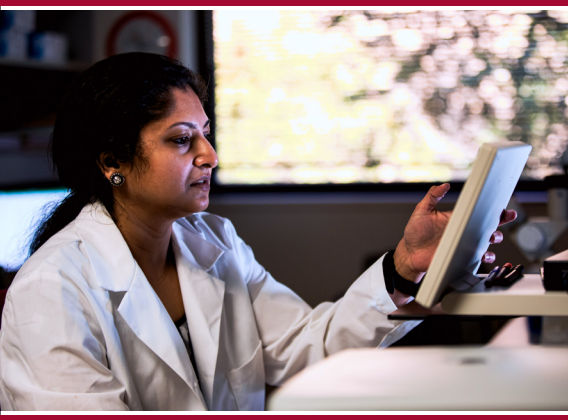
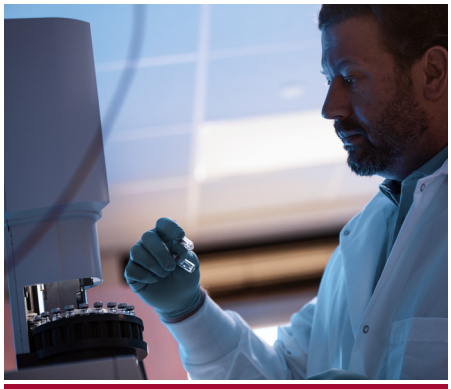
OU Health | Harold Hamm Diabetes Center





RESEARCH AT THE ROOT

The pursuit that drives us

NEW RECRUITS (2019)

METABOLISM PROGRAM

Michael Rudolph, Ph.D. | University of Colorado
Choctaw Nation Chair in Adult Endocrinology
Assistant Professor, Physiology
Director of the Rodent Metabolic Phenotyping Resource

Ken Jones, Ph.D. | University of Colorado
Harold Hamm Chair in Clinical Diabetes Research
Associate Professor, Cell Biology
HHDC Director for Bioinformatics; Director of the Laboratory for Molecular Biology and Cytometry Research

Tiangang Li, Ph.D. | Kansas University Medical Center
Harold Hamm Chair in Adult Diabetes Research
Associate Professor, Physiology

Norm Hord, Ph.D. | Oregon State University
Professor and Chair, Nutritional Sciences

Karen Jonscher, Ph.D. | University of Colorado
Associate Professor, Biochemistry & Molecular Biology

Archana Unnikrishnan, Ph.D. | University of Oklahoma Health Sciences Center
Chickasaw Nations Endowed Scholar
Assistant Professor, Biochemistry & Molecular Biology

CANCER AND DIABETES

Elizabeth Wellberg, PhD | University of Colorado
Assistant Professor, Pathology

VISION

To help children, adults and their families live healthier lives without diabetes and its consequences.

MISSION

To improve patient outcomes and reduce the burden of diabetes in Oklahoma and the Nation. The mission will be accomplished through multidisciplinary research that leads to discoveries for the causes and complications of diabetes and to translate this knowledge into effective clinical treatments and prevention efforts.

MEET THE DIRECTOR

Jacob (Jed) E. Friedman, Ph.D.
Director, OU Health Harold Hamm Diabetes Center

Since 2019, it has been my privilege to lead Harold Hamm Diabetes Center and continue its development as one of the few comprehensive diabetes centers of its kind in the nation. Here, we integrate top-flight academic research with clinical care and disease prevention. I am very grateful to continue to honor the philanthropic gift and the legacy created by Mr. Harold Hamm. Our Mission is to improve patient outcomes and reduce the burden of diabetes in Oklahoma and the nation. We are relentless in our commitment to discover a cure for diabetes that will end the diabetes pandemic in the 21st century.

THE SETTING

The face of diabetes has undergone striking changes over several decades. The number of Americans diagnosed with diabetes has increased, from 5.5 million in 1980 to 34 million in 2020. Currently, one in eight Oklahomans have Type 2 diabetes, and one-third of the state's adult population has pre-diabetes and are completely unaware of their precarious condition. Tragically, Oklahoma's Native Americans have over twice the risk of developing diabetes and are almost twice as likely as non-Hispanic whites to die from diabetes or suffer from its complications, including cardiovascular disease, fatty liver disease, and cancer.

The University of Oklahoma's Health Sciences Center (OUHSC) is one of only a few comprehensive academic health centers in the nation. OUHSC provides HHDC a unique and ideal foundation for multidisciplinary, collaborative, team-based research, clinical care, and prevention programs. A diabetes center must be equipped to address the multidimensional aspects of diabetes in individuals and communities to produce the advances so desperately needed. More than 164,000 square feet in capital facilities are dedicated to the center, with opportunities for further expansion. Faculty are supported by private, state and federal funding, including 15 endowed chairs ranging from $1 million to $4 million each.

Oklahoma City is the home of HHDC's basic research enterprise. We conduct clinical research in Oklahoma City, Tulsa, and at partner sites across the state.

SOURCES: Centers for Disease Control and Prevention; Oklahoma State Department of Health.

OUR HISTORY

Early on, OUHSC received international recognition for its work in the field of diabetes, creating a unique foundation for HHDC to build upon. As early as the late 1950s, OUHSC researcher **Dr. Kelly West** began his work that led to him becoming the first person to systematically study the mechanisms, natural history, and diagnostic criteria used to identify diabetes. Today, he is internationally regarded as the "father of diabetes epidemiology." The most prestigious award in diabetes epidemiology, given by the American Diabetes Association, is named in his honor. In the 1960s, **Dr. Paul Kimmelstiel** came to OUHSC to carry on his groundbreaking work in diabetes and kidney disease, resulting in the identification of Kimmelstiel-Wilson syndrome, a kidney condition associated with diabetes. In 1987, **Dr. James Gavin** joined OUHSC and pioneered innovative techniques for educating young children about diabetes and the importance of healthy lifestyles in preventing the disease. Dr. Gavin went on to become the President of the American Diabetes Association from 1993-94. In the 1990s, **Dr. Kenneth Copeland** came to OUHSC and greatly expanded the pediatric diabetes program, which has led the way in researching prenatal and childhood causes of diabetes, as well as establishing treatment guidelines for type 2 diabetes in children. In the 2000s, the university recruited **Dr. Timothy Lyons** to increase the focus of OUHSC's endocrinology programs on adult diabetes research and clinical care. In 2019, **Dr. Jed Friedman** joined OUHSC, as Harold Hamm Diabetes Center's first Director, to explore three potential pathways to a cure for diabetes: the first 1,000 days, protecting the pancreas, and the intersection of diabetes and cancer.

above
Dr. Friedman and the Harold Hamm Diabetes Center Research Faculty Members

below
The new Patient Tower, on the OUHSC campus.

What is the new vision for the HHDC?

Our Vision is to help children, adults and their families live healthier lives without diabetes and its consequences.

How will resources help build the scientific and clinical research base for HHDC and lead to a national/international reputation?

Our Goals:

- Increase our research base and translate new knowledge into effective clinical treatments and prevention efforts to halt the obesity and diabetes epidemic and its complications.
- Target specific goals and strategies including development of effective interventions in pre-clinical models of obesity and diabetes, combined with clinical research trials that will, in turn, potentially decrease the risk for diabetes and its complications.
- Maintain specific focus on primary prevention of diabetes, and treatments for disorders that often accompany diabetes, including hypertension, fatty liver disease and cancer.

Strategies:

- Conduct aggressive basic-sciences faculty recruitment in the intersection between metabolism and genetics, epigenetics, microbiome and pathophysiology, including large data integration.
- Develop and expand clinical cohorts to identify pathways for development of disease in youth and adults at high risk for obesity and diabetes and its complications, including Non Alcoholic Fatty Liver Disease (NAFLD), cancer, and accelerated aging.
- Expand use of advanced bioinformatics methods, including machine learning and artificial intelligence to understand and prevent or predict complex disease pathways from the cellular level to populations.
- Take advantage of existing tribal navigators and partnerships to understand diabetes pathophysiology specifically focused on our tribal partners.
- Train the next generation of diabetes researchers, by recruitment of successful mentors across the college of medicine and professional schools.

above
Announcement of $34 million gift by the Harold Hamm Foundation, at the 2018 Bedlam football game

- Increase commercialization opportunity in clinical-translational therapies aimed at treating diabetes and its complications across the lifespan through collaboration with bio-engineering, and business development processes at OU Health and OU-Norman.

HHDC will continue to expand its extensive collaboration with partners across the healthcare system, most notably Oklahoma Children's Hospital, Oklahoma Medical Research Foundation, Oklahoma's tribal nations, and the University of Oklahoma on both Norman and Tulsa campuses.

To all our stakeholders, we truly appreciate your support as we seek to elevate HHDC, its work and its mission. As HHDC grows stronger and gains stature as a nationally recognized biomedical research center, our resources can be deployed in new directions that optimize our search for a cure, which will end the diabetes pandemic.

In 2018, Harold Hamm donated $34M to jump-start the Harold Hamm Diabetes Center Pilot Program. We have maximized this program with donor funding from the Harold Hamm Foundation, the Chickasaw Nation, Presbyterian Health Foundation, the Stephenson Cancer Center, the Reynolds Aging Center and many other donors to encourage new collaborations between our members and broaden our impact on diabetes research. Through philanthropic funding, Harold Hamm Diabetes Center is able to support the 3 Pathways in research through these annual solicitations.

THE CHALLENGE

Epidemiology has shown that type 1 diabetes incidence has been increasing worldwide. Similarly, type 2 diabetes has been increasing and spans the spectrum of age, race and ethnicity, but striking increases have been found in Native American youth as never before. The strong association between maternal obesity/diabetes and childhood obesity and its sequelae is of particular concern because almost 2/3 of American women now enter pregnancy either overweight or obese and up to 30% of pregnant women develop Gestational Diabetes Mellitus (GDM). This creates a vicious, detrimental cycle of intrauterine transmission of metabolic disease from the mother to her children. One in ten Americans today suffers from diabetes. The serious complications associated with diabetes include heart attack, stroke, kidney disease requiring dialysis or transplant, blindness, liver disease, amputations, several cancers, COVID-19, and death. Every year diabetes and pre-diabetes costs $3.2 Billion in Oklahoma, of which $873 million is spent on indirect costs from lost productivity due to diabetes. If trends continue, the American Medical Association estimates that one-third of all children born in the United States today (and one-half of Native American children) will develop type 2 diabetes (T2D) in their lifetime.

Despite the grim picture painted by these statistics, we are not powerless against diabetes. Harold Hamm Diabetes Center (HHDC) works to reduce these trends by advancing research, translating it into better treatment options, and offering programs to prevent diabetes.

Research is indeed at the root of our enterprise. This report elucidates the ways HHDC answers the call for progress against the pandemic of diabetes and its complications.

above
HHDC's pediatric research laboratories are adjacent to our pediatric clinic on the fourth floor of the OU Health Children's Physicians tower in Oklahoma City.

THREE PATHS TO A CURE

THE FIRST 1,000 DAYS

Acquisition of the **Microbiome** in mothers and infants leading to novel nutritional interventions for mothers and newborns aimed at preventing diabetes and obesity risk during the first 1,000 days from conception to 2 years of age

PROTECTING THE PANCREAS

Use **machine learning** in established databases for diabetes to identify proteins for interrupting the destruction of the pancreas that may lead to a Vaccine

DIABETES & CANCER

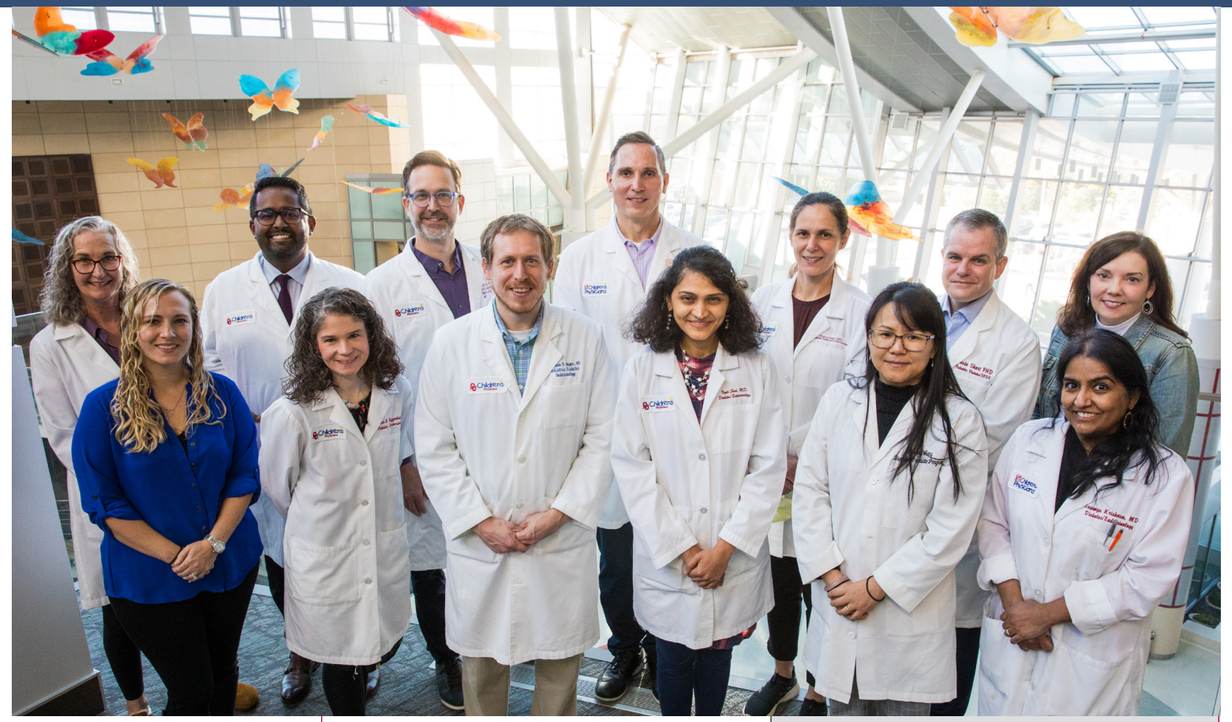
Integration of **Immunoengineering** to exploit resources in both diabetes and cancer research to accelerate exploration of connected solutions

THREE PATHS TO A CURE

PATHWAY ONE:
Within the section of Diabetes/Endocrinology at Oklahoma Children's Hospital the incidence of youth-onset T2DM has increased by 20% just in the last few years such that 1 out of every 3 children diagnosed with diabetes will have youth-onset T2DM.

The first 1,000 days, beginning with conception to early childhood, provide the foundation for lifelong health. It is a time when our external environments–from the food we eat to our exposures to stress and adversity–shape our future health in powerful ways. Maternal diets/excess fuel can cause long-term, subtle, irreversible changes in the development, structure and function of some tissues and vital organs (liver, skeletal muscle, lungs, pancreas, kidney, brain) as a result of disruptions in mothers' metabolism. This risk is further exacerbated by excessive weight gain in postnatal/adult life.

Can we identify factors responsible for these changes in diabetes/obesity rates in Oklahoma and the nation? Members of Harold Hamm Diabetes Center (HHDC) faculty have begun to uncover some of the most important physiological processes underlying risk for childhood obesity and diabetes during the first 1,000 days. This includes identification of changes in mothers' metabolism that impact the infant gut microbiome, immune function, infant stem cells, and more recently, novel bioactive components of human breast milk that accelerate weight gain and impact immunity in the newborn. Determining how nutrition and genetic risk impacts these



above
Pictured are the Research Faculty within the section of Diabetes/Endocrinology at Oklahoma Children's Hospital.

The health effects of breastfeeding for mothers are just as powerful [as the infants], reducing a woman's risk of heart disease, breast cancer, ovarian cancer, diabetes and depression.

factors, if harnessed for clinical application, could **revolutionize the prevention of obesity and diabetes** by interrupting a vicious cycle across generations. We believe the prospect of effective interventions in women with obesity and those with GDM will, in turn, potentially decrease the risk for childhood obesity in their offspring, with significant implications for **primary prevention of diabetes** and other disorders that plague these children and young adults (hypertension, fatty liver, psychosocial disorders, etc.)

Diabetes and the Infant Microbiome: The Undiscovered Community Within. The new science of the gut microbiome has exploded in recent years with new tools and discoveries in diseases ranging from diabetes to cancer, to mental health, and many other immunological disorders. Maternal diet plays a major role in determining the development of the gut microbiome and is therefore a modifiable risk factor and interventional strategy. Investing in this new frontier of science holds the promise for identifying how nutritional therapies aimed at correcting the microbiome in mothers and babies in the first 1,000 days holds the promise to prevent type 1 and type 2 diabetes, and a host of other immune related disease pathways from asthma to autism.

The Diabetes and Pregnancy Clinics at Oklahoma Children's Hospital are uniquely organized with a multidisciplinary clinical team active in translational research. They are performing a randomized clinical trial targeting mothers with elevated triglycerides with high dose omega-3 fatty acids -the TOTS TRIAL designed to lessen the impact of excess maternal fuels on infant adiposity, microbiome, and inflammation that predicts later-life diabetes risk.

When it comes to giving babies the healthiest start to life, breastfeeding is unmatched. Packed with antibodies, stem cells and other unique properties, breast milk acts as babies' first vaccine and lowers a child's risk of developing obesity later in life. The health effects of breastfeeding for mothers are just as powerful, reducing a woman's risk of heart disease, breast cancer, ovarian cancer, diabetes and depression. It has long been thought that human

breast milk composition was uniform among women. However, human milk exhibits high inter-individual variability in a number of factors that modify its protective effects for the infant.

HHDC researchers are looking closely at the role lactation plays in long term health by leveraging the largest prospective longitudinal milk composition study focused on the unique role of breast milk in trans-generational transmission of obesity risk. The significance of this research lies in advancing knowledge of the consequences of inter-individual variation in human breast milk in infants with high risk of future obesity. Knowing the factors that influence milk variation in ways that matter for the infant metabolism is a key step in helping to optimize this critical first food. This cutting-edge work is the **#2 major national research priority** for the U.S. Department of Agriculture and Department of Health and Human Services in the field of maternal infant nutrition.

Knowing the factors that influence milk variation in ways that matter for the infant metabolism is a key step in helping to optimize this critical first food.

Key Areas of Focus:

- We are focusing on clinical trials linking pregnancy and infant development in the first 1,000 days with interventions to prevent obesity/diabetes in youth. We have a strong, integrated campus-wide center for clinical investigations in human pregnancy and newborn health that manages and enrolls healthy-pregnant women and women diagnosed with diabetes or obesity into longitudinal studies of the mothers and children of these mothers. A patient "Navigator" program for women with Gestational Diabetes is underway for the Chickasaw Nation Health clinic. We utilize a wide range of approaches including the microbiome, genetics, metabolomics, immunology, and nutrition to **"build a healthier baby."**
- We are testing products of the microbiome specifically for correcting the effects of maternal obesity in infants of diabetic/obese mothers and preventing the immune cell "programming" for diabetes.

- We are investigating novel bioactive factors in breast milk from mothers with obesity/GDM to prevent excess infant adiposity and microbiome changes in infants.
- Given the aggressive nature and high risk for complications in children with diabetes, our studies focus on identifying predictors that will differentiate youth that progress to beta cell failure and the role that insulin resistance in puberty plays in beta cell failure. The Treatment Options for Type 2 Diabetes in Adolescents and Youth (TODAY) study was a landmark trial to begin to explore the optimal treatment for youth-onset T2DM.
- Oklahoma is also part of the large Environmental Influences on Childhood Health Outcomes (ECHO) consortium, a National Institutes of Health effort to develop a cohort of over 50,000 youth to understand the environmental triggers of many chronic childhood diseases.

JEANIE TRYGGESTAD, M.D.

Children's Hospital Foundation Paul and Ruth Jonas Chair in Pediatric Diabetes/Endocrinology
Associate Professor, Department of Pediatrics

"Youth onset type 2 diabetes is an aggressive disease with significant complications presenting in the third decade of life. It is clear that exposure to diabetes in utero programs the infant for an increased risk of youth onset type 2 diabetes associated with declining beta cell function. In addition to developing treatment modalities to preserve beta cell function and reduce diabetes related complications in youth onset type 2 diabetes, prevention of diabetes must occur at the earliest stages focusing on optimal health and nutrition in the mother and infant."

PATHWAY TWO:

Protecting the Pancreas

Pancreatic β-cell (the cells that produce insulin) death and dysfunction play essential roles in the development of both type 1 and 2 diabetes. On the other hand, β-cells have a huge capacity to regenerate to meet metabolic demands. Hence, the ability to restore and maintain functional β-cell mass via β-cell regeneration/transplantation and improve survival will provide the means to treat or even cure diabetes. In Type 1 Diabetes (T1D), immune cells, called t-cells, move into the pancreas and are involved in the destruction of vital insulin-producing cells. T1D is now predictable in humans with the measurement of type 1 diabetes associated autoantibodies in the peripheral blood, yet the factors that trigger the killing process for both T1D and T2D are unknown.

Researchers at the HHDC are looking to identify proteins that can be used to interrupt the destruction of insulin-producing β-cells in the pancreas. Using high throughput screening (HTS) of candidate proteins on the surface of immune cells, researchers at the HHDC recently identified small molecules and growth factors that promote β-cell regeneration in vitro, some of which are capable of reversing hyperglycemia in diabetic animals by restoring β-cell mass.

Evidence is mounting that T1D, a progressive chronic autoimmune disease, might be triggered by alterations in gut microbiota in childhood. Recently, "The Environmental Determinants of Diabetes in the Young" (TEDDY) study collected and characterized the natural history of the early gut microbiome in connection to islet autoimmunity (IA) and the development of T1D in an international cohort of over 800 infants from birth to young teens. A major research direction is to use machine learning to predict the combination of microbiome changes in T1D. Collaboration across the School of Computer Sciences on the OU Norman campus, and assets across the OUHSC campus leveraged together with basic scientists have identified new pathways in the microbiome that predict changes in immunity in children with T1D, necessary for potentially protecting the pancreas.

Key Areas of Focus:

- Utilize AI/ML to analyze large data bases to uncover early onset causes for T1D and T2D, with an emphasis on the first 1,000 days of life.
- Uncovering new proteins to promote insulin production and protect the pancreas in T2D using bioinformatics to screen large chemical libraries and high throughput screening.
- Discover new proteins on immune cells that can lead to a vaccine against destruction of the pancreas in T1D.
- Identify preventative pathways for protecting the pancreas in prediabetes, particularly in Native American youth.

DAVID SPARLING, M.D., PH.D.

CHF Paul and Ann Milburn Chair in Pediatric Diabetes
Associate Section Chief, Department of Pediatrics

"The more we learn about the beta cell, the more we realize that it's at the root of both Type 1 and Type 2 diabetes. Understanding how the body responds to stress on the pancreas, and the beta cells specifically, are absolute needs to understanding the immune responses in Type 1 diabetes, and beta cell failure in Type 2. I really see protecting the pancreas as the path to understanding the cause, and finding the cure, of diabetes."

PATHWAY THREE:

Immunoengineering to Fight Diabetes and Cancer

Oklahoma ranks in the top five states for diabetes and obesity and, as stated earlier, our state's Native Americans have over twice the risk of developing diabetes and are almost twice as likely as non-Hispanic whites to die from diabetes. Likewise, our state's Native American cancer rates are 1.4 times higher than the US (all races) rate. Mortality rates are over 50% higher and, for specific cancers, even worse: 50% to 99% higher for lung, prostate and colorectal cancer; over 100% higher for cervical cancer; and over 200% higher for kidney cancer. **These incidence and mortality rates are among the highest in the nation for any population. Nearly 40% of adults and 20% of children are obese, and those percentages are increasing. Not only is obesity associated with a higher risk of diabetes and 13 types of cancer, it can also adversely affect cancer treatment and survival. Research to untangle the relationship between obesity/diabetes and cancer will inform the development of effective strategies that reduce cancer and diabetes risk and improve patient outcomes.** While many factors are considered responsible for the cause/relationship between diabetes and cancer, conclusive answers and clearly defined pathways forward remain elusive for researchers–the link between cancer and diabetes is still obscure.

OU already has a strong body of research and clinical trial success at our nationally ranked OU Health Stephenson Cancer Center (SCC). We believe a distinctive strength can be achieved by aligning these unique resources with the Stephenson School of Biomedical Engineering (SBME) at our Norman campus, together with the HHDC, by strategically leveraging immunoengineering toward fighting both diabetes and cancer. The vision is to integrate complex immunological challenges with biomedical engineering platforms with the aim of accelerating the development and delivery of novel immunoengineering therapeutics and technologies for diabetes and cancer.

Research progress in this area has suffered from the lack of systematically structured collaborations, longitudinal cohort studies linked with biospecimens, structured epidemiology tools, genetic testing, and biomarker development and validation. Given the increasing incidence and prevalence of both diabetes and cancer, their complications, high mortality rates, and associated health care cost, the HHDC, SCC, and SBME vision is to join forces to discover new insights into the diabetes/cancer association, utilizing the promising tools of Immunoengineering, to develop revolutionary new treatments for these diseases.

Key Areas of Focus:

- To collaborate with bioengineering to therapeutically evaluate a new biotechnology to modulate the immune system with common elements between diabetes and cancer.
- To break the link between diabetes and cancer by distinguishing the metabolic and molecular biomarkers common between diabetes and cancer, including the microbiome.
- To validate the direct effects of obesity and diabetes on tumor development and anti-cancer therapies by developing clinically relevant animal models with human tumor transplantation.

LIZ WELLBERG, PH.D.

Assistant Professor, Department of Pathology

"Individuals with diabetes have an increased risk for certain cancers, including those in the breast, uterus, liver, and pancreas. Scientists are still unsure why, but early programming of the immune system's ability to fight off the first cancer cells may be to blame. In addition, several cancer treatments, including those for breast and prostate, increase the likelihood of a person developing diabetes later in life."

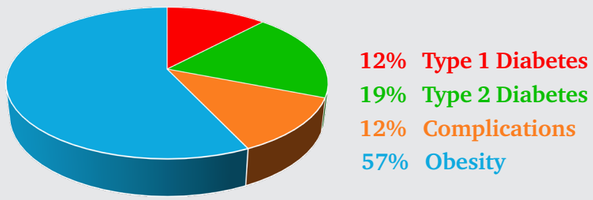
SUPPORTING OUR VISION THROUGH RESEARCH

In 2018, the Harold Hamm Foundation donated $34M to accelerate Harold Hamm Diabetes Center faculty recruitment and establish a pilot grant program. In addition to the Hamm Foundation, donor funding from the Chickasaw Nation, Presbyterian Health Foundation, Stephenson Cancer Center, the Reynolds Aging Center, and other donors provided the necessary matching funds to launch the program. Our goal is to award up to $2.6 million each year in competitive, peer-reviewed grant awards.

Beginning in 2019, HHDC developed the HHDC Pilot Program to support 3 pathways toward a cure, and has awarded over $6 million dollars for 39 grants to establish collaborative teams within our membership. Our center has also directly funded diabetes researchers in Oklahoma through collaborative seed grants, start-up funding for research projects, training grants for master's- and doctoral-level students to enhance their training in diabetes and related fields, travel stipends to promote collaboration with other institutions, and equipment grants that give the center's members access to the most advanced, up-to-date technological innovations to further their work.

HHDC research programs today span diverse disciplines and focus on Type 2 diabetes, including Gestational Diabetes, and T1D in adults and youth, and examining the causes and complications of diabetes, including Nonalcoholic Fatty Liver Disease (NAFLD) and diabetic retinopathy, to help identify better or new prevention strategies, treatments, and ultimately a cure for diabetes.

Pilot Funding: Key Areas of Focus:



Other broad areas of focus include:

Genetics and Environmental causes of diabetes | It is unclear how genetics may contribute to the development of type 2 diabetes, and how this interacts with the environment. NIH grants are examining how genetics may influence the ABILITY of an individual to develop type 2 diabetes, particularly in certain ethnic populations. In addition, several grants are exploring why and how children whose parents have diabetes are genetically predisposed to developing type 2 diabetes.

Diabetes in Native Americans | Obesity and type 2 diabetes affect Native Americans disproportionately when compared to all other ethnic groups, with almost half eventually developing diabetes and related complications. Several NIH studies have resulted from collaborative partnerships with tribal nations across the state, aimed at better understanding the relationship between Native Americans and the high incidence of diabetes, including how we can predict and prevent diabetes.

Causes and prevention of diabetic complications | Many people with diabetes develop other life-altering, and often fatal, diseases directly caused by diabetes, including heart disease, kidney failure, and diabetic eye disease. Several of the center's basic research groups examine what causes these devastating diabetes complications, and how to prevent them. With our partners at the Dean McGee Eye Institute, new therapies and techniques are being tested and developed that have the potential of stopping diabetes-related blindness and vision loss.

Additional areas of research interest include:

- Diabetes management in young adults transitioning from pediatric to adult care
- Gastric bypass surgery in ameliorating diabetes
- Impact of COVID on long term complications of diabetes

TODAY Study | HHDC is at the forefront of how to treat children diagnosed with type 2 diabetes. Once a disease seen almost exclusively in adults, type 2 diabetes diagnoses are now made in children at increasingly higher rates. Because a child having type 2 diabetes was virtually unheard of twenty years ago, consistent guidelines for treatment had yet to be established. To solve this problem, a national multicenter NIH clinical study, known as Treatment Options for Type 2 Diabetes in Youth (TODAY) study, initiated more than a decade ago. HHDC's **Dr. Kenneth C. Copeland** served as the national co-chair for the study, and our center enrolled more patients than any other site in the nation, thanks in large part to participation from Oklahoma's Native American tribes. The study resulted in the release of universally recommended guidelines for treatment. To continue to explore the best care options, the national study completed another 5-year run, led by **Dr. Steven Chernausek** and **Dr. Jeanie Tryggestad** focusing on diabetic complications, making it one of the longest running diabetes research projects at OUHSC. Moving forward, Dr. Jeanie Tryggestad is focusing on the next phase of the work: predictions for diabetes based on early causative events in T2D in youth.

The intersection of Cancer and Diabetes/Obesity | Individuals with diabetes have an increased risk for certain cancers, including those in the breast, uterus, liver and pancreas. Scientists are still unsure why, but early programming of the immune system's ability to fight off the first cancer cells may be to blame. In addition, several cancer treatments, including those for breast and prostate, increase the likelihood of a person developing diabetes later in life. While many factors are considered responsible for the cause/relationship between diabetes and cancer, conclusive answers and clearly defined pathways forward remain elusive for researchers. For example, **Dr. Elizabeth Wellberg** is researching how menopause and estrogens affect weight gain, breast cancer development, and the risk for type 2 diabetes.

Translational Research | In collaboration with OB-GYN and a team of Pediatricians, HHDC is developing and testing novel interventions in mothers with obesity and those diagnosed with Gestational Diabetes with **Dr. Stephanie Pierce**. This focuses on nutritional interventions in mothers and infants during pregnancy and in the first 1000 days including breast feeding, aimed at improving maternal health and infant growth and metabolism during the first year of life, when body fat triples, the gut microbiome develops, the immune system matures, and appetite signals emerge in toddlers. Because a child having T2D or pediatric NAFLD was virtually unheard of twenty years ago, consistent guidelines for prevention and treatment have yet to be established. Clinical trials led by **Dr. Kevin Short, Dr. Jed Friedman,** and **Dr. Sirish Palle** are underway with youth with NAFLD aimed at understanding the causative factors and development of new therapies aimed at intervention/prevention of disease. HHDC encourages and supports clinicians to perform diabetes translational research, enhancing collaboration between clinicians and basic diabetes researchers.

Pediatric Metabolic Research Program | With support from the Children's Hospital Foundation, HHDC is engaged in many studies that examine the causes of diabetes as early as fetal development and throughout adulthood. Six faculty members, led by program director **Dr. David Fields**, are currently engaged in projects on the fetus and childhood origins of obesity and metabolic diseases, including the discovery of bioactive components and benefits of breastfeeding in improving the health of children, and metabolic disease in Native American youth.

Gastric bypass program | The greatest single risk factor for the development of type 2 diabetes (T2D) is obesity. Reducing obesity is the first line approach to preventing onset of new cases and treating existing cases. One of the most successful interventions for reducing obesity and improving insulin-sensitivity is gastric bypass surgery. HHDC is supporting a collaborative effort with **Dr. Laura Fischer** between clinical and basic science faculty to understand how reduction of obesity improves insulin resistance and T2D.

TrialNet | With UTSouthwestern as our partnering coordinating center, HHDC has been an affiliate site for the Type 1 Diabetes TrialNet international network for over a decade, examining the natural history of the development of Type 1 diabetes in high-risk individuals. TrialNet in Oklahoma, under the direction of **Dr. David Sparling** has also served as the springboard for several studies looking to prevent the progression of Type 1 diabetes, several of which HHDC has participated in, including the Oral Insulin Prevention Study, the Abatacept Prevention Study, and the HCQ Prevention Study. The work of TrialNet has refined the diagnosis and progression of Type 1 diabetes, and continues the search for a cure.

Immunoengineering and Modulators of Metabolism | The link between cancer and diabetes and the immune system remains an area of active investigation. The ultimate goal of immune engineering is to harness the exquisite specificity of the immune system to prevent and treat disease, often focusing on metabolic endpoints in specific cell types. Combining the assets of Stephenson Cancer Center, Stephenson School of Biomedical Engineering (SBME) and Harold Hamm Diabetes Center creates a synergistic strength that is unique nationwide. **Dr. Friedman** and his team are investigating how maternal diet impacts the origins of innate immunity and its role in accelerating diabetes and cancer. **Dr. Tiangang Li** is investigating how a novel Cancer therapeutic can be exploited as a new drug target for diabetes. Our goals are to integrate cancer biologists and diabetes experts who have a common interest in how inflammation and cellular metabolism influence cell function to develop novel therapies.

RESEARCH FUNDING AND SUPPORT

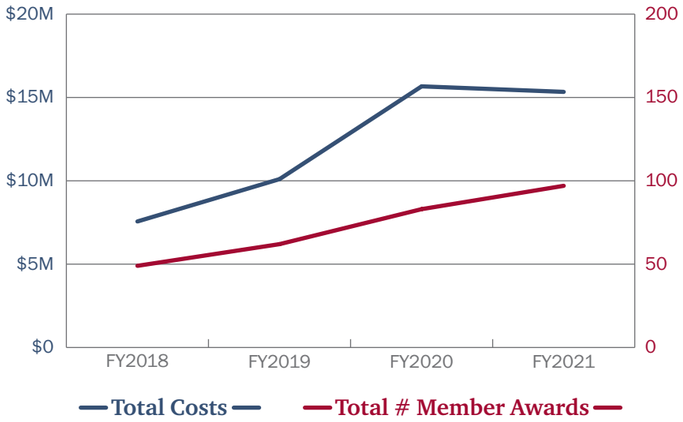
HHDC currently has 136 active members in Full, Associate, Affiliate and Trainee categories.

External research grants provide long-term support for multidisciplinary programs of high relevance for diabetes research. Federal funding from National Institues of Health in particular helps build our researchers' ability to address key scientific questions by supporting work across different fields and programs, and through collaborations with other universities.

Our grants also support the development of research resources to integrate basic (laboratory) research with applied research to develop new approaches to prevention and treatment of diabetes.

Over the past four years, our members have doubled our federal NIH research base in diabetes to $15M annually. Our goal is to raise this output over the next several years and compete for a National Diabetes Center designation through the National Institutes of Health.

Number of Diabetes Awards

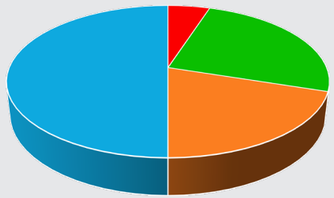


The National Institute of Health sets the standards for being a nationally recognized center. To be competitive for this grant, it is important to maintain a research base. The current active research base for Diabetes Research is $19.9 million in which 83% has been secured with federal grants.

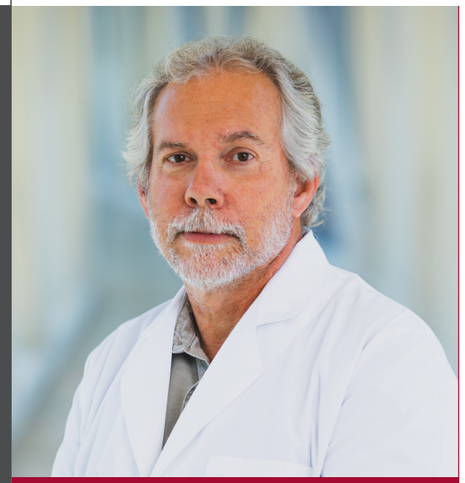
Research Funding Goals over the next 5 years

- We continue to increase the Diabetes Center Research base at OUHSC by adding new faculty and growing collaborations, with an emphasis on team science between departments, and campuses locally and nationwide. Growing our funding base in diabetes will help the HHDC qualify for submission of an NIH-Diabetes Research and Education Center grant in the near future.
- We will provide greater resources and incentives to grow our clinical research center.
- Our campus-wide strategic plan includes a top-down clinical and research mission focused on diabetes. This includes significantly expanding research partnerships with pharmaceutical, biotechnology, medical device, and other healthcare companies.

HHDC Members Research Focus:



$1.0M Type 1 Diabetes
$5.0M Type 2 Diabetes
$4.0M Complications
$9.9M Obesity



KEN JONES, PH.D.

Harold Hamm Endowed Chair in Clinical Diabetes Research

HHDC Director for Bioinformatics and Director, Laboratory for Molecular Biology and Cytometry Research

Associate Professor, Department of Cell Biology
Director, Laboratory for Molecular Biology and Cytometry Research

"As faculty of the HHDC, my mission is to educate and disseminate knowledge of high-throughput technologies to the scientific community. My goal is to help scientists select the right technology and methodology to ensure successful research."

CORE RESEARCH FACILITIES

HHDC has exponentially grown new centralized shared resources for diabetes researchers, including core facilities, equipment, personnel, capital facilities, and symposia. HHDC occupies approximately 25,000 square feet of bench laboratory space, exclusive of animal facilities, with additional space available as needed. HHDC has funded over $3 million in equipment grants that give the center's members access to the most advanced, up-to-date technological innovations to further their work. Examples include high throughput sequencers, single cell microfluidics, cyTOF flow cytometry, and an expanded Metabolomics core.

With the recruitment of **Dr. Ken Jones,** HHDC has added an important informatician to the HHDC. Dr. Jones is the Director of the Laboratory for Molecular Biology and Cytometry Research that includes state of the art transcriptomic analysis for single cell RNA and DNA analysis. The recent shift from bulk data in genetics to individual single cellular profiles have unveiled how diverse cellular populations can be examined for how they apply data from numerous individual cells within physiological and pathological contexts to better understand mechanisms of health and disease. HHDC also houses a Biostatistics, Epidemiology, and Research Design Core; the College of Pharmacy Research Imaging Facility; BSL2 Rodent Barrier Facility; Mass Spectrometry and Proteomics, DNA Sequencing and Genomics, and Flow Cytometry and Imaging facilities, and a new Center for Drug Discovery.

In addition, 3 core facilities to facilitate diabetes research have been developed through the NIH-funded Mentoring Diabetes Research in Oklahoma CoBRE grant.

- Diabetic Animal Core
- Histology, Image Acquisition and Image Analysis Core
- Diabetic Human Sample Repository

THE HAMM PRIZE

HHDC promotes advances in the field of diabetes internationally through its awarding of the $250,000 Harold Hamm International Prize for Biomedical Research in Diabetes, the largest diabetes research award in the world. Many refer to the Hamm Prize as the "Nobel Prize in Diabetes" for recognizing the significant advancements toward a cure for diabetes.

The Hamm Prize is awarded biennially to an individual or research team who has either demonstrated lifelong contributions to the field or realized a singular advance. Each Prize cycle includes an open nominations process. Prize laureates are selected by an international jury of leading diabetes scientists, convened by HHDC in the spring of every odd-numbered year. HHDC honors each laureate with a reception at the American Diabetes Association Scientific Sessions, held in a major city, and with an invitation to present the Hamm Lecture in Oklahoma City. The Prize is officially conferred at HHDC's Connect+Cure Gala. COVID-19 prevented a 2021 Gala. The Hamm Prize will be presented to Professor Andrew Hattersley at a later date.

HAMM PRIZE LAUREATES

2021

Andrew T. Hattersley, CBE, FMedSci, FRS
University of Exeter Medical School, U.K.

2019

Daniel J. Drucker, M.D.
Lunenfeld-Tanenbaum Research Institute,
Mt. Sinai Hospital,
University of Toronto in Ontario, Canada

2017

Ralph A. DeFronzo, M.D.
University of Texas Health Science Center

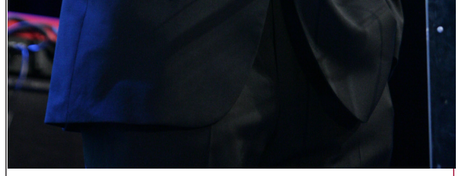
2015

C. Ronald Kahn, M.D.
Joslin/Harvard

2013

Peter H. Bennett, M.B., Ch.B., F.R.C.P., F.F.P.H.
NIDDK/NIH

Held biennially in the fall, HHDC's Connect+Cure Gala is among Oklahoma's largest events benefiting the health sciences. Billed as "a celebration of progress toward a cure for diabetes," the occasion attracts nearly 1,000 of Oklahoma's most influential people and features a nationally known guest emcee and topflight entertainment. Our 2019 gala netted over $1.1 million in philanthropic support.



RESEARCH EVENTS

HHDC Research Symposium | A day of scientific talks and posters presented by faculty, students, and three visiting keynote speakers. Held annually in the fall.

Hamm Lecture in Diabetes Research | A presentation by the current laureate of the Hamm Prize. Held biennially (odd-numbered years) in October.

Hamm Prize Jury Symposium | This day of lectures features distinguished members of the Selection Jury for the Hamm Prize. Held biennially (odd-numbered years) in the spring.

HHDC Lecture Series | Visiting experts from across the globe are invited to present talks on the OUHSC campus.

HHDC Metabolic Research Conference | A series of symposia with outside presenters on diabetes-related topics. Held bimonthly on an academic calendar.

Henry Turner Lecture | Established to honor Henry Turner, an OUHSC researcher known for identifying Turner Syndrome, a chromosomal condition that increases the likelihood of developing diabetes.

Kelly West Lecture | Named in honor of OUHSC researcher Kelly West, recognized internationally as the "father of diabetes epidemiology."

VISITING PROFESSORSHIPS

Jack and Evelyn Trachtenberg Visiting Professorship | Established by a gift from the Larry and Mary Trachtenberg family

Macy Nigh Whitener Visiting Professorship | Established through a gift from Oklahoma governor and first lady George and Donna Nigh, named for their granddaughter who has diabetes

Kenneth C. Copeland Visiting Professorship | Named to honor Kenneth Copeland, who served as the director of HHDC–Children's, vice chair of University of Oklahoma College of Medicine Department of Pediatrics, and chief of the Section of Pediatric Diabetes and Endocrinology

above
Dr. Jed Friedman presenting at the 2019 Harold Hamm Research Symposium. Due to COVID, the 2020 & 2021 Research Symposiums were virtual.

left
Poster presentations are an annual highlight of our Research Symposium and provide junior researchers with valuable feedback on their work.

CLINICAL TRIALS

HHDC conducts clinical trials for all ages of participants in Oklahoma City, Tulsa, and at partner sites across Oklahoma. Studies range from original investigations within HHDC, to NIH studies, to international pharmaceutical trials at various phases. Volunteer recruitment is mostly decentralized to meet the needs of the study at hand and the population desired. Our flagship building houses a large Adult Clinical Trials suite on its ground floor. We actively invite patients and other adults in the community to join a volunteer registry, which our personnel uses to recruit participants based on eligibility metrics. Most of our pediatric clinical trials emanate from our Pediatric Metabolic Research Program adjacent to our children's clinic and pediatric laboratories. Patients are recruited primarily though our pediatric clinic in Oklahoma City as well as partner sites across the state. We are members of the Type 1 Diabetes Exchange and the Pediatric Diabetes Consortium.

HHDC houses the OUHSC Oklahoma Clinical and Translational Science Institute (OCTSI) to provide institutional support and oversight of clinical trials. The HHDC Clinical Research Unit within the OCTSI is active in diabetes clinical trial studies.

A clinical study of particular note is our Wavelengths program. Wavelengths eases the transition from pediatric to adult care for young adult patients (15–25) with diabetes. The program coordinates clinical care, educates families, and provides for peer interactions. The data collected in Wavelengths provides valuable insight that could lead to better diabetes self–management and support of young adults with diabetes.

RESEARCH AT THE ROOT

HHDC's mission has "research at the root," but it is also comprehensive of patient care, diabetes prevention in the community, and professional education. We aspire to excellence in each of these areas.

Patient Care | In our adult clinic (Oklahoma City), board-certified endocrinologists lead a multidisciplinary team that includes certified diabetes educators, nurse practitioners, medical device training specialists and dietitians. HHDC has two pediatric diabetes and endocrinology clinical practices, one in Oklahoma City and one in Tulsa, caring for children and adolescents. Our pediatric team provides multidisciplinary care in the same areas of the adult practice, with an added behavioral health component staffed by a psychologist. This team also provides the medical staff for Camp Blue Hawk, an annual residential summer camp for children ages 9-16 with type 1 diabetes. Our clinical care network provides referrals for behavioral health, eye care, dental care, and bariatric surgery, among other services, as part of a closely managed diabetes care plan individualized to each patient. HHDC clinicians also provide outpatient care specifically to American Indian partners at several tribal nation clinics throughout the state.

Diabetes Prevention | The National Diabetes Prevention Program, managed by the Centers for Disease Control and Prevention, is a curriculum proven to cut adults' type 2 diabetes risk by more than half. HHDC is fully certified by the CDC to offer the program, and we offer it to Oklahoma City metro-area residents at a discount, thanks to targeted philanthropic support. The center employs a healthy lifestyles coach to lead the program.

above
Healthy Lifestyle Coach Beth Goetz leads a class of participants for the National Diabetes Prevention Program.

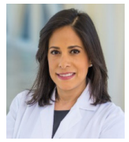
below
Audience members listen to the keynote speaker at the Harold Hamm Diabetes Care Summit. *(Picture taken before COVID)*

Professional Education | The Harold Hamm Diabetes Care Summit, held annually in the fall, is the Oklahoma region's premier continuing-education conference for diabetes. The Summit is among the region's largest healthcare conferences generally, attracting some 300 physicians, nurses, dietitians, diabetes educators, and other professionals from Oklahoma and beyond. The Summit's curriculum explores the latest clinical guidelines and best practices, with updated clinical approaches for diabetes patient management and interprofessional strategies for diabetes self-care and education. Our 2021 Summit was co-sponsored by the Association of Diabetes Care & Education Specialists. HHDC's other lectures and symposia also attract a range of biomedical professionals from the community.

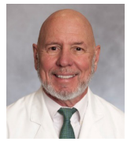
Nutrition as Medicine | Nutrition is at the heart of diabetes prevention and may also play a role in diabetes reversal. In fact, Food as Medicine is a major focus of prevention at OU-Tulsa. Dr. Marianna Wetherill is at the forefront of designing diets that achieve just that. Through her community-based participatory research study NOURISH OK, she is working with a key community partner, Tulsa CARES, to explore strategies for lowering diet-associated inflammation and its associated impact on insulin resistance among people living with HIV, who are at higher risk for diabetes. Through her involvement with the OU Culinary Medicine Program, she also led development of a First 1,000 Days online nutrition curriculum for expecting mothers and families with small children, designed to address key micronutrient and dietary fiber gaps common in pregnancy through age 2. These assets will be featured on the HHDC website for use by patients and providers. Also with the OU Culinary Medicine teaching team, she delivers culinary medicine modules in "food as medicine" for diabetes to OU-Tulsa medical students, physician assistant students, and OUHSC dietetic interns. In 2021, she advised healthcare and philanthropic organizations operating in Delaware and Kansas in the design of food as medicine interventions for patients with type 2 diabetes, hypertension, and high-risk pregnancies. As a member of the Food is Medicine Advisory Board of the Food and Society Program at the Aspen Institute, she contributed to the "Food is Medicine Research Priorities Action Plan", which details critical gaps and strategic research priorities for national stakeholders that was published in January 2022.

CORE RESEARCH FACULTY

Joni Beck, Pharm.D., B.C.-A.D.M., C.D.C.E.S.
CLINICAL PROFESSOR, PEDIATRIC DIABETES AND ENDOCRINOLOGY
Research interests include pediatric diabetes, young adult transition services and evaluation of diabetes education and program development.



Marisol Castillo-Castrejon, Ph.D.
ASSISTANT PROFESSOR OF RESEARCH, PATHOLOGY
Her research focuses on the role of the immune system in the development of obesity and dysregulated metabolism across the lifespan.



Steven D. Chernausek, M.D.
CHF EDITH KINNEY GAYLORD ENDOWED RESEARCH CHAIR, EMERITUS
CLINICAL PROFESSOR, PEDIATRIC DIABETES AND ENDOCRINOLOGY
DIRECTOR OF METABOLIC RESEARCH PROGRAM, SECTION CHIEF
His research interests include the hormonal control of growth and the metabolic effect of fetal growth retardation. His group is also studying epigenetic factors in diabetes.

Michael Elliott, Ph.D.
ASSOCIATE PROFESSOR, OPHTHALMOLOGY
He is studying regulation of the blood-retinal barrier and novel modulators of ocular inflammatory responses in diabetic retinopathy.

Jolyn Fernandes, Ph.D.
ASSISTANT PROFESSOR, PEDIATRIC NEONATAL-PERINATAL MEDICINE
ASSOCIATE DIRECTOR OF METABOLOMICS
Her research focuses on diverse approaches to identify key pathways that associate pre- and postnatal environmental exposures with offspring disease susceptibility.

David Fields, Ph.D.
CHF CHICKASAW NATION ENDOWED CHAIR
ASSOCIATE PROFESSOR, PEDIATRIC DIABETES AND ENDOCRINOLOGY
His research is to understand the role of modifiable gravid maternal factors (e.g. diet, physical activity, diabetes, obesity and mode of feeding) on the development of their offspring's fat and lean mass in the first month of life and the subsequent influence on future disease risk in childhood, adolescence and adulthood.

Laura Fischer, M.D.
ASSISTANT PROFESSOR, SURGERY
MEDICAL DIRECTOR OF THE METABOLIC AND BARIATRIC SURGERY PROGRAM
Her main research interest is investigating the link between obesity and cancer. She also performs translational and clinical research in inflammation, gut hormones and the microbiome, laparoscopic and robotic education and simulation, as well as patient outcomes after weight-loss surgery.

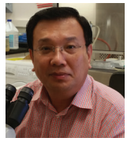
Willard Freeman, Ph.D.
MEMBER, GENES & HUMAN DISEASE RESEARCH PROGRAM – OKLAHOMA MEDICAL RESEARCH FOUNDATION
His research focuses on Epigenetics of early nutrition in gut and brain, and includes mitochondrial dysfunction in complications of diabetes.

Jed Friedman, Ph.D.
DIRECTOR, HAROLD HAMM DIABETES CENTER
ASSOCIATE VICE-PROVOST FOR DIABETES PROGRAMS, CHICKASAW NATION ENDOWED CHAIR
PROFESSOR OF PHYSIOLOGY, PEDIATRICS, DIVISION OF ENDOCRINOLOGY AND METABOLISM, BIOCHEMISTRY & MOLECULAR BIOLOGY
His research focuses on the causes and consequences of maternal obesity and Gestational Diabetes Mellitus (GDM) on the development of fetal metabolic systems particularly the mechanisms driving Obesity and Non-Alcoholic Fatty Liver Disease (NAFLD) at the molecular, endocrine, and epigenetic levels.

Randle Gallucci, Ph.D.
PROFESSOR, PHARMACEUTICAL SCIENCES
His research areas include IL6 signaling and its role in diabetes wound healing delay.

Minu George, M.D.
ASSOCIATE PROFESSOR, PEDIATRIC DIABETES AND ENDOCRINOLOGY
CLINICAL PROGRAMS DIRECTOR
OUTPATIENT CLINIC DIRECTOR
His research interests include the prevention of obesity in childhood, metabolic syndrome, and diabetes mellitus types 1 and 2.

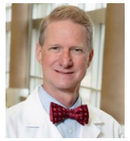
Qing Guo, M.D., Ph.D.
PROFESSOR, PHYSIOLOGY
His lab is studying pathogenesis of retinal fibrosis in diabetic nephropathy and identifying therapeutic targets.



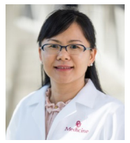
Norman Hord, Ph.D., M.P.H., R.D.
PROFESSOR AND CHAIR, NUTRITION
His research focuses on diet-related risk factors for cardiovascular disease, diabetes and cancer, specifically, dietary nitrate and nitrite in the prevention and treatment of disease.

Amanda Janitz, Ph.D., M.P.H., B.S.N.
ASSISTANT PROFESSOR, BIOSTATISTICS AND EPIDEMIOLOGY
Her research interests are diabetes/obesity and cancer. She is currently working with Native American Tribes to evaluate the impact of diabetes on breast cancer survival.

David Jelley, M.D.
HILLE CHAIR IN DIABETES
PROFESSOR, OU SCHOOL OF COMMUNITY MEDICINE-TULSA
His research focuses on management of children with type 1 diabetes, and works with TrialNet and the Type 1 Diabetes Exchange.



Shaoning Jiang, Ph.D.
ASSISTANT PROFESSOR OF RESEARCH, PEDIATRIC DIABETES AND ENDOCRINOLOGY
Her research interests include DNA methylation and miRNAs in epigenetic regulation of metabolic disorders during development of adipose tissue and the placenta.

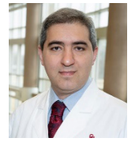


Emily J. Jones, Ph.D., R.N.C.-O.B., F.A.H.A., F.P.C.N.A.
ASSOCIATE PROFESSOR, NURSING
Dr. Jones is a nurse scientist who conducts type 2 diabetes and cardiovascular disease prevention-focused community-based participatory research in partnership with the Chickasaw Nation.

Kenneth Jones, Ph.D.
HAMM CHAIR IN CLINICAL DIABETES RESEARCH
ASSOCIATE PROFESSOR, CELL BIOLOGY
His research interests include the design, implementation, and analysis of next-generation sequencing data applied to diabetes in tissues and cells from humans and animal models. He is also researching the role of coagulation pathways in the liver.

Karen Jonscher, Ph.D.
ASSOCIATE PROFESSOR, BIOCHEMISTRY AND MOLECULAR BIOLOGY
Her research seeks to understand why a mother's obesity primes her child in utero to increase risk for developing metabolic disease in later life and how a novel antioxidant, pyrroloquinoline quinone (PQQ), acts to protect metabolic health.

Adi Joshi, Ph.D.
ASSISTANT PROFESSOR, PHARMACEUTICAL SCIENCES
His research focuses on understanding Aryl hydrocarbon Receptor (AhR) signaling in normal liver physiology, as well as in plethora of hepatic and metabolic diseases.

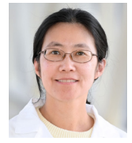


Zhamak Khorgami, M.D.
ASSISTANT PROFESSOR, OU SCHOOL OF COMMUNITY MEDICINE-TULSA
His research is focused on the outcomes of metabolic and bariatric surgery, the impact of obesity on healthcare, and minimally invasive surgical techniques.

Sowmya Krishnan, M.D.
ASSOCIATE PROFESSOR, PEDIATRIC DIABETES AND ENDOCRINOLOGY
FELLOWSHIP PROGRAM DIRECTOR
Her research focus is on bone health in children with diabetes and other chronic medical conditions.

Yun Le, Ph.D.
HAROLD HAMM CHAIR IN DIABETES RESEARCH
PROFESSOR, ENDOCRINOLOGY AND DIABETES
His research interests include breakdown of the blood-retina barrier and alteration and degeneration of retinal neurons in diabetic retinopathy using conditional gene knockout mice.

Tiangang Li, Ph.D.
HAROLD HAMM CHAIR FOR ADULT DIABETES RESEARCH
ASSOCIATE PROFESSOR, PHYSIOLOGY
His research interests are diabetes and non-alcoholic fatty liver disease (NAFLD) and many other chronic liver diseases.



Hui-Ying Lim, Ph.D.
ASSISTANT PROFESSOR, PHYSIOLOGY
Her research interests are novel heart factors and their molecular signaling mechanisms on cardiac physiology and energy metabolism.

Jonea Lim, M.D.
ASSOCIATE PROFESSOR, ENDOCRINOLOGY AND DIABETES
ASSOCIATE FELLOWSHIP DIRECTOR, MEDICAL DIRECTOR OF CLINICAL TRIALS UNIT
Her research interests include Phase III clinical trials for diabetes and pituitary disorders.

Sydney Martinez, Ph.D., M.P.H.
ASSISTANT PROFESSOR, BIOSTATISTICS AND EPIDEMIOLOGY
Her research primarily focuses on addressing health disparities related to tobacco, cancer, and diabetes.

Benjamin Miller, Ph.D.
MEMBER, OKLAHOMA MEDICAL RESEARCH FOUNDATION
His research studies aging and the lifespan, specifically how to maintain muscle, which is important for maintaining independence and a healthy metabolism.

Gennadiy Moiseyev, Ph.D.
ASSISTANT PROFESSOR OF RESEARCH, ENDOCRINOLOGY AND DIABETES
His research interests include deficient vitamin A metabolism in visual impairment in diabetic retinopathy.

Dean Myers, Ph.D.
JOHN W. RECORDS CHAIR IN MATERNAL-FETAL MEDICINE
PROFESSOR, OBSTETRICS AND GYNECOLOGY
ASSOCIATE VICE PRESIDENT FOR RESEARCH
His research seeks to identify the mechanisms through which maternal obesity and diet during pregnancy program the developing fetus leading to a constellation of adverse effects on physiological organs regulating metabolism, immune response and critically brain function in the offspring.

Katherine S. O'Neal, Pharm.D., M.B.A., B.C.A.C.P., C.D.C.E.S., B.C.-A.D.M., A.E.-C., C.L.S., F.A.A.D.E.
ASSOCIATE PROFESSOR, PHARMACY: CLINICAL & ADMINISTRATIVE SCIENCES
Her research interest centers around raising awareness and disseminating knowledge of topics that will ultimately empower patients for self-management of diabetes and other chronic health conditions while using health literacy sensitive principles.

Ann L. Olson, Ph.D.
EDITH KINNEY GAYLORD FOUNDATION PRESIDENTIAL PROFESSOR
PROFESSOR, BIOCHEMISTRY AND MOLECULAR BIOLOGY
The major research focus is insulin action and GLUT4 function in adipose tissue and muscle. Specifically, her lab is studying the molecular mechanisms that underlie GLUT4 transcriptional control, and gene regulation in adipose tissue.

Chongle Pan, Ph.D.
ASSOCIATE PROFESSOR, MICROBIOLOGY AND PLANT BIOLOGY, AND COMPUTER SCIENCE – OU NORMAN
His research is focused on knowledge discovery from big -omics data and predictive understanding of complex biological systems.

Sirish Palle, M.D.
ASSOCIATE PROFESSOR, PEDIATRIC GASTROENTEROLOGY
MEDICAL DIRECTOR FOR PEDIATRIC LIVER TRANSPLANT PROGRAM - CHILDREN'S HOSPITAL OF OKLAHOMA
His research is focused on the treatment of liver disorders in children, particularly pediatric Non-Alcoholic Fatty Liver Disease (NAFLD).

Jennifer Peck, Ph.D.
PROFESSOR AND VICE CHAIR, BIOSTATISTICS AND EPIDEMIOLOGY
Her research focuses on reproductive and perinatal epidemiology with an interest in the role of environmental chemical exposures on maternal metabolic disorders and child development.

Raju Rajala, Ph.D.
M.G. MCCOOL CHAIR IN OPHTHALMOLOGY
EDITH KINNEY GAYLORD PRESIDENTIAL PROFESSOR
PROFESSOR, OPHTHALMOLOGY
His research interests include function and regulation of insulin receptors and insulin signaling proteins in the retina.

Michael Rudolph, Ph.D.
CHOCTAW NATION CHAIR IN ADULT ENDOCRINOLOGY
ASSISTANT PROFESSOR, PHYSIOLOGY
His research investigates how maternal derived fatty acids (especially from mothers with metabolic dysfunction) might condition neonatal adipogenesis and future obesity risk.

Dharambir K. Sanghera, Ph.D.
PROFESSOR, PEDIATRIC GENETICS
Her research focuses on the interplay between environmental and genetic factors involved in type 2 diabetes, obesity, and cardiovascular disease pathogenesis.

Kevin Short, Ph.D.
CHF CHOCTAW NATION ENDOWED CHAIR
ASSOCIATE PROFESSOR, PEDIATRIC DIABETES AND ENDOCRINOLOGY
His research is to identify the most effective lifestyle approaches to prevent or reverse the cardiometabolic risk in children and young adults with an emphasis on Non Alcoholic Fatty Liver Disease (NAFLD).

Susan Sisson, Ph.D.

SAM K. VIERSEN FAMILY FOUNDATION PRESIDENTIAL PROFESSOR
ASSOCIATE PROFESSOR, NUTRITIONAL SCIENCES
CHAIR, DEPARTMENT OF ALLIED HEALTH SCIENCES
Her research interests include the influence of the physical and social environment on food consumption and physical activity behaviors and the impact of sedentary lifestyle on chronic diseases such as obesity in young children.

Kruti Shah, M.D.

ASSISTANT PROFESSOR, PEDIATRIC DIABETES AND ENDOCRINOLOGY
Her research interest is human milk exosomal microRNAs and associations with maternal Overweight/Obesity and Infant Body Composition in infants.

David Sparling, M.D., Ph.D.

CHF PAUL AND ANN MILBURN CHAIR IN PEDIATRIC DIABETES
ASSISTANT PROFESSOR AND VICE-CHAIR, PEDIATRIC DIABETES AND ENDOCRINOLOGY
ASSOCIATE SECTION CHIEF
His research focuses on both diagnosis and management of children with type 1 diabetes as the site PI for TrialNet, as well as examining the role of adipocytes in inflammation.

Michael Stout, Ph.D.

ASSOCIATE MEMBER, AGING AND METABOLISM RESEARCH PROGRAM – OKLAHOMA MEDICAL RESEARCH FOUNDATION
His research is to understand how metabolic disturbances such as obesity, dyslipidemia, and diabetes can promote the aging process and the onset of multimorbidity in brain and liver.

Yusuke Takahashi, Ph.D.

ASSOCIATE PROFESSOR OF RESEARCH, ENDOCRINOLOGY AND DIABETES
He is studying the role of miRNAs in pathogenesis of retinal inflammation and neovascularization in diabetic retinopathy.

Trent Tipple, M.D.

PROFESSOR, PEDIATRIC NEONATAL-PERINATAL MEDICINE
CHF REBA MCENTIRE ENDOWED CHAIR, SECTION CHIEF
His research interests are to improve the prevention, diagnosis and treatment of life-threatening neonatal diseases, specifically redox biology, lung development and lung injury/repair.

Jeanie Tryggestad, M.D.

PAUL AND RUTH JONAS CHAIR IN DIABETES
ASSOCIATE PROFESSOR, PEDIATRIC DIABETES AND ENDOCRINOLOGY
Her research interests include microRNAs in obesity, type 2 diabetes (especially in Native American populations), and vascular function in obesity and type 2 diabetes.

Archana Unnikrishnan, Ph.D.

CHICKASAW NATIONS ENDOWED SCHOLAR
ASSISTANT PROFESSOR, BIOCHEMISTRY AND MOLECULAR BIOLOGY
Her research focuses on various aspects of Aging, (1) the effect of dietary restriction on aging and insulin sensitivity, (2) the effect of dietary restriction on DNA methylation, and (3) the role played by DNA methylation in dietary restriction mediated metabolic/cellular memory.

Weidong Wang, Ph.D.

ASSOCIATE PROFESSOR, ENDOCRINOLOGY AND DIABETES
One of his research areas is to generate pancreatic beta cells from humans induced pluripotent stem cells and develop an autologous cell-based therapy to replenish insulin-producing β-cells for the purpose of treating T1DM.

Ashley E. Weedn, M.D., M.P.H., F.A.A.P.

ASSOCIATE PROFESSOR, GENERAL AND COMMUNITY PEDIATRICS
Her research interest is in early childhood obesity prevention, and she works with clinicians across the state and the Chickasaw Nation on both clinical and research initiatives to improve child health outcomes.

Liz Wellberg, Ph.D.

ASSISTANT PROFESSOR OF RESEARCH, PATHOLOGY
Her research focuses on the mechanisms through which obesity promotes breast cancer relapse and progression, and also on the metabolic effects of estrogen deprivation that occur with endocrine (anti-estrogen) therapy.

Jian Xu, Ph.D.

ASSOCIATE PROFESSOR, ENDOCRINOLOGY AND DIABETES
His research interests include endothelial dysfunction in diabetes, specifically, mechanisms underlying the endothelial regulation of metabolic disorders, focusing on the role of the ubiquitin-proteasome system in diabetes.

Xichun Yu, M.D.

PROFESSOR OF RESEARCH, ENDOCRINOLOGY AND DIABETES
He is studying GRK2 and proteasome dysregulation in myocardial ischemia and altered autonomic signaling in diabetic cardiomyopathy.

Xin Zhang, M.D., Ph.D.

PROFESSOR, PHYSIOLOGY
His research interests include dysregulated adhesion molecules in impaired podocyte adhesion and podocyte injury in diabetic nephropathy.

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The Bricktown canal, pictured above, is a popular downtown destination for tourists and locals alike. This thriving urban district is home to more than 45 restaurants, bars, and retail shops, along with family-friendly attractions, public art, museums, galleries, and even an urban beach for summer fun. The diversity of businesses, educational institutions, housing and leisure activities in this area make it a true 24/7 destination, one of the most distinct and historic in OKC.

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