BUILDING BETTER Babies

WEDNESDAY MAY 31, 2017
8 am–5 pm
Krugman Conference Hall & Hensel Phelps Auditorium West
CU–Anschutz Medical Campus
The prevailing paradigm has been that disease is largely caused by an interaction between genes and lifestyle. However, the Developmental Origins of Health and Disease (DOHaD) concept, now widely accepted based on strong epidemiological evidence and studies in animal models, supports that major chronic diseases, including neuropsychiatric disorders, diabetes, obesity, allergies, cardiovascular and lung disease, have their origins in utero and early childhood. This transformative discovery has profound public health consequences and will likely change the way we practice medicine. To curb the current epidemic of non-communicable diseases such as cardiovascular disorders, obesity and diabetes, primary prevention prior to conception, during pregnancy, and/or in early infancy is critical and is likely to be a powerful and cost-efficient form of intervention. However, therapeutic advances in this field have been limited.

Investigators at University of Colorado Anschutz Medical Campus (CU-AMC) are recognized as leaders in this research field. The developmental origins of adult disease concept spans all research and clinical disciplines, necessitates a life span perspective and requires a focus on sex differences in disease susceptibility. The Building Better Babies Program, initiated by 60 individual investigators in the fall of 2015, is a transformative and multidisciplinary initiative at the CU-AMC, with the short-term objective to establish an interactive network to integrate researchers and care providers across disciplines and schools to stimulate collaboration and exchange of ideas. The long-term objective of the Program is to promote the development of new, effective and safe primary prevention strategies to eliminate early life origins of chronic disease, thereby improving the health of the next generation in Colorado, the nation and the world.

The organization of a Building Better Babies Symposium May 31, 2017 at the CU-AMC is one of the first deliverables of the Program. The overall goal of the symposium is to highlight the critical importance of the DOHaD concept for a better understanding of life long health and adult disease and to discuss how mechanistic links between an adverse early life environment and later disease can be exploited to develop novel intervention strategies in pregnant women and infants. The specific objectives of the symposium are to empower and inspire CU-AMC scientists and clinicians across career stages, disciplines and schools, to showcase existing strengths on our campus in the area of developmental origins of health and adult disease, to catalyze new collaborations and ideas, to review some key mechanisms underpinning early life origins of disease, to explore emerging novel intervention approaches, to discuss the impact of the DOHaD perspective on personalized medicine, health care organization and health care costs and to help develop the future agenda of the Building Better Babies Program.

We hope that the Building Better Babies Symposium will excite, intrigue and motivate you!

Symposium Organizing Committee:

Steven Abman, MD
Linda Barbour, MD
Dana Dabelea, MD, PhD
Jed Friedman, PhD
Teresa Harper, MD
William W. Hay, MD
Thomas Jansson, MD, PhD
Theresa Powell, PhD
Judy Regensteiner, PhD
Nanette Santoro, MD
IN MEMORIAM

Randy Ross, MD

Randy Ross was the nucleus around which the idea of the Building Better Babies Program was formed and he was instrumental in getting the program started. Randy Ross loved children and child psychiatry. He came to Colorado from Seattle in 1993 to join our Schizophrenia Center. He had a strong interest in childhood psychosis and wanted to learn how we approached the genetics of adult schizophrenia. As Danny Pine of the National Institute of Mental Health said about him, “Randy was one of the few good ones, who saw that child psychiatry needed to seek better science.” He asked community pediatricians to send him children who were not responding to stimulants, whom he then diagnosed as psychotic. Suddenly, we had 50 children with schizophrenia, more than the world’s known prevalence of what was thought then to be an exceedingly rare illness and Randy went on to help hundreds of seriously ill children in Colorado.

For 23 years, I and many of you were privileged to work side by side with Randy as clinicians, teachers, and researchers. We learned that he was extremely bright, curious, and empathic, that he loved to be confrontational, and that he always had time to help and teach another, and never failed to listen.

Randy became increasingly interested in early fetal development, as he traced the origins of schizophrenia back to conception itself. His clinical trials of intervention in pregnancy were recognized as ground breaking in editorials for New England Journal of Medicine and Psychiatry Journal Watch by leading child psychiatrists including Barbara Geller. He was working on a paper confirming his findings when he died. His work will go on, however, with his colleagues at the University following the path he laid for us.

Great physicians seem to die of their own illness, and Randy himself died of an early developmental issue with his heart that was diagnosed when he came to Colorado. For the next 23 years he was treated here and endured constant issues and procedures that would have stopped a lesser man. He was awaiting a heart transplant when he fell, suffering a massive cerebral hemorrhage. He died in his wife Melissa’s arms with his three children by his side, as he had hoped it would end. We are left with times to smile when we remember him, and times of sadness when we miss him.

~ Robert Freedman
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<th>Time</th>
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<tr>
<td>8–8:25 am</td>
<td>Light Breakfast and Registration</td>
<td>Outside Hensel Phelps Auditorium West</td>
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<td>8:25–8:35 am</td>
<td>Welcome and Introduction</td>
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<td><strong>Thomas Jansson, MD, PhD</strong></td>
<td>SOM, CU-Anschutz Medical Campus</td>
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<td>8:35–8:40 am</td>
<td>In Memoriam Randy Ross, MD</td>
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<td><strong>Camille Hoffman, MD</strong></td>
<td>SOM, CU-Anschutz Medical Campus</td>
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<td>8:40–8:50 am</td>
<td>Opening Remarks</td>
<td>Hensel Phelps Auditorium West</td>
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<td><strong>Dean John J. Reilly Jr., MD</strong></td>
<td>SOM, CU-Anschutz Medical Campus</td>
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**SESSION 1**

**MODERATORS:** William W Hay, MD and K. Joseph Hurt, MD

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<tr>
<td>8:50–9:20 am</td>
<td><strong>Keynote Lecture 1</strong></td>
<td>Hensel Phelps Auditorium West</td>
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<td><em>Why Building Better Babies Matters</em></td>
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<td><strong>Mark Hanson, PhD</strong></td>
<td>University of Southampton, United Kingdom</td>
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<td>9:20–9:50 am</td>
<td><strong>Keynote Lecture 2</strong></td>
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<td><em>Chorioamnionitis: A Complex Confounder of Perinatal Outcomes</em></td>
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<td><strong>Alan Jobe, MD</strong></td>
<td>Cincinnati Children’s Hospital Medical Center Cincinnati, OH</td>
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<td>9:50–10:15 am</td>
<td><strong>Break</strong></td>
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SESSION 2

MODERATORS: Nanette Santoro, MD and Sarah Borengasser, PhD

10:15–10:45 am  **Keynote Lecture 3**  
_Distinguishing Causal Intrauterine Effects from Non-Causal Association_  
Debbie Lawlor, PhD  
University of Bristol, United Kingdom  
Hensel Phelps Auditorium West

10:45–11:15 am  **Keynote Lecture 4**  
_Fetal Programming of Sex Differences in the Brain: Shared Impact on Disorders of Mood, Heart and Memory_  
Jill M. Goldstein, PhD  
Harvard University, Cambridge, MA  
Hensel Phelps Auditorium West

11:15 am–12 pm  **Lunch**  
Meet-the Keynote Speaker for Lunch for In-training Investigators  
Krugman Conference Hall

12–1:15 pm  **Poster Session**  
Krugman Conference Hall and lobby
SESSION 3

MODERATOR: Theresa Powell, PhD

1:15–1:45pm  **Keynote Lecture 5**  
*Building the Next Generation of Babies in Oregon*  
Kent Thornburg, PhD  
Oregon Health Science University, Portland, OR

1:45–2:30 pm  **Panel Discussion**  
*How Does The Building Better Babies Concept Influence How We Practice Medicine, How We Organize Health Care and Build Our Future Society?*

Led by:  
Kent Thornburg, PhD  
Oregon Health Science University, Portland, OR

Panel Members:  
Will Cook  
President and Chief Executive Officer, University of Colorado Hospital  

Mark Hanson, PhD  
University of Southampton, United Kingdom  

Daniel Hyman, MD  
Chief Medical and Patient Safety Officer, Children's Hospital Colorado  

Scott D. Matthews, MSW, MHA  
Regional Maternal/Child Health Director, March of Dimes  

Judy Regensteiner, PhD  
SOM, CU-Anschutz Medical Campus
SESSION 4

MODERATORS: Linda Barbour, MD and Stephanie Wesolowski, PhD

WOMENS HEALTH

2:30–2:45 pm  *The Impact of Obesity on Fertility and Conception: It Starts in the Brain, But Where Does It End?*
Nanette Santoro, MD
SOM, CU-Anschutz Medical Campus

*High Fat Diet-Induced Ovarian Dysfunction: Can it Have an Impact on Future Pregnancies?*
Malgorzata E. Skaznik-Wikiel, MD
SOM, CU-Anschutz Medical Campus

MENTAL HEALTH

2:45–2:55 pm  *Potential Prenatal Interventions to Change the Trajectory of Adverse Fetal-Child Neurodevelopment*
Camille Hoffman, MD
SOM, CU–Anschutz Medical Campus

LEAD CENTER/EPIEMDIOLOGY

2:55–3:15 pm  *A Lifecourse Approach to Pediatric Obesity and Diabetes*
Dana Dabelea, MD, PhD
School of Public Health–CU-Anschutz Medical Campus

*Environmental Chemical Exposures During Pregnancy and Infant Adiposity and Growth–The Healthy Start Study*
Anne Starling, PhD
CU-Anschutz Medical Campus–School of Public Health

3:15–3:35 pm  Refreshments

Outside Hensel Phelps Auditorium West
SESSION 5

MODERATOR: Teresa Harper, MD and Ramón Lorca, PhD

METABOLISM

3:35–3:55 pm  New Tools to Understand Pathways for Programming Infant Metabolism in Mouse, Monkey, and Man
Jed Friedman, PhD
SOM, CU-Anschutz Medical Campus

Maternal Obesity Alters Fat Metabolism and DNA Methylation in Stem Cells from Human Infants
Kristen Boyle, PhD
SOM, CU-Anschutz Medical Campus

PLACENTA

3:55–4:15 pm  Targeting Placental Function to Treat Pregnancy Complications and Prevent Fetal Programming: The Adiponectin Example
Thomas Jansson, MD, PhD
SOM, CU-Anschutz Medical Campus

The Placental Vasculature: A Building Block to a Better Baby
Emily Su, MD
SOM, CU-Anschutz Medical Campus

GENE THERAPY

4:15–4:30 pm  Placental Gene Transfer of IGF-1: Correction of IUGR and Fetal Re-Programming
Timothy M. Crombleholme, MD
SOM, CU-Anschutz Medical Campus
**FETAL PHYSIOLOGY**

4:30–4:50 pm  *Reduced Amino Acid Uptake and Protein Synthesis Rates in the Skeletal Muscle of the IUGR Fetus*
Laura Brown, MD
SOM, CU-Anschutz Medical Campus

*Amino Acids Promote Pancreatic Islet Function and Development in the IUGR Fetus*
Paul Rozance, MD
SOM, CU-Anschutz Medical Campus

**LUNG DEVELOPMENT**

4:50–5:10 pm  *Antenatal Origins of Chronic Lung Disease after Preterm Birth*
Steven Abman, MD
SOM, CU-Anschutz Medical Campus

*Fetal Vitamin D Deficiency Impairs Lung Structure and Increases Susceptibility to Hyperoxia Injury in the Developing Rat*
Erica Mandell, DO
SOM, CU-Anschutz Medical Campus

5:10–5:20 pm  **Poster Prizes and Closing Remarks**  
Jed Friedman, PhD
SOM, CU-Anschutz Medical Campus
Thomas Jansson, MD, PhD
SOM, CU-Anschutz Medical Campus
Linda Barbour, MD
SOM, CU-Anschutz Medical Campus

Hensel Phelps Auditorium West
JILL M. GOLDSTEIN, PHD is a Professor of Psychiatry and Medicine at Harvard Medical School and Director of Research at the Connors Center for Women's Health and Gender Biology at Brigham & Women's Hospital. She is a clinical neuroscientist and internationally recognized expert in understanding sex differences in health and diseases associated with the central nervous system. Dr. Goldstein's work has been funded by the National Institutes of Health for nearly 30 years. She has published over 160 articles, chapters and other original and peer-reviewed work in these areas. In 2007 she was named the Spinoza Professor by the Academic Medical Center, University of Amsterdam for her work on the role of hormones and sex differences in the brain for understanding clinical disorders in medicine, and in 2015, she received the Distinguished Scientist Award from the National Association for Research on Schizophrenia and Depression. Nationally, she has served on several scientific review boards and participated in strategic planning for the National Institute of Mental Health, NIH Office of Research on Women's Health, and the Institute of Medicine.

MARK HANSON, PHD is Director of the Institute of Developmental Sciences and British Heart Foundation Professor of Cardiovascular Science at the University of Southampton, UK. He is a founder member and current President of the International Society for the Developmental Origins of Health and Disease (DOHaD). His research concerns several aspects of development and health, ranging from how the environment during development can affect the risk of non-communicable diseases to population studies aimed at the early identification of risk, so that timely preventative interventions can be made. His work explores the underlying biological mechanisms, including epigenetic processes, which relate to such risks in both developed and developing countries. Dr. Hanson has authored over 400 original papers, reviews and book chapters and 11 books on the applications and implications of developmental science to medicine and society. He is actively engaged in wider understanding of science through public lectures and popular science books. His recently co-authored books include Mismatch – the lifestyle diseases timebomb (2006), Fat, Fate and Disease (2012) and Principles of Evolutionary Medicine (2nd Ed. 2016).
DEBBIE LAWLOR, PHD has a background in clinical and public health practice and has been an academic since 2003. She is Professor of Epidemiology and Deputy Director of the MRC Integrative Epidemiology Unit at the University of Bristol, UK. Her research is concerned with predictors and causes of adverse pregnancy and perinatal outcomes in both spontaneous conception and following IVF, and with understanding the potential long-term effects of different pregnancy experiences on offspring future cardio-metabolic health. She is at the forefront of integrating established and novel study designs and methods to better distinguish causal effects from non-causal association. In her talk for this symposium she will discuss the importance, challenges and some potential solutions to determining causal effects of maternal pregnancy exposures on subsequent offspring outcomes.

ALAN JOBE, MD is Professor of Pediatrics in the Divisions of Neonatology and Pulmonary Biology at the Cincinnati Children's Hospital, University of Cincinnati. Dr. Jobe’s research in the area of surfactant metabolism and physiology played a major role in the development of surfactant therapy for the treatment of respiratory distress syndrome in preterm infants. His research interests include regulation of surfactant homeostasis, fetal inflammation, lung development, neonatal lung injury and bronchopulmonary dysplasia. He has had continuous R01 funding throughout his career, and is presently the Chair of the Steering Committee for the NICHD Global Research Network and consultant for a Bill and Melinda Gates supported evaluation of maternal and infant mortality. Dr. Jobe has received numerous awards including the 1986 E Mead Johnson Award; the 2002 Finnish Pediatric Societies Arvo Yippö Medal for Pediatric Research; the 2011 AAP Virginia Apgar Award; and the 2017 Mary Ellen Avery Award of the PAS.
KEYNOTE SPEAKERS

KENT L. THORNBURG, PhD is the M. Lowell Edwards Endowed Chair and Professor of Medicine in the Knight Cardiovascular Institute at the Oregon Health & Science University. He holds joint professorships in the Departments of Physiology & Pharmacology, Obstetrics & Gynecology and Biomedical Engineering. He directs the Center for Developmental Health in the Knight Cardiovascular Institute and the OHSU Bob and Charlee Moore Institute for Nutrition & Wellness. He studies how women adapt to pregnancy and the roles of maternal diet and body composition in regulating fetal growth and lifelong health. He studies how early life heart development leads to adult onset heart disease and he oversees clinical studies in rural Oregon and Alaska. Kent Thornburg serves regularly on advisory panels at the National Institutes of Health, the American Heart Association and the Children’s Heart Foundation and serves on the scientific advisory board of the Preeclampsia Foundation. He is director of translational research training for the Knight Cardiovascular Institute and holds multiple grants from the NIH.

PANEL MEMBERS

WILL COOK is the president and chief executive officer of University of Colorado Hospital (UCH). Mr. Cook joined University of Colorado Hospital in September 2015 and is responsible for advancing patient care, innovation and research at UCH. Mr. Cook received a Master’s degree in Health Administration from Washington University School of Medicine and a Bachelor of Arts degree in Business Administration from Texas A&M University. He also completed a two-year fellowship in Health Care Administration at Johns Hopkins Health System. Prior to UCH, Mr. Cook worked at UPMC (University of Pittsburgh Medical Center), an academic medical center with 21 hospitals, 3,400 employed physicians and more than 60,000 employees. He has a broad base of operational health care experience in outpatient and inpatient services. In his most recent role, Mr. Cook served as senior vice president of UPMC’s Health Services Division, chief operating officer of Physician Services, and president of UPMC Mercy. While at UPMC, Mr. Cook held several leadership roles including serving as vice president of operations at Magee Women’s Hospital of UMPC.
MARK HANSON, PHD is Director of the Institute of Developmental Sciences and British Heart Foundation Professor of Cardiovascular Science at the University of Southampton, UK. He is a founder member and current President of the International Society for the Developmental Origins of Health and Disease (DOHaD). His research concerns several aspects of development and health, ranging from how the environment during development can affect the risk of non-communicable diseases to population studies aimed at the early identification of risk, so that timely preventative interventions can be made. His work explores the underlying biological mechanisms, including epigenetic processes, which relate to such risks in both developed and developing countries. Dr. Hanson has authored over 400 original papers, reviews and book chapters and 11 books on the applications and implications of developmental science to medicine and society. He is actively engaged in wider understanding of science through public lectures and popular science books. His recently co-authored books include *Mismatch – the lifestyle diseases timebomb* (2006), *Fat, Fate and Disease* (2012) and *Principles of Evolutionary Medicine* (2nd Ed. 2016).

DANIEL HYMAN, MD currently serves as the Chief Medical and Patient Safety Officer at Children's Hospital Colorado. Dr. Hyman was previously the Chief Children's Quality Officer and the Chief Medical Officer for Ambulatory Care at New York Presbyterian Hospital. He received his MD from Albert Einstein College of Medicine, completed a Pediatric residency at CHOP, and received a Master's Degree in Medical Management from Tulane University. Dr. Hyman has served on numerous national leadership committees and currently serves on the Quality and Performance Committee for the Children's Hospital Association (CHA) Board and the Clinical Steering Team for the Children's Hospital Solutions for Patient Safety Network. Dr. Hyman also co-chairs the Measurement Sub-Committee and Patient Family Engagement team for CHSPS. He previously served on the Child Health Quality Council for National Association of Children's Hospitals and Related Institutions, the Strategic Policy and Advisory Committee for the National Institute for Children's Health Quality and the Steering Committee for the Quality and Safety Leaders Forum for Children's Hospital Association.
SCOTT D. MATTHEWS, MSW, MHA serves the March of Dimes as a Regional Maternal/Child Health Director. Since 2006, he has had the privilege of working with dedicated community leaders to improve premature birth rates.

During his tenure, he has focused on making significant gains across a spectrum of community programs, NICU family support and advocacy. He is responsible for convening diverse organizations to advance public health and strengthen access to prenatal care so that every baby has a healthy beginning in life. Scott has dedicated his career to the nonprofit sector, with focus on health care issues.

JUDITH REGENSTEINER, PHD is Director of the Center for Women’s Health Research, Director of the Office of Women in Medicine and Science and Professor of Medicine in the Department of Medicine at CU-AMC. Dr. Regensteiner has been Principal Investigator or Co-Investigator of several grants to assess cardiovascular consequences and sex differences in type 2 diabetes and the effects of exercise training in people with type 2 diabetes and peripheral artery disease. She was an Investigator for the National Institutes of Health’s Diabetes Prevention Program and the “Look Ahead” program. Currently, she is Principal Investigator for the National Institutes of Health’s Building Interdisciplinary Research Careers in Women’s Health (BIRCWH) grant as well as her research grants. Dr. Regensteiner has authored more than 100 research publications in her areas of expertise and has received many honors. Recently, she led the writing of a publication for the journal Circulation, entitled, Sex Differences in the Cardiovascular Consequences of Type 2 Diabetes.
STEVEN ABMAN, MD is Professor of Pediatrics and Director of the Pediatric Heart Lung Center (PHLC) at the University of Colorado. Dr. Abman maintains strong translational research and clinical interests in neonatal lung injury, lung vascular development, pulmonary hypertension, chronic lung disease in the newborn (bronchopulmonary dysplasia), persistent pulmonary hypertension of the newborn (PPHN), and related areas. With outstanding collaborators in the PHLC and others, his lab explored many original basic and clinical studies on the physiology, pathobiology and treatment of pulmonary vascular disease in the newborn, which included early studies on nitric oxide biology and therapy in experimental models and clinical settings. His lab continues to explore basic mechanisms through which early disruption of angiogenesis and angiocrine signaling during lung development impairs alveolarization and contributes to long-lasting abnormalities of lung structure, especially after preterm birth. Dr. Abman has received numerous major awards, including the Outstanding Investigator Award from the AAP (1998), the E. Mead Johnson Award of the SPR (1999), the Mary Ellen Avery Award from the APS/SPR and the Arvo Yllpo Medal Award from Finland (2017).

KRISTEN BOYLE, PHD earned her PhD in Bioenergetics from East Carolina University in 2009 and completed her Postdoctoral fellowship focused on gestational diabetes and muscle metabolism with Dr. Jed Friedman in 2013. Dr. Boyle is currently an Assistant Professor in the Department of Pediatrics, Section of Nutrition at the University of Colorado Anschutz Medical Campus. Her current research is focused on mechanisms of developmental programming in humans, using an umbilical cord-derived stem cell model. Dr. Boyle’s research program is aimed at understanding how the intrauterine environment, and obesity and diabetes exposure in particular, may impact fetal skeletal muscle and adipose tissue development and metabolism.
TIMOTHY M. CROMBLEHOLME, MD is Professor of Surgery at Children’s Hospital Colorado and the Department of Surgery at the University of Colorado School of Medicine. He completed his training in general surgery at UCSF, his Pediatric Surgical fellowship at the Floating Hospital for Infant and Children and his Fetal Surgery research fellowship at UCSF. Dr. Crombleholme was recruited to CHOP to cofound the Center for Fetal Diagnosis and Treatment there. He established an NIH funded research laboratory and was tenured at the University of Pennsylvania School of Medicine. In 2004, he became the Richard and Geralyn Aziz Khan Professor of Pediatric Surgery at Cincinnati Children’s Hospital and founded the Fetal Care Center of Cincinnati, the Center for Molecular Fetal Therapy and served as the Associate Director of the Cincinnati Children’s Research Institute. He joined the CU faculty as a tenured Professor and Director of the Center for Children’s Surgery and Vice-Chair of the Department of Surgery as well as Director of the Colorado Institute for Maternal Fetal Health and the Colorado Fetal Care Center in 2011.

LAURA D. BROWN, MD is an Associate Professor of Pediatrics at the University of Colorado School of Medicine and a practicing neonatologist. Her research goal is to understand the basic biology of fetal muscle development and protein metabolism in order to optimize body composition and growth in the IUGR fetus and neonate. Ultimately, her goal is to preempt the complications of IUGR related to low muscle mass. She performs physiological studies in the fetus, including the use of stable isotopic techniques, to assess whole body and muscle-specific protein metabolism. Her important contributions to the field thus far include fundamental knowledge about how the fetus adapts to variations in substrate and hormone availability by changing substrate oxidation patterns and protein accretion rates. Her funding record has included support from the University of Colorado Center for Women’s Health Research, a K12 BIRCWH Scholar Award, funding from the Gerber Foundation, and an R01 Research Project Award.
DANA DABELEA, MD, PHD’s research interest is the understanding of how early life risk factors, such as exposure to maternal diabetes and obesity, and other environmental and behavioral factors operating during fetal or early post-natal life, influence the development of childhood obesity and diabetes. Her experience includes epidemiological studies with community-based and clinic-based sampling, longitudinal follow-up, and extensive sample collection and storage. She has conducted landmark studies on childhood type 2 diabetes, obesity, and perinatal determinants of future risk. At this time, she is PI of several large longitudinal studies, including Healthy Start, a pre-birth cohort that explores how early life exposures program neonatal growth, fatness and metabolism, and identifies mediators that can be targeted by future interventions. This study has enrolled over 1,400 mother-offspring dyads in Colorado and children are followed up to 7-9 years through the ECHO consortium. Such studies provide a rich resource for training students, junior faculty and fellows in diabetes research, lifecourse, perinatal and pediatric epidemiology.

JED FRIEDMAN, PHD received his PhD in Physiology and joined the University of Colorado School of Medicine in 2000, where he is Professor of Pediatrics, Biochemistry, Endocrinology and Reproductive Sciences. His work on Developmental Origins of Health and Disease involves novel animal models of maternal obesity (transgenic mice, Non-Human Primates) and longitudinal clinical investigation utilizing human myocytes, adipocytes, and umbilical-derived mesenchymal stem cells in infants born to women with Gestational Diabetes. In 2012 he established the Colorado Program for Nutrition and Healthy Development, sponsored by Colorado Children’s Hospital. Currently he is investigating how maternal diet impacts the infant microbiome and Non Alcoholic Fatty Liver Disease (NAFLD) in human neonates and in germ-free mice. He has trained 54 Post-Docs, MD fellows, and graduate students (7R01s, 8Ks, 6F32s), including 9 currently on faculty at the University of Colorado. He also directs the NIH-Nutrition Obesity Research Center (NORC) Molecular and Cellular Analytical Core Lab.
M. CAMILLE HOFFMAN, MD, MSCS is an Assistant Professor of Maternal Fetal Medicine in the University of Colorado School of Medicine Departments of Obstetrics & Gynecology and Psychiatry. Dr. Hoffman completed medical school at the Medical University of South Carolina, Ob/Gyn residency at the University of Miami, and her MFM fellowship at the University of Colorado. She is a clinician-scientist who studies maternal-child mental health relationships and is currently investigating interventions to improve multigenerational mental health and child neurodevelopment. She serves as Principal Investigator or co-investigator on several federally and privately funded research grants. Her research was recently featured in a Rocky Mountain PBS documentary on health disparities in infant mortality entitled “Precious Loss.” Dr. Hoffman has clinical expertise in the management of high-risk pregnancy, obstetric ultrasound, and perinatal mental health (PMH). She is a founding board member of the North American PMH Society and also serves as the social media director for “the International Marcé society” for PMH.

THOMAS JANSSON, MD, PHD is the Florence Crozier Cobb Endowed Professor, Chief Division of Reproductive Sciences and Vice Chair of Research at the Department of Obstetrics & Gynecology, at CU-AMC. Dr. Jansson has national and international recognition for his translational research exploring the cellular and molecular mechanisms that regulate placental function in normal pregnancy and in pregnancy complications and to investigate the role of the placenta in determining fetal growth and long-term health.

The research group employs physiological, molecular and translational approaches, and utilizes a wide variety of model systems including primary human trophoblast cells and explants, human placental tissue, mice, rats, and non-human primates. Dr. Jansson's lab has proposed that placental nutrient sensing, a novel function of the placenta, determines life-long health. Dr. Jansson has a distinguished publication record, serves regularly on NIH study sections, is Principal Investigator on numerous NIH grants and the recipient of several awards, such as the 2005 International Federation of Placenta Associations (IFPA) award and the 2017 President’s Achievement Award of the Society for Reproductive Investigation.
ERICA MANDELL, DO is currently an Assistant Professor in the Department of Pediatrics, Section of Neonatology at the University of Colorado. Dr. Mandell's research interests are in fetal lung development and postnatal therapies for bronchopulmonary dysplasia (BPD). During her fellowship, Dr. Mandell studied the effects of vitamin D on lung growth and function in a rodent model of chorioamnionitis induced by intra-amniotic endotoxin. Her work was the first to demonstrate a striking protective effect of early vitamin D treatment in an animal model of BPD after antenatal stress, and to further show that at least part of these effects are mediated through enhanced or preserved pro-angiogenic signaling mechanisms after lung injury. Dr. Mandell's current work is focused on vitamin D regulation of vascular development in the fetal lung and how antenatal stress, especially in the setting of preterm birth, alters vitamin D signaling and contributes to the pathogenesis of BPD.

PAUL ROZANCE, MD is an Associate Professor at the University of Colorado School of Medicine in the Department of Pediatrics and the Section of Neonatology and the inaugural holder of the Frederick Battaglia Chair in Neonatology Research. With the foundation developed by his predecessors and the collaborations with his colleagues he has been able to pursue his goals of better understanding how the fetus translates nutrient signals (supply from the placenta) into anabolic signals for growth (insulin secretion) with specific focus on situations of placental insufficiency and intrauterine growth restriction (IUGR) and the pancreatic beta-cell. These translational studies revolve around the broad area of perinatal insulin-nutrient metabolism and this expertise led to his clinical interest in glucose metabolism during the transition from intrauterine to extrauterine life and the problem of neonatal hypoglycemia.
MALGORZATA E. SKAZNIK-WIKIEL, MD is an Assistant Professor in the Division of Reproductive Endocrinology and Infertility at the University of Colorado. She received her medical degree from Albany Medical College, completed her residency at Beth Israel Medical Center in New York and did a fellowship at Massachusetts General Hospital, Harvard Medical School. She has been an active clinician and researcher in Reproductive Endocrinology since 1986. Dr. Santoro's major research interests include the health implications of premature menopause, peri-menopause, and postmenopause. Dr. Santoro's current research involves treatment of menopausal symptoms in women, the role of obesity in reproductive dysfunction, and training of reproductive endocrinologists in clinical research. Her laboratory has specialized in the development and measurement of reproductive hormones using state-of-the-art methodologies. She developed techniques to perform field studies that allow for daily hormone assessments without the inconvenience of blood drawing by using urine sampling.
ANNE STARLING, PHD is an environmental epidemiologist focused on how exposures in early life shape growth, adiposity and chronic disease risk. She holds a PhD from the University of North Carolina at Chapel Hill and an MPhil degree from the University of Cambridge. As a pre-doctoral trainee at the National Institute of Environmental Health Sciences, she studied the influence of persistent environmental chemical exposures during pregnancy on adverse maternal outcomes. In her post-doctoral work at the Center for Lifecourse Epidemiology of Adiposity and Diabetes at the University of Colorado Anschutz Medical Campus, she examined how exposures in the prenatal period shape adiposity and obesity risk in offspring. Her work integrates chemical, nutritional and metabolic exposures and explores the biological pathways by which these conditions may influence disease risk. Dr. Starling was recently appointed to the faculty of the Department of Epidemiology and will begin as an Assistant Professor on June 1st.

EMILY SU, MD is an Associate Professor in the Division of Maternal-Fetal Medicine and the Division of Reproductive Sciences at the University of Colorado School of Medicine.

Dr. Su completed both her Obstetrics and Gynecology residency and Maternal-Fetal Medicine fellowship at Northwestern University in Chicago, where she was then appointed as an Assistant Professor. Immediately beginning after her fellowship, she has been continuously grant-funded, first through the American Association of Obstetricians and Gynecologists Foundation (AAOGF)/Society for Maternal-Fetal Medicine Career Development Award followed by a three-year NIH K08 Mentored Clinical Scientist Research Career Award. This resulted in an independent R01 focusing on molecular mechanisms underlying abnormal fetoplacental angiogenesis in fetal growth restriction. She was awarded the 2015 Society for Reproductive Investigation President's Achievement Award.
POSTER SESSION

12–1:15 pm | Krugman Conference Hall /Lobby outside

Handouts of all posters and abstracts will be provided to registered attendees on the day of the Symposium.

POSTER # 1 Placental nutrient transporter protein expression across the first half of pregnancy and the impact of obesity

L. James-Allan • A. Kramer • T.L. Powell • T. Jansson
Department of Obstetrics and Gynecology and Pediatrics, University of Colorado Anschutz Medical Campus, CO, USA

POSTER # 2 activation of AMPK reduces contractile response in isolated murine uterine artery

Sydney L. Coates • Ramon A. Lorca • Colleen G. Julian • Lorna G. Moore
Division of Reproductive Sciences, Department of Obstetrics and Gynecology, University of Colorado Anschutz Medical Campus, Aurora, CO

POSTER # 3 Profiles of adolescent metabolic risk in relation to in-utero exposures: the EPOCH study

Anna Bellatorre • Ann Scherzinger • Elizabeth Stamm • Mercedes Martinez
Brandy Ringham • Dana Dabelea
Department of Epidemiology and Department of Biostatistics and Informatics, School of Public Health and Department of Radiology, School of Medicine, University of Colorado Anschutz Medical Campus, Aurora, CO

POSTER # 4 Adiponectin supplementation during pregnancy normalises offspring cardiac hypertrophic gene expression in a mouse model of maternal obesity

O.R. Vaughan • F.J. Rosario • M. Gossling • T.L. Powell • T. Jansson
Departments of Obstetrics and Gynecology and Pediatrics, University of Colorado Anschutz Medical Campus, Aurora, CO, USA

POSTER # 5 Fetal glucose consumption in human pregnancy in vivo determined by 4-vessel sampling and Doppler ultrasound

T.M. Michelsen • A.M. Holme • G. Haugen • T.L. Powell • T. Jansson • T. Henriksen
Division of Reproductive Sciences, Department of Obstetrics and Gynecology and Division of Neonatology, Department of Pediatrics, Anschutz Medical Campus, Aurora, CO, USA; Department of Obstetrics Rikshospitalet and Department of Fetal Medicine, Division of Obstetrics and Gynecology, Oslo University Hospital, Norway
**POSTER # 6**  *Phthalate exposure alters first trimester placental gene methylation in women*

N. M. Grindler • I. Yang • L. Vanderlinden • K. Rajendiran • K. Kannan • D. A. Schwartz
S. Teal A. J. Polotsky • T. L. Powell • T. Jansson
Departments of OB/GYN, Medicine and Pediatrics, University of Colorado Anschutz Medical Campus, Aurora, CO, and New York State Dept of Health, Albany, NY

**POSTER # 7**  *The association between gut microbiota and obesity in pregnant women and children*

Maggie A. Stanislawski • Dana Dabelea • Brandie D. Wagner • Marci K. Sonta • Nina Iszatt
Cecilie Dahl • Catherine A. Lozupone • Merete Eggesbo
Colorado School of Public Health and School of Medicine, Anschutz Medical Campus Aurora, Colorado and Division of Epidemiology, Norwegian Institute of Public Health, Oslo, Norway

**POSTER # 8**  *Decreased skeletal muscle amino acid transporter gene expression, essential amino acid uptake, and protein synthesis rates in late gestation IUGR fetal sheep*

J. Stremming • P. J. Rozance • S. R. Wesolowski • T. Jansson • R. B. Wilkening • W. W. Hay Jr. L. D. Brown
Departments of Pediatrics and Obstetrics and Gynecology, University of Colorado Anschutz Medical Campus, Aurora, CO, USA

**POSTER # 9**  *Insulin like growth factor/IGF binding protein-3 (RHIGF-1/RHIGFBP-3) improves lung structure and prevents pulmonary hypertension in antenatal models of bronchopulmonary dysplasia*

Gregory Seedorf • Taylor Nowlin • Bradley Wallace • Amelie Peisl • Christina Kim
Jennifer Martineau Bosco • Dennis Keefe • Steven H. Abman
Pediatric Heart Lung Center, Department of Pediatrics, University of Colorado Anschutz Medical Campus, Aurora, CO and Shire, Lexington, MA, USA

**POSTER # 10**  *Maturational changes in pulmonary artery endothelial cell function in vitro and responsiveness to insulin growth factor-1/binding protein 3 in the developing sheep lung*

Christina Kim • Gregory Seedorf • Taylor Nowlin • Dennis Keefe • Kurt Albertine
Mar Janna Dahl • Steven H. Abman
Pediatric Heart Lung Center, Department of Pediatrics and Surgery, University of Colorado Denver Anschutz Medical Campus, Aurora, Colorado, United States, Shire Pharmaceuticals, Waltham MA and Department of Pediatrics, University of Utah Health Sciences Center, Salt Lake City, Utah
POINTER SESSION (CONTINUED)

**POSTER # 11** Antenatal and postnatal anti-sFlt-1 antibody treatments preserve lung structure in experimental bronchopulmonary dysplasia
Bradley Wallace • Gregory Seedorf • Amelie Peisl • Taylor Nowlin • Jennifer Bosco
Dennis Keefe • Steven H. Abman
Pediatric Heart Lung Center, Children’s Hospital Colorado, Aurora, CO and Shire Plc, Lexington, MA

**POSTER # 12** Developmental programming by mother’s milk
Jenifer Monks • David J. Orlicky • Andrew E. Libby • Elise S. Bales • Michael C. Rudolph • Ginger C. Johnson • Vanessa D. Sherk • Matthew R. Jackman • Paul S. MacLean
James L. McManaman
Division of Reproductive Sciences, Department of Obstetrics & Gynecology, Division of Endocrinology, Metabolism, & Diabetes, Department of Medicine and Pathology Department, School of Medicine, University of Colorado Denver Anschutz Medical Campus, Aurora, CO

**POSTER # 13** Chronic ischemia augments coronary reserve in fetal myocardium
Eileen I. Chang • Samantha Louey • Isa Lindgren • George D. Giraud • Kent L. Thornburg
Knight Cardiovascular Institute, Center for Developmental Health, Oregon Health & Science University, Portland, Oregon, Portland VA Healthcare System, Oregon Health & Science University, Portland, Oregon

**POSTER # 14** Fibroblast growth factor 21 is a novel protein sensor in pregnancy
Elizabeth F. Sutton • Christopher D. Morrison • Jacqueline M. Stephens • Leanne M. Redman
Pennington Biomedical Research Center, Louisiana State University, Baton Rouge, Louisiana

**POSTER # 15** Identification of bacteria in brain cortex and placenta of fetuses exposed to hypoxia
Miguel A. Zarate • Michelle Rodriguez • Eileen I. Chang, PhD • Thomas Arndt
Maureen Keller-Wood • Eric Triplett • Charles E. Wood
Department of Physiology and Functional Genomics, University of Florida College of Medicine, Gainesville, Florida, Department of Microbiology & Cell Science, University of Florida Institute of Food and Agricultural Sciences, Gainesville, Florida and Department of Pharmacodynamics, University of Florida College of Pharmacy, Gainesville, Florida
POSTER # 16  AMPK activation induces vasodilation of myometrial arteries from pregnant women  
Ramón A. Lorca  •  Sydney Coates  •  Colleen G. Julian  •  Lorna G. Moore  
Division of Reproductive Sciences, Department of Obstetrics and Gynecology, University of Colorado  
Anschutz Medical Campus Aurora, Aurora, CO

POSTER # 17  Initial access and treatment engagement in a perinatal mental health outpatient program  
Catherine Wolcott  •  Lyndsey Evans  •  Celeste St. John-Larkin  •  Jennifer J. Paul  
Children’s Hospital Colorado

POSTER # 18  Increased placental storage of long chain polyunsaturated fatty acids in human intrauterine growth restriction  
Stephanie S Chassen  •  Veronique Ferchaud-Roucher  •  Madhulika Gupta  •  Thomas Jansson  
Theresa L. Powell  
Department of Pediatrics, Section of Neonatology and Department of OBGYN, University of Colorado  
Anschutz Medical Campus, Aurora, CO and Children’s Health Research Institute, University of Western Ontario, London ON, Canada

POSTER # 19  Quantifying three-dimensional rodent retina vascular development using optical tissue clearing and light-sheet microscopy  
Jasmine N. Singh  •  Taylor M. Nowlin  •  Gregory J. Seedorf  •  Steven H. Abman  •  Douglas P. Shepherd  
Department of Physics, University of Colorado Denver, Denver, USA and Pediatric Heart Lung Center,  
Department of Pediatrics, University of Colorado Anschutz Medical Campus, Aurora CO

POSTER # 20  Epigenetic mediation of in utero exposure to gestational diabetes (GDM) on childhood adiposity outcomes using bayesian network analysis  
Katerina Kechrís  •  Weiming Zhang  •  Elizabeth J. Davidson  •  Tasha E. Fingerlin  •  Ivana Yang  
Dana Dabelea  
Department of Biostatistics and Bioinformatics, Colorado School of Public Health, Aurora, CO, Division of Biomedical Informatics and Personalized Medicine, Department of Medicine, University of Colorado  
School of Medicine, Aurora, CO, Department of Epidemiology, Colorado School of Public Health, Aurora,  
CO and Center for Genes, Environment and Health, National Jewish Health, Denver, CO
POSTER SESSION (CONTINUED)

POSTER # 21: Preconceptional lipid-based micronutrient supplementation reduced circulating branched chain amino acids in guatemalan women who are overweight or obese at 12 weeks gestation: a pilot study
S.J. Borengasser  •  M.E. Kerns  •  A.P. Palacios  •  P.R. Baker  •  J.F. Kemp  •  S.D. Morrison
J.E. Westcott  •  J.E. Friedman  •  A. Garces  •  L. Figueroa  •  K.M. Hambidge  •  N.F. Krebs
Department of Pediatrics – Nutrition, Clinical Genetics and Metabolism, and Neonatology, University of Colorado Anschutz Medical Campus, Department of Integrative Biology, University of Colorado Denver, Department of Medicine, University of Oklahoma and Institute of Nutrition of Central America and Panama, Guatemala City, Guatemala

POSTER # 22  Inhibition of LPS-induced Iκbβ/NFκB signaling attenuates IL-1β expression without increasing cell death in the developing lung
Brittany Butler  •  Sarah McKenna  •  Clyde J. Wright
Department of Pediatrics, Section of Neonatology, University of Colorado Anschutz Medical Campus, Aurora, CO

POSTER # 23  Leucine potentiates glucose stimulated insulin secretion in fetal sheep
Brit H. Boehmer • Laura D. Brown • Stephanie R. Wesolowski • William W. Hay • Paul J. Rozance
Department of Pediatrics, Section of Neonatology, University of Colorado Anschutz Medical Campus, Aurora, CO

POSTER # 24  Gut microbes in infants of obese mothers promote hepatic inflammation and pro-inflammatory liver macrophage polarization in germ free mice
TK. Soderborg • K. Strand • C. Mulligan • D. Lemas • K. Kuhn • L. Johnson • A. D’Alessandro
D.N. Frank • R.C. Janssen • L.A. Barbour • K.C. El-Kasmi • J.E. Friedman.
Department of Pediatrics, Section of Neonatology and Section of Gastroenterology, Hepatology and Nutrition; Department of Medicine, Division of Endocrinology, Metabolism and Diabetes, Division of Rheumatology and Division of Infectious Disease; Department of Pathology, University of Colorado Anschutz Medical Campus, Aurora, CO

POSTER # 25  Characterization of the insulin sensitivity of primary human trophoblast cells from placentas of gestational diabetic mothers
M. Castillo-Castrejon  •  T. Jansson  •  T.L. Powell
Department of Obstetrics and Gynecology and Pediatrics, University of Colorado, Anschutz Medical Campus, CO, USA
**POSTER # 26** High n-6 polyunsaturated fatty acids in human milk elevates adipose deposition in infants, and in mice, hypomethylates PPARγ2 increasing later life obesity risk.

M. C. Rudolph • B. E. Young • J. A. Houck • M. R. Jackman • P. G. Webb • D. J. Lemas
T. L. Hernandez • L. A. Barbour • J. E. Friedman • N. F. Krebs • P. S. MacLean
University of Colorado, School of Medicine, Anschutz Medical Campus, Aurora CO

**POSTER # 27** mTOR complex 1 decreases in the early gestation and is not impacted by maternal body mass index

E. Silva • T. L. Powell • T. Jansson
Department of Obstetrics and Gynecology and Department of Pediatrics, University of Colorado, Anschutz Medical Campus, CO, USA

**POSTER # 28** PQQ prevents developmental programming of microbial dysbiosis and macrophage polarization to attenuate liver fibrosis in obese mice

J. E. Friedman • E. Dobrinskikh • A. Alfonso-Garcia • A. Fast • D. N. Frank • L. K. Johnson
D. J. Orlicky • E. O. Potma • K. C. El Kasmi • K. R. Jonscher
Departments of Pediatrics, Medicine, Pathology and Anesthesiology, University of Colorado Anschutz Medical Campus, Aurora, CO; Department of Biomedical Engineering and Beckman Laser Institute, University of California, Irvine, Irvine, CA; Children's Hospital Colorado

**POSTER # 29** Maternal BMI is correlated with non-fasting human milk insulin, but not macronutrients

B. Young • M. Sarangam • A. L. Garcés • L. Figueroa • G. Tejeda • J. Kemp • J. Westcott
M. Hambidge • N. Krebs
University of Colorado School of Medicine, Department of Pediatrics Section of Nutrition, Anschutz Medical Campus, Aurora, CO and INCAP (Institute of Nutrition of Central America and Panama), Guatemala City, Guatemala

**POSTER # 30** Role of hypoxia on metabolic programming of decreased mitochondrial oxidation and increased glucose production in the liver of fetuses with intrauterine growth restriction

S. R. Wesolowski • M. F. Terry • J. Houck • P. S. MacLean • M. R. Jackman • W. W. Hay Jr.
J. E. Friedman • P. J. Rozance • L. D. Brown
Perinatal Research Center, University of Colorado Anschutz Medical Campus, Aurora, CO
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