaluation of markers of cardiometabolic health and well-being in transgender youth</td>
</tr>
<tr>
<td>J. Raymond, MD</td>
<td>G. Klingesmith, MD</td>
<td>Transition of Diabetes Care from Pediatric to Adult</td>
</tr>
<tr>
<td>K. Simmons, MD</td>
<td>A. Michels, MD</td>
<td>General population screening for type 1 diabetes risk</td>
</tr>
<tr>
<td>C. Wood, MD</td>
<td>P. Wadwa, MD; M. Rewers, MD, PhD</td>
<td>Use of telemedicine for care of pediatric type 1 diabetes</td>
</tr>
</tbody>
</table>
K12 Career Development Program - Developing Pediatric Diabetes Investigators for the Future

In 2001 the NIH funded this K12 program to train pediatric endocrine physician scientists in diabetes research in response to the identified critical shortage. The scientists trained through this program have been successful in beginning to address the shortage of highly trained physician scientists in Pediatric Endocrinology. This critical shortage in pediatric diabetes investigators comes at a time when knowledge of the basic immunopathophysiology of type 1 diabetes is expanding rapidly and new treatment options taking advantage of advances in immunology, molecular biology and bio-medical engineering are on the horizon. Collaborative training of physician scientists in both clinical and basic science research is essential to take advantage of and expand on our new understanding of the causes of and approaches to interventions in type 1 diabetes. The shortage of pediatric endocrinologists is made more critical with the 3-5% increase in type 1 diabetes worldwide. All of the junior faculty scholars mentored through the BDC K12 Program remain in academic pediatric endocrinology and have obtained K23 or equivalent JDRF career development awards. The investigators who have participated in the DIFF Program at the Barbara Davis Center are prepared to assume leadership roles in the nation’s research efforts in pediatric diabetes.

Career Development Awards

<table>
<thead>
<tr>
<th>Trainee</th>
<th>Project Title</th>
<th>Award No.</th>
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</thead>
<tbody>
<tr>
<td>Chan, Christina, MD</td>
<td>Cystic Fibrosis Related Diabetes</td>
<td>NIH K12 DK094712</td>
</tr>
<tr>
<td>Driscoll, Kimberly, PhD</td>
<td>Adherence intervention to promote optimal use of insulin pumps in adolescents with diabetes</td>
<td>NIH K23 DK091558</td>
</tr>
<tr>
<td>Forlenza, Gregory, MD</td>
<td>Evaluation of Malglycemia in the Pediatric Hematopoietic Stem Cell Transplant Population</td>
<td>NIH K12 DK094712</td>
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<tr>
<td>Frohnert, Brigitte, MD, PhD</td>
<td>Etiology of Type 1 Diabetes</td>
<td>NIH K12 DK094712</td>
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<tr>
<td>Majidi, Shideh, MD</td>
<td>The Use and Effectiveness of Screening for Depression Risk in Youth with the Type 1 Diabetes</td>
<td>NIH K12 DK094712</td>
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<tr>
<td>Michels, Aaron, MD</td>
<td>Structure-Based selection of small molecules targeting allele specific MHC II autoantigen presentation</td>
<td>NIH K08 DK095995</td>
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<tr>
<td>Raymond, Jennifer, MD</td>
<td>Transition of Diabetes Care from Pediatric to Adult</td>
<td>NIH K12 DK094712</td>
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<tr>
<td>Simmons, Kimber, MD</td>
<td>Identification of Children at Risk for Type 1 Diabetes in the General Population Using DBS Methodology</td>
<td>JDRF 2-SRA-2016-202-S-B</td>
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<tr>
<td>Snell-Bergeon, Janet, PhD</td>
<td>Mechanisms for the Loss of Premenopausal Protection from Cardiovascular Disease in Women with T1</td>
<td>ADA 7-13-CD-10</td>
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<tr>
<td>Steck, Andrea, MD</td>
<td>Determinants of rate of progression to type 1 diabetes</td>
<td>ADA 1-14-CD-17</td>
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Postdoctoral Trainees 2015-2016

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<tr>
<th>Trainee</th>
<th>Faculty Member</th>
<th>Title of Research Project</th>
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</thead>
<tbody>
<tr>
<td>N. Farnsworth, PhD</td>
<td>R. Benninger, PhD</td>
<td>Regulation of islet gap junction coupling and function under inflammatory conditions</td>
</tr>
<tr>
<td>L. Hudish, PhD</td>
<td>L. Sussel, PhD</td>
<td>Understanding the coding and non-coding transcriptional networks regulating cell fate specification in the CNS in comparison to the pancreatic islet</td>
</tr>
<tr>
<td>C. Kiekhaefer, PhD</td>
<td>A. Michels, MD</td>
<td>Immune Stimulatory Small Molecules in Type 1 Diabetes</td>
</tr>
<tr>
<td>D. Lorberbaum, PhD</td>
<td>L. Sussel, PhD</td>
<td>Understanding the transcriptional networks regulating cell fate specification in the pancreas</td>
</tr>
<tr>
<td>B. Murphy, PhD</td>
<td>H. Davidson, PhD</td>
<td>Post-translation modification of Beta-cell granule autoantigens</td>
</tr>
<tr>
<td>Z. Zhao, MD</td>
<td>L. Yu, MD</td>
<td>Expanding the existing ECL autoantibody technology</td>
</tr>
</tbody>
</table>
### Predoctoral Trainees 2015-2016

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<th>Title of Research Project</th>
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</thead>
<tbody>
<tr>
<td>J. Realsen</td>
<td>P. Chase, MD</td>
<td>The need for an Ultra-Rapid Acting Insulin</td>
</tr>
<tr>
<td>L. Duca</td>
<td>J. Snell-Bergeon, PhD</td>
<td>Vascular disease, inflammation and hormones in women with type 1 diabetes</td>
</tr>
<tr>
<td>K. Waugh</td>
<td>J. Snell-Bergeon, PhD</td>
<td>EPOCH Study</td>
</tr>
<tr>
<td>A. Keshawarz</td>
<td>J. Snell-Bergeon, PhD</td>
<td>CACTI/EDEN Study</td>
</tr>
<tr>
<td>R. Ross</td>
<td>J. Snell-Bergeon, PhD</td>
<td>CACTI Study</td>
</tr>
<tr>
<td>T. Brown</td>
<td>J. Snell-Bergeon, PhD</td>
<td>Mediation of insulin resistance by sex hormones in women with type 1 diabetes</td>
</tr>
<tr>
<td>A. Bodan</td>
<td>J. Snell-Bergeon, PhD</td>
<td>Glycemic control and BMI in adolescents with type 1 diabetes followed in a specialty pediatric diabetes clinic</td>
</tr>
<tr>
<td>E. Westfall</td>
<td>P. Chase, MD</td>
<td>Improving Glycemic Control in Type 1 Diabetes</td>
</tr>
<tr>
<td>A. Fouts</td>
<td>A. Steck, MD</td>
<td>Type 1 Diabetes Prediction and Prevention Non-autoimmune Diabetes</td>
</tr>
<tr>
<td>H. Goettle</td>
<td>P. Chase, MD A. Steck, MD</td>
<td>Type 1 Diabetes TrialNet: researchers who are exploring ways to prevent, delay and reverse the progression of type 1 diabetes</td>
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<tr>
<td>J. Thurston</td>
<td>J. Snell-Bergeon, PhD L. Pyle, PhD</td>
<td>CACTI Study</td>
</tr>
<tr>
<td>A. Cousins</td>
<td>J. Raymond, MD</td>
<td>T32 predoctoral trainee</td>
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<tr>
<td>D. Jin</td>
<td>M. Jin, MD</td>
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<td>A. Piropato</td>
<td>J. Snell-Bergeon, PhD</td>
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<td>A. Karlin</td>
<td>D. Maahs, MD</td>
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<td>N. George</td>
<td>G. Forlenza, MD R. Slover, MD</td>
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<td>C. Goyne</td>
<td>A. Michels, MD</td>
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<td>M. McClain</td>
<td>J. Raymond, MD K. Driscoll, MD</td>
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<td>A. Sanders</td>
<td>M. Kelsey, MD</td>
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<tr>
<td>K. Strickland</td>
<td>K. Nadeau, MD</td>
<td>T32 predoctoral trainee</td>
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<tr>
<td>N. Rao</td>
<td>P. Wadwa, MD J. Snell-Bergeon, PhD</td>
<td>T32 predoctoral trainee</td>
</tr>
</tbody>
</table>
**BDC Annual Keystone Conference**

This four-day conference, started by Dr. Peter Chase 27 years ago, remains the Center’s flagship in the area of continuing medical education (CME) in Management of Diabetes. Initially a biannual event, the conference is now offered annually and attracts over 500 participants nation-wide. The course is designed to help healthcare providers caring for patients with diabetes, including but not limited to, endocrinologists/diabetes specialists, internists, pediatricians, family physicians, physician assistants, medical residents and fellows, nurse practitioners, nurses, dietitians and certified diabetes educators.

**Dr. Satish Garg** serves as the current Program Director, attracting national and international experts to lead discussions at the forefront of diabetes management, technology, and therapeutic options.

**In addition to distinguished faculty from the Barbara Davis Center, speakers have featured:**

**2015 Keynote Speakers**

**David S. Shade, MD**
Professor of Medicine and Chief, University of New Mexico School of Medicine

**2015 National & International Session Leaders**

**David D’Alessio, MD**
Professor of Medicine, University of Cincinnati

**Phil Zeitler, MD**
Professor of Pediatrics and Endocrinology, Children’s Hospital Colorado, University of Colorado Denver School of Medicine

**Ralph DeFronzo, MD**
Professor of Medicine, University of Texas Health Science Center at San Antonio

**Alan Cherrington, PhD**
Professor of Molecular Physiology and Biophysics, Professor of Medicine, Vanderbilt University

**Darrell Wilson, MD**
Professor of Pediatrics, Lucile Salter Packard Children's Hospital, Stanford School of Medicine

**Elizabeth Seaquist, MD**
Professor of Medicine, University of Minnesota

**Trevor Orchard, MD, FAHA, FA**
Professor of Epidemiology, Pediatrics and Medicine, University of Pittsburgh

**Allison Goldfine, MD**
Associate Professor of Medicine, Joslin Diabetes Center, Harvard Medical School

**Naresh Mandava, MD**
Professor and Chair, Rocky Mountain Lions Eye Institute, Department of Ophthalmology, University of Colorado School of Medicine

**Guido Freckmann, MD**
Professor of Medicine, Institut für Diabetes-Technologie Forschung, Universität Ulm Helmholtzstr
Kevan Herold, MD  
Professor of Immunobiology and Medicine, Yale University

Alan Cherrington, PhD  
Professor of Molecular Physiology and Biophysics Professor of Medicine

Sir George Alberti, MD  
Professor of Medicine, Kings College School of Medicine, University of Newcastle upon Tyne

Judy Regensteiner, MD  
Professor of Medicine, Director, Center for Women's Health Research, University of Colorado School of Medicine

2016 Key Note Speaker
Courtney Harper Lias, PhD  
Director, FDA

Robert Ratner, MD  
Chief Scientific and Medical Officer, American Diabetes Association

2016 National & International Session Leaders
Stephen Davis, MD, MBBS  
Professor & Chair, University of Maryland

Robert Ratner, MD  
Chief Scientific and Medical Officer, American Diabetes Association

Hertzel Gerstein, MD  
Professor, McMaster University

Lutz Heinemann, PhD  
Partner & Scientific Consultant, Profil Institut für Stoffwechselsforschung GmbH

Carla Greenbaum, MD  
Director, Diabetes Program, Benaroya Research Institute

Jay Skyler, MD, MACP  
Professor, University of Miami

Melena Bellin, MD  
Assistant Professor, University of Minnesota

Ralph DeFronzo, MD  
Professor, University of Texas Health Science Center at San Antonio

Desmond Schatz, MD  
Professor & Associate Chair of Pediatrics, University of Florida, Diabetes Institute

William Herman, MD  
Professor, University of Michigan

Phil Cryer, MD  
Professor, Washington University in St. Louis

Stephen Davis, MD, MBBS  
Professor & Chair, University of Maryland

Brian Frier, MD, FRCP  
Professor, University of Edinburgh

Roman Hovorka, PhD  
Director of Research, University of Cambridge

Aaron Kowalski, PhD  
Chief Mission Officer & Research Vice President, Juvenile Diabetes Research Foundation

Jonathan Schoen, MD  
Associate Professor, University of Colorado Denver
Lilly Conferences (2010 – 2015)
Since 2010, BDC faculty have been providing a 2-day course in the etiology and management of diabetes to 50-100 employees of Eli Lilly. Topics range from diabetes technology including hands on experience, to psychosocial aspects and complications from diabetes.

Transforming Diabetes Care (Oct, 2016)
The BDC teamed up with Johnson & Johnson Diabetes Institute, LLC to present this 2 day program titled ‘Advancing Care through Technology for Insulin-Requiring Patients with Diabetes.’ Taught by clinicians from both the Pediatric and Adult clinics, topics covered a range of issues from emerging technologies to patient engagement.

Carousel of Hope Symposium (Oct, 2016)
Produced by the BDC, this symposium titled ‘Emerging Diabetes Technologies & Beta Cell Biology’ featured national experts in type 1 diabetes presenting on a variety of topics followed by panel discussions chaired by Drs. Satish Garg and Lori Sussel.

Barbara Davis Center Diabetes Seminar Series
Organized and hosted by the Basic and Translational Research Division, this ‘Grand Rounds’ style lecture series was launched in the Fall of 2016. National and international speakers share their expertise on a wide variety of topics. Organized by Drs. Richard Benninger, Maki Nakayama, and Holger Russ, attendees from across campus welcomed the following speakers this past Fall:

<table>
<thead>
<tr>
<th>Speaker</th>
<th>Topic</th>
<th>Home Institution</th>
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</thead>
<tbody>
<tr>
<td>Danwei Huangfu, PhD Assistant Member</td>
<td><em>Human development through the lens of pluripotent stem cells</em></td>
<td>Sloan-Kettering Institute Developmental Biology Program</td>
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<tr>
<td>Colin Nichols, PhD Professor</td>
<td><em>KATP channels and disease: From neonatal diabetes to a cardiovascular syndrome</em></td>
<td>Washington University, St. Louis Dept of Cell Biology and Physiology</td>
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<tr>
<td>Thomas DeLong, PhD Assistant Professor</td>
<td><em>Hybrid Insulin Peptides: Discovery and Applications</em></td>
<td>University of Colorado Anschutz SOM-Immunology Microbiology</td>
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<tr>
<td>Roberta Pelanda, PhD Professor</td>
<td><em>Lessons from hu-mice on human B cell development and B cell tolerance</em></td>
<td>University of Colorado Anschutz SOM-Immunology Microbiology</td>
</tr>
<tr>
<td>Luc Baeyens, PhD Associate Specialist</td>
<td><em>Mechanisms controlling beta cell birth and generation</em></td>
<td>Free University Brussels Genetics and Medical Regeneration</td>
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</table>

International Programs

Christian Medical College Ludhiana, 35th Annual Meeting
The BDC produced this 3 ½ day meeting providing continuing medical education for physicians in August, 2016. Graduates of Christian Medical College, Ludhiana, India traveled from around the world to participate in this meeting accredited by the Accreditation Council for Continuing Medical Education (ACCME).

Chinese Delegation, ATDC Keystone Conference
Physicians from China participated in this 3 week program leading up to the ATDC Keystone conference in July. BDC physicians and staff provided intensive training in the latest clinical practices for type 1 patients including topics on technology, nutrition, and mental health. Sessions also included presentations of current research conducted at the BDC from clinical trials to epidemiological studies to the latest inquiry in basic science.

ATDC International Delegation Educational Program
Every year, the BDC produces an extra day of in-depth education for our international participants in the ATDC Keystone conference in July. Conducted at the Barbara Davis Center, participants receive presentations on cutting edge topics in type 1 diabetes.

**Programs for Community & Staff**

**AMC Immunology/Autoimmunity Journal Club**

This campus wide journal club is organized by Thomas Sosinowski, PhD of the BDC Basic and Translational Research Division. Students and trainees, as well as more senior investigators, present a new article or articles including a review of the topic, pertinent literature and discuss how the article(s) fit into/advance current thought and where the field might go from here. This is a popular program that attracts participants from many areas of the AMC, especially post-docs and junior faculty. The inclusion of many senior faculty, encourages exchange of ideas and provides knowledgeable comments and expertise on the papers presented.

**Research in Progress Series**

The Research in Progress series fosters collaborative learning through weekly presentations by BDC and affiliated investigators. Coordinated by Richard Benninger, PhD in 2015 and Nijun Jin, MD in 2016, the series provides over 20 presentations per year to interested participants.

**NIDDK Medical Student Research Program**

Since 2009, the BDC has participated in the NIDDK Medical Student Research Program in Diabetes. Each summer for 8-12 weeks, four first or second year medical students are supported with a small stipend as they pursue research in type 1 diabetes. In August of each year there is a scientific symposium for all program participants at Vanderbilt University where each student presents a brief summary of their summer work. Dr. Georgeanna Klingensmith managed the program which hosted 4 students in the summer of 2015 and 2016.

**Grandparents Workshop**

This special workshop developed by the BDC pediatric clinic is designed specifically for grandparents of children with type 1 diabetes. The workshop teaches grandparents the fundamentals of diabetes from nutrition to blood testing. Sessions are designed to encourage open discussion and answer the myriad of questions parents and grandparents share when learning their child has been diagnosed with type 1 diabetes.

**The Beyond High School Program**

This annual summer program was designed by the team at the Barbara Davis Center to help graduating seniors and young people with diabetes to better understand what it will be like to manage diabetes on their own. Life in college and /or in a new job can be challenging so having a good plan for managing your diabetes is essential. This day long session brings 30-40 new HS graduates together with past participants of our program. The Beyond High School Program is a fun interactive program that prepares adolescents with diabetes for several life changes during their transition from high school to college, to work and living away from parents.
## STAFF ROSTERS

CDE = Certified Diabetes Educator  
CIP & CGM Trainer = Certified Insulin Pump & Continuous Glucose Monitoring Trainer  
Financial Report

<table>
<thead>
<tr>
<th>Central Administration</th>
<th>Cindy Cain, NP, CDE</th>
<th>Tai-Ping Hartwell</th>
<th>Nhung Nguyen</th>
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<tr>
<td></td>
<td>Sr. Instructor</td>
<td>Clinical Division Administrator</td>
<td>Professional Research Assistant</td>
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<td>Jawahar Sandeep Chittajallu</td>
<td>Susan Michelle Clay</td>
<td>Raquel Hink, MPH, PA</td>
<td>Darcy Owen, MS, RD</td>
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<td>Student Assistant</td>
<td>Professional Research Assistant</td>
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<td>Cherie Cobb</td>
<td>Theresa Cox, RN</td>
<td>Vanessa Hoy, RN, NP</td>
<td>Robert Owen</td>
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<td>Yen Nguyen</td>
<td>Beverly Cruz</td>
<td>Tonya Jenkins</td>
<td>Susie Owen, RN, CDE, CIP &amp; CGM Trainer</td>
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<td>IT Technician</td>
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<td>Allison Reeds</td>
<td>Kelly Dufner</td>
<td>Maria Jerez</td>
<td>Isamar Pacheco</td>
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<td>Marnie Sekkingstad</td>
<td>Monica Eva</td>
<td>Emily Jost</td>
<td>Andrea Pascual</td>
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<td>Mary Norbury-Glazer</td>
<td>Ellen Fay-Itzkowitz, MS, CSW, CDE</td>
<td>Anne Kaess, RD</td>
<td>Regina Reece</td>
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<tr>
<td>IT Program Director</td>
<td>Instructor</td>
<td>Clinical Instructor</td>
<td>Program Assistant</td>
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<td>Christy Vasey</td>
<td>Michelle Flagg, MS, PA</td>
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<td>Jeannyfer Reither</td>
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<td>Bing Wang</td>
<td>Alexandra Fouts</td>
<td>Karen Kuu</td>
<td>Tyler Reznick-Lipina</td>
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<td>IT Senior Professional</td>
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<td>Grants &amp; Contracts Administrator</td>
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<td>Pediatric Clinic</td>
<td>Tavia Franklin</td>
<td>Samantha Lange</td>
<td>Alexandra Roacho</td>
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<td>Rhea Allingham</td>
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<td>Laura Rodriguez</td>
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<td>Carolyn Banion, NP, MS, PNP, CDE</td>
<td>Agnes Furlaga</td>
<td>Vicky Gage, RN, CDE</td>
<td>Vicki Schatzel, RN, CDE, CIP &amp; CGM Trainer</td>
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<td>Senior Instructor</td>
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<td>Kylie Anne Benson</td>
<td>Vicky Gage, RN, CDE</td>
<td>Athena Garcia</td>
<td>Jackie Shea</td>
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<td>Kayce Berke, RN</td>
<td>Carmen Garcia</td>
<td>Jason Gensler</td>
<td>Emily Simmons</td>
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<td>Franziska Bishop</td>
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<td>Sr. Professional Research Assistant</td>
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<td>Kathy Smith, RN, CDE, CIP &amp; CGM Trainer</td>
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<td>Mireya Centeno</td>
<td>Loise Gilmer, MS, RD, CDE</td>
<td>Alejandra Munoz-Schanez</td>
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</table>
Gail Spiegel, MS, RD, CDE
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Professional Research Assistant

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Erin Youngkin
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Adult Clinic

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PUBLICATIONS
(Jan 2015 – Dec 2016)
BDC Publications (Jan 2015 – Dec 2016)


22. Buckingham, B., Cheng, P., Beck, R. W., Kollman, C., Ruedy, K. J., Weinzimer, S. A., . . . Type 1 Diabetes TrialNet Study, G. (2015). CGM-measured glucose values have a strong correlation with C-peptide, Hba1C and IDAAC, but do poorly in predicting C-peptide levels in the two years following onset of diabetes. Diabetologia, 58(6), 1167-


Members of other Departments and organizations are key collaborators with Barbara Davis Center faculty in both education and research.

**Primary Collaborators:**

**SCHOOL OF MEDICINE DEPARTMENTS/DIVISIONS:**

- **Pediatrics / Endocrinology**
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  - Jennifer Barker, MD
  - Christine Chan, MD
  - Stephanie Hsu, MD, PhD
  - Michael Kappy, MD, PhD
  - Megan Kelsey, MD
  - Kristen Nadeau, MD
  - Philip S. Zeitler, MD, PhD
  - Shaodong Dai, PhD
  - Kathryn Haskins, PhD
  - Jill Slansky, PhD

- **Cardiology**
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- **Renal Medicine Disease & Hypertension (Nephrology)**
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  - Richard Johnson, MD, FACP

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- **Surgery / CCTCARE**
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- **Endocrinology, Metabolism & Diabetes**
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  - Brian Haugen, MD
  - Michael McDermott, MD
  - Jane E-B Reusch, MD
  - Irene Schauer, MD, PhD

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  - Shaodong Dai, PhD
  - Kathryn Haskins, PhD
  - Jill Slansky, PhD

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  - Edwin Liu, MD
  - Ronald Sokol, MD

- **Pediatrics / Emergency Medicine**
  - Arleta Rewers, MD, PhD

- **Pediatrics / Pulmonology**
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  - Scott Sagel, MD

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  - Scott Sagel, MD

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  - Brian Haugen, MD
  - Michael McDermott, MD
  - Jane E-B Reusch, MD
  - Irene Schauer, MD, PhD

- **Immunology/Microbiology**
  - John Cambier, PhD

**THE COLORADO SCHOOL OF PUBLIC HEALTH DEPARTMENTS:**

- **Epidemiology**
  - Dana Dabelea, MD, PhD
  - Richard Hamman, MD, DrPH
  - Jill Norris, PhD

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  - Kim McFann, PhD
  - Laura Pyle, PhD

**NATIONAL JEWISH HEALTH**

- Philippa Marrack, PhD

**CHILDREN’S HOSPITAL COLORADO RESEARCH INSTITUTE**

- Frederick Suchy, MD