KRISTEN E. BOYLE, PHD

CURRICULUM VITAE

Associate Professor
University of Colorado School of Medicine
Department of Pediatrics, Section of Nutrition

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RESEARCH INTERESTS

Cellular metabolism, epigenetics, and molecular biology:

- Mechanisms for maternal obesity influence on offspring metabolic disease risk using a human umbilical cord-derived mesenchymal stem cell model
- Role of oxidative stress in metabolism
- Epigenetic regulation of cellular metabolism and development of metabolic disease

EDUCATION

1996-2001	*University of Massachusetts, Amherst, MA* **Bachelor of Science in Exercise Science and Nutrition, *cum laude*** Minor: English Interdisciplinary Honors Program
2002-2005	*Ohio University, Athens, OH* **Master of Science in Exercise Physiology** *Thesis:* Ghrelin reflects changes in body size, not energy availability
2005-2009	*East Carolina University, Greenville, NC* **Doctor of Philosophy in Bioenergetics** *Dissertation:* Metabolic inflexibility in skeletal muscle with obesity
2009-2012	*University of Colorado Anschutz Medical Campus, Aurora, CO* **Postdoctoral Fellowship** *Project:* Skeletal muscle mitochondrial capacity in pregnant women with obesity and diabetes

ACADEMIC APPOINTMENTS

2013-2019	*University of Colorado Anschutz Medical Campus, Aurora, CO* **Assistant Professor** School of Medicine, Department of Pediatrics, Section of Nutrition
2018-Present	*University of Colorado Anschutz Medical Campus, Aurora, CO* **Graduate Faculty Appointment** - Cell Biology, Stem Cells, and Development Program - Integrated Physiology - Biomedical Sciences Program
2019-Present	*University of Colorado Anschutz Medical Campus, Aurora, CO* **Associate Professor** School of Medicine, Department of Pediatrics, Section of Nutrition

HONORS AND AWARDS

1996-1998	State of Connecticut Academic Scholarship
1996-2001	Commonwealth of Massachusetts Academic Scholarship
2001	Commonwealth Scholar, University of Massachusetts, Amherst
2003-2004	Department of Biological Sciences Travel Grant, Ohio University
2011-2013	National Institutes of Health Loan Repayment Program Recipient
2012	Seahorse Bioscience Travel Award Recipient
2013, 2016	University of Colorado Women's Health Research Day Poster Award ***Awarded to top 5 abstract presentations of ~30*
2014-2016	National Institutes of Health Loan Repayment Program Recipient
2015	Young Investigator Travel Grant Award Recipient, American Diabetes Association ***Awarded to junior scientist presenters of top abstracts*
2015	President's Oral Session Abstract Selection, American Diabetes Association ***Top 8 abstracts of over 4,000*

PROFESSIONAL MEMBERSHIP

2003-2005	American College of Sports Medicine (ACSM)
2009-Present	American Society for Nutrition (ASN)
2013-Present	The Obesity Society (TOS)
2013-Present	American Diabetes Association (ADA)
2014-2015	The American Heart Association (AHA)
2017-Present	Perinatal Research Society (PRS)

SERVICE

2006-2007 *Graduate Student Organization, East Carolina University*
Vice President
Assisted in organizing graduate students for self-advocacy programs, fund raisers.

2013-2015 *Pediatric Nutrition Seminar Series*
Co-Chair/Chair
Assisted in coordinating speakers and speaking locations for lecture series sponsored by the Section of Nutrition in the Department of Pediatrics at the University of Colorado.

2013-Present *Center for Women's Health Research (CWHR)*
Junior Faculty Affiliate
I participate in fund-raising and community awareness events, representing the center. I present my research at the Annual Board Meeting and to affiliated lay audiences as opportunities arise. I have attended and participated in meetings with local members of the United States Congress to advocate for and advance the mission of the center.

2014-2019 *UCSOM Department of Pediatrics Junior Faculty Interest Group*
President: 2017-2019
Member: 2014-2017
We plan and participate in quarterly events geared toward junior faculty training and development (e.g., promotions, grant management, wellness). We advocate for policy change at the department level for issues important to junior faculty (e.g., faculty recognition, paid family leave, faculty equity). We share responsibility for representation at Academic Affairs meetings and revision of Department of Pediatrics Faculty Handbook.

2015-Present *Gates Center for Regenerative Medicine*
Member

2019-Present *Women's Reproductive Health Research K12 Career Development Award*
Member, Internal Advisory Committee

2021-Present *American Society for Nutrition*
Chair-Elect, Maternal, Perinatal and Pediatric Nutrition Research Interest Section

2021-Present American Diabetes Association/European Association for the Study of Diabetes: Precision Medicine Diabetes Initiative
Member, Precision Prognostics for Gestational Diabetes Working Group

ACADEMIC CERTIFICATIONS & CAREER DEVELOPMENT

2011-2012	*Co-Mentor Training*, Colorado Clinical and Translational Sciences Institute (4 x 5 hr sessions). Participated as mentee with post-doctoral mentor.
2012-2014	*Responsible Conduct of Research Training*, University of Colorado School of Medicine (9 x 1 hr sessions)
2013-Present	*Health Information Privacy and Security Training*, Collaborative Institution Training Initiative (CITI) Program (online training/certification)
2013-Present	Junior Faculty Training Modules, University of Colorado Center for Women's Health Research (1-3 x 1 hr sessions per year)
2014-2015	*Women's Leadership Training*, Women in Medicine and Science, University of Colorado School of Medicine (4 x 5-8 hr sessions, 50 women selected/year)
2015	*Examining a Developmental Approach to Childhood Obesity: The Fetal and Early Childhood Years Workshop*, Institute of Medicine and National Research Council of the National Academies, Washington DC (2 x 8 hr sessions)
2016	*Nutrigenetics, Nutrigenomics, and Precision Medicine Short Course*, University of Carolina Nutrition and Obesity Research Center, Kannapolis, NC (4 x 8 hr sessions)

REVIEW & REFEREE

Grant Proposal Review

2015-Present	*Reviewer*, Colorado Clinical & Translational Sciences Institute Pre-K Review Program: Internal review and study section of NIH K award or similar grant mechanisms (3 cycles per year)
2017-Present	*Ad Hoc Reviewer*, Colorado Clinical & Translational Sciences Institute K to R Transition Program: Internal review and study section of NIH R01 or similar grant mechanisms
2017-2018	*Reviewer*, American Association for the Advancement of Sciences (AAAS) Research Competitiveness Program: Supports and coordinates peer-review of proposals to U.S. and International grant organizations (1-2 cycles per year)
2018-Present	*Reviewer*, Dr. Lorna Moore Launch Award, University of Colorado Anschutz Medical Campus
2018	*Reviewer*, Colorado Clinical & Translational Sciences Institute Child Maternal Health Pilot Award Program

2019	*Reviewer*, Center for Women's Health Research Junior Faculty Seed Grant Program, University of Colorado Anschutz Medical Campus
2019-Present	*Reviewer*, University of Colorado Graduate School NRSA Mock Review Program, Internal review and study section of NIH F award or similar grant mechanisms
2020-Present	*Member,* Colorado CTSI Pilot Award Program Review Committee
2020-Present	*Member,* NIH NIDDK Special Emphasis Panel
2021	*Ad hoc reviewer*, NIH NHLBI SBIR Special Emphasis Panel
2021	*Ad hoc reviewer*, NIH NIDDK NMDH Study Section
2021	*Stage I reviewer*, NIH Director's New Innovator Award Program

Internship Application Review

2017-Present	*Reviewer*, Children's Hospital Colorado Child Health Research Internship: Review of >30 applications for 8-week summer research internship (1 cycle per year)

Abstract Review

2019-Present	*Reviewer*, American Society for Nutrition Annual Conference

Manuscript Review

Verified Peer Review Record at *Publons:* publons.com/a/1337364/

Ad-hoc Reviewer for:

Adipocyte
American Journal of Obstetrics & Gynecology
American Journal of Physiology
Applied Physiology, Nutrition, and Metabolism
Archives of Physiology and Biochemistry
Biotechniques
Cell Biology International
Cell Reports
Childhood Obesity
Diabetes
Diabetologia
Epigenomics
European Journal of Nutrition
Experimental Physiology
International Journal of Obesity
International Journal of Sports Medicine
Journal of Applied Physiology
Journal of Clinical Investigation
Journal of Diabetes and its Complications
Journal of Molecular Endocrinology
Molecular Nutrition and Food Research
Metabolites
Pediatric Research
Reproduction
Scientific Reports
Stem Cells
The FASEB Journal
Obesity

INVITED LECTURES

International

1. Maternal Obesity and Offspring Adiposity: Clues from Umbilical Cord Mesenchymal Stem Cells. Obesity and Adipose Tissue Biology, Keystone Symposia, Banff, Alberta, Canada, February 2019.

2. Epigenetic Mechanisms for Altered Infant Metabolism with Maternal Obesity: Insights from Umbilical Cord Stem Cells. Perinatal Society of Australia & New Zealand Virtual Congress 2021. Sydney, Australia, March 2021.

National

1. Maternal obesity and the fetal programming of disordered metabolism. The National Conference on Women's Health Research: Sex Differences Across the Lifespan, Colorado Springs, CO, September 2016.

2. Programming of Adiposity and Metabolism. Pediatric Academic Societies Meeting. San Francisco, CA, May 2017.

3. Umbilical Cord Mesenchymal Stem Cells: Programmed Risk? Aspen/Snowmass Perinatal Biology Meeting, Aspen, CO, August 2019.

4. Programmed epigenetic risk: Can stress exposures in utero predispose infants to obesity and metabolic disease? American Society for Biochemistry and Molecular Biology (ASBMB) Meeting, Philadelphia, PA, April 2022.

Regional

1. Skeletal Muscle Lipid Oxidation: Substrate Selection and Obesity, Metabolism Interest Group, University of Colorado Anschutz Medical Campus, March 2009.

2. Pediatric Obesity: From the Womb. Denver Dietetic Association, Denver, CO. February 2010.

3. Maternal Programming of Fetal Stem Cells: How Obesity in Pregnancy Imparts Disease Risk in the Next Generation. University of Missouri Nutrition and Exercise Physiology Seminar Series, Columbia, MO. March 2015.

4. Maternal Obesity Alters Fat Metabolism and DNA Methylation in Stem Cells from Human Infants. Building Better Babies Symposium. Aurora, CO, May 2017.

5. Maternal Obesity and the Epigenetic Regulation of Offspring Adiposity. Animal Reproduction & Biotechnology Laboratory Seminar Series. Colorado State University, Fort Collins, CO, November 2018.

6. Umbilical Cord Derived Mesenchymal Stem Cells Characterize Phenotypes of Infants Born to Mothers with Obesity. SCORE Seminar Series, University of Colorado Boulder, Boulder, CO. December 2019.

7. Maternal Obesity and Offspring Adiposity: Identifying Mechanisms for Obesity Risk Using Umbilical Cord Derived Mesenchymal Stem Cells. Center for Children's Healthy Lifestyles & Nutrition Seminar Series, University of Kansas Medical Center. March 2020.

8. Maternal obesity and offspring adiposity: How stress exposures in utero predispose infants to obesity and metabolic disease. William Hansel Visiting Scientist Seminar Series, Pennington Biomedical Research Center, Baton Rouge, LA, September 2021.

Local

1. Lipid Oxidation in Obesity: A Case for Metabolic Inflexibility. Diabetes and Obesity Research Seminar, East Carolina University, Greenville, NC. November 2007.

2. Measurement of Mitochondrial Function. Metabolism Interest Group Seminar, University of Colorado Anschutz Medical Campus, April 2010.

3. Metabolic Substrate Switching: Stories from Obese, Insulin Resistant, Skeletal Muscle Mitochondria. Metabolism and Diabetes Interest Group Seminar, University of Colorado Anschutz Medical Campus, September 2011.

4. Lipid Metabolism in Human Skeletal Muscle: Measuring Mitochondrial Function Using the Seahorse Metabolic Analyzer. Mucosal Inflammation Program, University of Colorado Anschutz Medical Campus, October 2012.

5. Maternal Programming of Fetal Stem Cells. Perinatal Research Conference, University of Colorado Anschutz Medical Campus, January 2013.

6. Maternal Programming of Fetal Stem Cells: How Obesity in Pregnancy Imparts Disease Risk in the Next Generation. Center for Women's Health Research Advisory Board Meeting, University of Colorado Anschutz Medical Campus, May 2013.

7. Maternal Obesity and Fetal Mesenchymal Stem Cell Differentiation. Pediatric Heart Lung Center, University of Colorado Anschutz Medical Campus, November 2014.

8. Maternal Programming of Fetal Stem Cells: How Obesity in Pregnancy Imparts Disease Risk in the Next Generation. Endocrine Research Conference, University of Colorado Anschutz Medical Campus, February 2015.

9. Maternal Programming of Fetal Stem Cells: How Obesity in Pregnancy Imparts Disease Risk in the Next Generation. LEAD Seminar Series, University of Colorado Anschutz Medical Campus, May 2015.

10. Mesenchymal Stem Cells: Clues for Understanding How Obesity in Pregnancy Impacts Offspring Adiposity. Pediatric Nutrition Seminar, University of Colorado Anschutz Medical Campus, June 2015.

11. Are Infants of Obese Mothers Programmed for Excess Adiposity and Metabolic Dysfunction?: A Mechanistic Approach. Endocrine Research Conference, University of Colorado Anschutz Medical Campus, September 2015.

12. Maternal Obesity and the Fetal Programming of Disordered Metabolism. Reproductive Sciences Seminar, University of Colorado Anschutz Medical Campus, October 2016.

13. Maternal Obesity Programs Deficits in Offspring Fatty Acid Oxidation. Perinatal-Neonatal Research Conference, University of Colorado Anschutz Medical Campus, November 2016.

14. Maternal Obesity and the Epigenetic Programming of Offspring Adiposity. Mucosal Inflammation Program, University of Colorado Anschutz Medical Campus, April 2017.

15. Maternal Obesity and Offspring Adipogenesis: Umbilical cord Mesenchymal Stem Cells. Maternal Fetal Medicine Research Series, University of Colorado Anschutz Medical Campus, November 2017.

16. Maternal Obesity and Offspring Adiposity. Basic & Translational Pediatric Research Seminar Series, University of Colorado Anschutz Medical Campus, January 2018.

17. Maternal Obesity and Offspring Fat Metabolism: Epigenetic Clues to Increased Obesity Risk. The Gates Center for Regenerative Medicine Seminar Series, University of Colorado Anschutz Medical Campus, March 2018.

18. Unravelling the Developmental Origins of Excess Adiposity: Umbilical Cord Mesenchymal Stem Cells. Cell Biology, Stem Cells, and Development Membership Seminar, University of Colorado Anschutz Medical Campus, May 2018.

19. Maternal Obesity and the Epigenetic Regulation of Offspring Adiposity. Perinatal-Neonatal Research Conference. University of Colorado Anschutz Medical Campus, November 2018.

20. Maternal Obesity and the Epigenetic Regulation of Offspring Adiposity. Integrated Physiology Seminar Series. University of Colorado Anschutz Medical Campus, December 2018.

21. MSC Metabolomics: Data Analysis for Deep Phenotyping. Exercise and Metabolism Meeting. University of Colorado Anschutz Medical Campus, January 2019.

22. Maternal Obesity: Pathways Leading to Offspring Obesity Risk. Barbara Davis Center Diabetes Day. University of Colorado Anschutz Medical Campus, March 2019.

23. What Makes a Phenotype: Maternal Obesity Induces Phenotypic Differences in Offspring MSCs. Department of Pediatrics Basic & Translational Research Seminar. University of Colorado Anschutz Medical Campus, March 2019.

24. Maternal Obesity and the Epigenetic Regulation of Offspring Obesity/Diabetes Risk. University of Colorado AMC Cells, Stem Cells, & Development Graduate Program Retreat. Breckenridge, CO. October 2019.

25. Mechanisms for Metabolic Disease Risk in Infants Born to Mothers with Obesity. University of Colorado Pediatric Nutrition Seminar Series, Anschutz Medical Campus, Aurora, CO. February 2020.

26. Determining Infant Risk for Developing Obesity and Diabetes. University of Colorado Center for Women's Health Research Community Engagement, Anschutz Medical Campus, Aurora, CO. July 2020.

27. Gestational Metabolic Stress and the Epigenetic Regulation of Myocyte Metabolism. University of Colorado Endocrine Research Conference, Anschutz Medical Campus, Aurora, CO. April 2022.

Conference Abstracts – Oral Presentations

1. **Boyle KE**, Thuma JR, and Loucks AB. Short-term effects of low energy availability on ghrelin reflect effects on body size, not leptin or insulin. 2003 American College of Sports Medicine 50th Annual Meeting, San Francisco, CA.

2. **Boyle KE**, Zheng D, Anderson EJ, Neufer PD, and Houmard JA. Mitochondrial function is impaired in cultured myotubes from obese humans. International Biochemistry of Exercise Conference, University of Guelph, Ontario, Canada, June 2009.

3. **Boyle KE**, Hwang H, DeVente JM, Barbour L, Hernandez T, Bowen B, Zhengping Y, Mandarino LJ, and Friedman JE. Quantitative Proteomic Profile in Skeletal Muscle from Women with Gestational Diabetes Reveals Potential for Reduced Mitochondrial Function, 2010 American Diabetes Association 70th Scientific Sessions, Orlando, FL.

4. **Boyle KE**, Heerwagen MJ, and Friedman JE. Transgenic mice enriched for omega-3 fatty acids show improved skeletal muscle mitochondrial fuel switching in response to high-fat diet. August 2011, FASEB Summer Research Conference: Nutrient Control of Metabolism and Cell Signaling, Steamboat Springs, CO.

5. **Boyle KE**, Patinkin Z, Shapiro ALB, Dabelea D, Friedman JE. Human mesenchymal stem cells from offspring of obese mothers have increased adipogenesis and evidence for insulin resistance: The Healthy Start Study. *2015 American Diabetes Association 75th Scientific Sessions, Boston, MA.* ***President's Oral Sessions.***

6. **Boyle KE**, Patinkin ZW, Shapiro ALB, Baker PR II, Dabelea D, Friedman JE. Disrupted GSK-3β/β-catenin signaling induces greater adipogenesis in mesenchymal stem cells derived from babies of obese women: The Healthy Start BabyBUMP Project. *2015 The Obesity Society ObesityWeek 2015, Los Angeles, CA.*

7. **Boyle KE**, Patinkin ZW, Shapiro ALB, Vanderlinden L, Kechris K, Dabelea D, & Friedman JE. DNA hypermethylation of metabolic genes corresponds to lower fatty acid oxidation in mesenchymal stem cells from infants of obese mothers: The Healthy Start BabyBUMP Project. *2016 Obesity and Adipose Tissue Biology, Keystone Symposia, Banff, Alberta, Canada.*

8. **Boyle KE**, Patinkin ZW, Shapiro ALB, Yang I, Davidson B, Vanderlinden L, Kechris K, Dabelea D, & Friedman JE. DNA Hypermethylation Corresponds to Differences in Metabolism and Cellular Differentiation in Mesenchymal Stem Cells from Infants Born to Obese Mothers: The Healthy Start BabyBUMP Project. *2016 American Diabetes Association 76th Scientific Sessions, New Orleans, LA.*

9. Keleher M, Shubhangi S, Brown A, Duensing A, Dabelea D, and **Boyle KE**. Maternal Obesity Linked to Hypertrophy in Adipogenic Infant MSCs: The Healthy Start ECHO Cohort 2019 The Obesity Society ObesityWeek 2019, Las Vegas, NV.

MEDIA

1. Endocrine News, "Obesity's Impact on mRNA in Skeletal Muscle". January 2011.
2. TIME Magazine, "How Obese Moms May Wire Kids for Obesity". June 9, 2015.
3. The Denver Post, "Obese Moms Program Offspring for Obesity and Metabolic Disease". June 12, 2015.
4. CBS, Channel 4: "Diabetes Study Tracks New Moms, Children: Colorado Researchers Look at what Causes Obesity". This interview focused on our research identifying greater adipogenesis in mesenchymal stem cells from infants of obese versus normal weight mothers. 2015.
5. Medpage Today: "Some Babies Get a Bad Start on Obesity Risk From Mom". November 2021.

TEACHING

Course Instruction

2003-2005 *Ohio University, Athens, OH*
BIOS 3450: Human Physiology Laboratory (2.0 credit hours)
25-30 undergraduate students. Developed and implemented course structure including lecture, lab practicum, and exams. Assessed and administered all grades.

2003-2005 *Ohio University, Athens, OH*
BIOS 4150: Exercise Physiology Laboratory (2.0 credit hours)
25-30 undergraduate students. Developed and implemented course structure including lecture, lab practicum, and exams. Assessed and administered all grades.

2006 *East Carolina University, Greenville, NC*
EXSS 3805: Physiology of Exercise (3.0 credit hours)
60-70 undergraduate students. Developed and implemented course structure including lecture, syllabus and exams. Assessed and administered all grades.

2013-2016 *University of Colorado Anschutz Medical Campus, Aurora, CO*
IDPT 7823/7809: Biomedical Sciences Core Course III:

Systems Biology of Energetics
Lecture Topic: Regulation of Cellular Metabolism. 50-60 graduate students. Lecture topics included anabolic and catabolic metabolism and the control of these systems by substrate availability, energetic demand, and oxygen availability. Methodology for measuring metabolism in cells and tissues. Includes selection and instruction for guided readings, quiz and exam preparation/grading (1 x 2 hour lecture/year, research article discussion).

2017 *University of Colorado Anschutz Medical Campus, Aurora, CO*
Journal Club Core Director: Pediatrics, Nutrition Section
Lecture Topic: Adipose Tissue Expansion and Metabolic Health. 10-15 students, post-docs, and faculty members. Selected topic and developed lecture, led discussion (2 x 1 hr lectures).

2020-Present *University of Colorado Anschutz Medical Campus, Aurora, CO*
CSDV 7606: Critical Analysis of Research in Cell Biology, Stem Cells and Development
Lecture Topic: Cell/Environment Interplay (1 block of 4). 6-8 graduate students. First-year graduate students will learn to critically evaluate scientific literature in preparation for writing and critiquing research grant proposals. Each session concludes with written mini-proposals and peer critiques.

Guest Lectures

2003 *Ohio University, Athens, OH*
BIOS 4500/5500: Principles of Endocrinology
25-30 undergraduate and graduate students. Developed and taught lecture on topics including growth hormone and IGF function, hypothalamic-pituitary-IGF axis, normal and abnormal growth patterns, pathology and treatment

2010-2012 *Metro State University, Denver, CO*
NUT 3400: Nutrition and Weight Management
30-35 undergraduate students. Developed and taught lecture on topics including obesity in pregnancy, gestational diabetes and epigenetic modification (2 x 1 hr lectures/semester).

2011 *Colorado School of Public Health MPH Program, Aurora, CO*
CBHS 6623: Nutrition in Global Community
20-25 graduate students. Developed and taught lecture on topics including obesity in pregnancy, gestational diabetes and epigenetic modification.

2015 *Colorado State University, Fort Collins, CO*
FSHN 750: Nutrition Pathophysiology
25-30 graduate students. Developed and taught lecture on topics including mechanisms of metabolic fetal programming and epigenetics.

2015, 2019 *University of Colorado Graduate School, Aurora, CO*
RSPC 7801: Molecular Mechanisms of Reproductive Endocrinology and Metabolism
10 graduate students. Developed and taught lecture on topics including lipid metabolism in reproduction and fetal programming.

Seminar Development/Retreat Planning

2014 *University of Colorado Anschutz Medical Campus, Aurora, CO*
Assisted: Respite/Wellness Seminar (1 hr seminar)
25-30 junior faculty members. Hosted by the Department of Pediatrics Junior Faculty Interest Group. Developed format, invited expert speaker.

2016 *University of Colorado Anschutz Medical Campus, Aurora, CO*
Assisted: Bi-Annual Zoo Retreat (half-day retreat)
40-50 junior faculty members. Hosted by the Department of Pediatrics Junior Faculty Interest Group. Developed format, invited speakers, hosted event. Topics included promotion readiness, lab and personnel management, work-life balance, and time management.

2017 *University of Colorado Anschutz Medical Campus, Aurora, CO*
Co-Lead: How to Network (1 hr panel discussion)
25-30 junior faculty members. Hosted by the Department of Pediatrics Junior Faculty Interest Group. Developed format, invited expert panel members, facilitated discussion.

2018 *University of Colorado Anschutz Medical Campus, Aurora, CO*
Co-Lead: Annual Faculty Retreat (full-day retreat)
25 faculty members. Hosted by the Department of Pediatrics, Section of Nutrition. Developed format, invited speakers, facilitated catering, hosted event. The theme was “Team Science”, with outside speakers, panel discussion, and team building events focused on this topic. Fellows and faculty presented research.

2018 *University of Colorado Anschutz Medical Campus, Aurora, CO*
Co-Lead: Research Finance 101 (1 hr seminar)
30-40 junior faculty members. A joint event hosted by the Department of Pediatrics Junior Faculty and PhD Faculty Interest Groups. Developed format, invited speakers, hosted event. Topics included budgeting for grants, managing finances post-award, and a panel discussion with local research, grants management, and center director experts.

2018 *University of Colorado Anschutz Medical Campus, Aurora, CO*
Co-Lead: Bi-Annual Zoo Retreat (half-day retreat)
40-50 junior faculty members. Hosted by the Department of Pediatrics Junior Faculty Interest Group. Developed format, invited speakers, hosted event. Topics Included promotion and tenure, wellness, and lab management.

TRAINING & MENTORING

Postdoctoral Fellow – Primary Mentor

2021-present

Manoel Lixandrão, PhD University of Colorado School of Medicine
Manoel is a new postdoctoral fellow in my laboratory (since September 2021). I mentor him in the use of our primary umbilical cord stem cell model, experimental design for *in vitro* mechanistic investigation, project development, manuscript writing, and grantsmanship.

Role: Primary Mentor

Education: Manoel earned his PhD in Science from the University of Sao Paulo (2020) investigating the effects of resistance exercise in the muscle hypertrophy in elderly individuals.

Project: Epigenetic regulation of *PRKAG2* for promoting metabolic disruption in mesenchymal stem cells from infants born to mothers with obesity.

2018-2021

Madeline Keleher, PhD University of Colorado School of Medicine
Madeline was a postdoctoral fellow in my laboratory. I mentored her in the use of our primary umbilical cord stem cell model, experimental design for *in vitro* mechanistic investigation, project development, manuscript writing, and grantsmanship.

Role: Primary Mentor

Education: Madeline earned her PhD in Biology from Washington University in St. Louis (2017) investigating offspring epigenetic effects of maternal obesity in a mouse model.

Project: Maternal obesity impacts infant stem cell adipogenesis and insulin sensitivity.

Mentee Accomplishments:
- Applied to NIH F32 08/2018
- Published 2 first author manuscripts, with 2 under review
- Took 9-mo break to pursue teaching interests
- Currently a medical writer at Oxford Pharmagenesis

Postdoctoral Fellow – Co-Mentor

2017-2019

Nicholas Broskey, PhD, Pennington Biomedical Research Center
Nick is a post-doctoral fellow at the Pennington Biomedical Research Center under the primary mentorship of Leanne Redman, PhD. I have been mentoring Nick on career development and mesenchymal stem cell differentiation and metabolism by phone and in person since 2017. Nick will visit my lab in fall 2018 to learn hands-on techniques unique to my lab. For this role I am listed as a collaborator on Nick's recent American Diabetes Association Pathway Accelerator grant

application (highly competitive, high risk/high reward), which will fast-track his transition to junior faculty.

Role: Primary Cell Culture & Metabolism Mentor

Project: Intergenerational inheritance of Type 2 diabetes: How exercise in pregnancy affects infant metabolism in mothers at risk for developing diabetes

Mentee Accomplishments:

- Received a Louisiana NORC Pilot award to complete his post-doctoral research project in 11/2017
- Submitted an American Diabetes Association Pathway Accelerator grant application in July 2018.
- Currently an Assistant Professor at East Carolina University

2019-Present **Lauren Gyllenhammer, PhD, University of California, Irvine**
Lauren is a postdoc at University of California Irvine who is funded on a K99/R00. Lauren studies maternal stress during pregnancy and the impact on offspring body composition. I will mentor Lauren as she transitions into her faculty position using the umbilical cord stem cell model we use in our lab.

Role: Primary Cell Culture & Metabolism Mentor

Project: Synergistic effect of maternal insulin-resistance and cortisol in pregnancy on fetal programming of child mitochondrial function and obesity risk.

Mentee Accomplishments:

- Received an NIH ECHO Opportunities and Infrastructure Fund project grant (08/2021)

2021-Present **Carmen Ortega-Santos, PhD University of Colorado School of Medicine**
Carmen is a postdoctoral fellow at the University of Colorado under the primary mentorship of Audrey Bergouignan, PhD. I will mentor Carmen on mechanistic and *in vitro* metabolic investigations using primary stem cells obtained from the human participants in their ongoing clinical research projects.

Role: Primary Cell Culture & Metabolism Mentor

Project: Impact of sedentary behavior and physical activity on metabolic flexibility in pre-diabetic population.

Mentee Accomplishments:

- Supported by NIH T32 Fellowship in the Department of Endocrinology Metabolism and Diabetes

Graduate Students

2012-2015 **Allison Shapiro, PhD, Colorado School of Public Health**
Allison was a PhD student in Epidemiology at the Colorado School of Public Health under the primary mentorship of Dana Dabelea, MD,

PhD. I mentored Allison basic cell culture techniques, primary mesenchymal stem cell differentiation and metabolism.

Role: Cell Culture & Metabolism Mentor

Project: Investigating the mediating role of Sirtuin 1 and PPAR-γ in the relationship between maternal dietary niacin intake and infant adiposity.

Mentee Accomplishments:

- First author on 1 original research article, co-authorship on 3 original research articles
- First author on 2 abstracts, co-authorship on over 10 abstracts
- Received PhD degree in December 2015
- Currently an Assistant Professor in the University of Colorado Department of Pediatrics, Endocrinology Section.

2014-2016 **Zachary Patinkin, Student Worker**

Zachary worked in my lab while pursuing a Master's degree in Public Health. I mentored Zachary in laboratory techniques, including sterile cell culture techniques, protein assessments, and metabolism. I also mentored Zachary on hypothesis generation, experimental design, manuscript drafting, and publication of results.

Role: Primary Research Mentor/Supervisor

Project: Human Mesenchymal Stem Cells and the Epigenetic Programming of Obesity

Mentee Accomplishments:

- Co-authorship on 4 original research articles, with 1 currently under review
- Co-authorship on over 10 abstracts
- Graduated Netter School of Medicine at Quinnipiac University

2018-2019 **Lillian Svete, University of Colorado School of Medicine**

Lily was a graduate student in the Medical Scientist Training Program at the University of Colorado School of Medicine pursuing an MD/PhD degree and completed a 10-week rotation in my lab in May 2018, where I am trained her in use of the primary umbilical cord stem cell model and experimental design for *in vitro* mechanistic investigation. During this time, Lily optimized molecular biology techniques such as chromatin immunoprecipitation and luciferase gene reporter assays. Lily decided to pursue an MD only degree and has completed her research requirement in my lab.

Role: Primary Research Mentor

Project: The role of *SDHC* and *PRKAG2* promoter methylation on transcription factor binding and gene transcription/miRNA in developmental programming.

Mentee Accomplishments:

- Lily has written a comprehensive review on miRNA in developmental programming, which we are preparing for submission.

2018-2021 **Nathan De Jong, Colorado State University**
Nathan is a PhD student at the University of Colorado under the primary mentorship of Audrey Bergouignan, PhD. I will mentor Nathan on mechanistic and *in vitro* metabolic investigations using primary stem cells obtained from the human subjects in his clinical research project.

Role: Basic Science Research Mentor

Project: Metabolic effects of breaking up sedentary time

Mentee Accomplishments:
- Has received a TL1 Pre-Doctoral Fellowship from the Colorado Clinical and Translational Sciences Program
- Successfully defended his dissertation Dec 2021
- Postdoctoral fellowship in research at Florida State University

Graduate Student Thesis Committee Member

Student (deg.)	*Advisor*	*Years*
Esteban Lucero (PhD)	Huntington Potter, PhD	2016-2021
Diane Gumina (PhD)	Emily Su, MD	2019-
Rosemary McDonald (PhD)	Raj Kumar, PhD	2019-
Arely Diaz (PhD)	Tânia Reis, PhD	2020-
Karli Swenson, (PhD)	Emily Bates, PhD	2020-

Undergraduate Students

2012 **John Davy, Summer Research Intern**
Children's Hospital Colorado Child Health Summer Research Internship

Role: Co-research mentor (with Jed Friedman)

Project: Analysis of skeletal muscle from the transgenic Fat-1 mouse in response to high fat diet

Mentee Accomplishments:
- John graduated from medical school at the University of Virginia, Class of 2018.

2015-2017 **Reilly Quist, Summer Research Intern & Student Worker**
Reilly is an undergraduate in the Pre-med program at the University of Colorado Denver. Reilly began working in my lab as a research intern in the June, 2015 and stayed on to complete her project. As her class schedule allows, Reilly returns to work on ongoing research projects.

Role: Primary Research Mentor

Project: Mesenchymal Stem Cells of Infants Born to Mothers with Obesity May Provide Clues to Future Obesity Risk: Analysis of AMPK Subunit Protein Content

Mentee Accomplishments:
- First author on 1 abstract presented at the University of Colorado Research and Creative Activities Symposium in April 2016.

- Accepted to the University of Colorado School of Medicine, Class of 2022.

High School Students

2016 **Phoebe Barr, Summer Research Intern**
Children's Hospital Colorado Child Health Summer Research Internship

Role: Primary Research Mentor

Project: Measuring the capacity for osteogenesis in mesenchymal stem cells derived from umbilical cord tissue of infants born to normal weight and obese mothers

Mentee Accomplishments:
- Phoebe graduated from the Denver Center for International Studies in 2017.
- Presented research at the CHCO Research Internship seminar (to fellow interns and faculty members).

2018-2019 **Shreya Shubhangi, Summer Research Intern**
Children's Hospital Colorado Child Health Summer Research Internship

Role: Primary Research Mentor

Project: Maternal obesity impacts infant stem cell adipogenesis.

Mentee Accomplishments:
- First author on 1 abstract presented at the Aspen/Snowmass Perinatal Biology Symposium in August 2019.
- Co-author on 1 manuscript currently under review
- Travel Award for Aspen/Snowmass Perinatal Biology Symposium in August 2019.
- Attending to Stanford University, Class of 2023.

2022 **Allison Brookhart, Summer Research Intern**
Children's Hospital Colorado Child Health Summer Research Internship

Role: Primary Research Mentor

Project: Maternal CBD exposure impacts offspring liver metabolism.

Mentee Accomplishments:
- Presented research at the CHCO Research Internship seminar (to fellow interns and faculty members).

Attending to UCLA, Class of 2025.

GRANT SUPPORT

Active

Extramural

2016-2023 **NIH, 1UG3OD023248-01**
Role: Investigator
Environmental Influences on Child Health Outcomes
Principal Investigator: Dana Dabelea, MD, PhD
The Early Life Exposome and Childhood Health – The Colorado Healthy Start 3 Cohort Study. The goal of this project is to estimate the early life "exposome", across a wide range of exposures (social, metabolic, chemical, physical), and conduct integrative analyses of early life exposure related to child health outcomes that are informed by molecular biomarkers ('omics) and pathways.

2018-2023 **NIH R01 DK 117168**
Role: Principal Investigator
Epigenetic programming of infant mesenchymal stem cells: mechanisms for obesity and diabetes risk in humans
The goal of this project is to determine the epigenetic mechanisms for perturbations in lipid metabolism of umbilical cord-derived mesenchymal stem cells from infant of obese versus normal weight mothers.
$1,122,625 direct costs ($1,677,087 total)

2021-2026 **NIH R01 NIDDK**
Role: Co-Investigator
Principal Investigators: Lynn A. Barbour, MD; Teri L. Hernandez, PhD, RN
Triglycerides as a Predictor of Newborn Subcutaneous and Liver Fat: Contributors to Fetal Fat Accretion in Obese Pregnancies
The goal of this project is to determine the predictive power of maternal triglycerides in fetal subcutaneous and liver fat, with a focus on early vs. late pregnancy and fasted vs. postprandial measures. Obese and overweight pregnant women will be included and placental transport of lipids, cord blood lipidomics, and infant adiposity and infant-derived stem cell adipogenesis will be measured.

2021-2022 **Colorado CTSI**
Role: Co-Principal Investigator
Principal Investigators: Kristen Boyle, PhD; Josianne Broussard, PhD
Impact of weight loss on the intrinsic circadian clock in human skeletal muscle
The goal of this pilot project is to determine whether circadian rhythm impairment is related to insulin sensitivity, and whether circadian rhythms can be improved with interventions such as weight loss and/or exercise.

2022-2027 **NIH R01 NICHD**
Role: Co-Principal Investigator

Principal Investigators: Kristen Boyle, PhD; Sonja Entringer, PhD; Pathik Wadhwa, PhD

Stress and Human Stem/Progenitor Cells: Biobehavioral Mechanisms

The goal of this project is to test hypotheses related to the role of maternal stress in fetal programming of the integrity of telomere and mitochondrial function in human progenitor/stem cells, and its clinical relevance for newborn phenotypes.

Completed

Extramural

2018-2021 **American Diabetes Association CORE #1-18-ICTS-016**
Role: Principal Investigator

Umbilical cord-derived stem cell metabolism: Understanding mechanisms for childhood obesity risk

The goal of this project is to comprehensively interrogate umbilical cord-derived mesenchymal stem cell response to metabolic stress, such as glucose starvation or excess fat exposure, to determine the role of stem cell metabolic outcomes as predictors of child metabolic health outcomes.
$545,321 direct costs ($600,000 total)

2015-2019 **NIH K01 DK106347**
Role: Principal Investigator

Human Mesenchymal Stem Cells and the Epigenetic Programming of Obesity.

This is a mentored research scientist career development award. The goal of this project is to identify epigenetic signatures related to differences in mesenchymal stem cell differentiation and metabolism based on mother's obesity status, that may give insight into the developmental programming of neonatal adiposity.
$368,227 direct costs ($397,687 total)

2016-2018 **P30GM118430-RedmanPF-01**
Role: Co-Investigator

IMAGINE COBRE Pilot
Investigation of the mechanisms for transmission of impaired glucose metabolism in infants exposed to diabetes in utero

Principal Investigator: Leanne M. Redman, PhD

The goal of this project is to test the hypothesis that *in utero* exposure to maternal substrate oxidation and placental lipotoxicity, characteristics of diabetic pregnancy, programs a metabolically inflexible phenotype in the offspring as measured by infant substrate oxidation and metabolism in umbilical cord derived mesenchymal stem cells from the infants.
$14,857 direct costs (sub-award)

2011-2012 **NIH F32 DK 089743**
Role: Principal Investigator

Cellular Mechanisms for Insulin Resistance in Human Gestational Diabetes Mellitus

The F32 award provides support for promising postdoctoral scholars who have the potential to become productive, independent investigators within the broad scope of biomedical, behavioral, or clinical research. The goal of this project is to investigate the role of skeletal muscle metabolism on the etiology of insulin resistance in women with gestational diabetes mellitus.

$97,264 direct costs (no indirect costs)

2013-2014 **The Obesity Society Early Career Research Grant**
Role: Principal Investigator

The Effect of Maternal Obesity on Skeletal Muscle Cell Differentiation

The goal of this project is to explore molecular pathways whereby fetal exposure to maternal obesity contribute to adiposity at birth and longitudinally at 5 months of life by measuring epigenetic modification of fetal mesenchymal stem cells.

$25,000 direct costs, no indirect costs

Intramural

2009-2010 **NIH T32 DK 007658**
Role: Postdoctoral Fellow
Principal Investigator: Nancy F. Krebs, MD

The primary goal of this training program in Nutrition is to train the next generation of physician scientists and basic researchers who are committed to the prevention of disease and health promotion through careers in human nutrition.

No Direct Costs

2013-2015 **NIH K12 HD 057022**
Role: Research Scholar
Principal Investigator: Judith G. Regensteiner, PhD
The Colorado Building Interdisciplinary Research Careers in Women's Health Program (BIRCWH)

The BIRCWH Award is a mentored career development award that connects junior faculty to senior faculty with shared interest in women's health and sex difference research with the goal of creating a pathway to independent research funding for the junior faculty in the field of women's health research. Application Title: Maternal Programming of Fetal Stem Cells.

No Direct Costs

2014-2015 **BERD Seed Program Grant**
Role: Principal Investigator
The Colorado Clinical & Translational Sciences Institute (UL1 TR001082)
Mesenchymal Stem Cells and the Epigenetic Programming of Neonatal Adiposity

This program offers one time funds to offset the cost of biostatistical consulting for junior faculty at the University of Colorado.

$1,000 direct costs, no indirect costs

2014-2015 **Center for Women's Health Research, Research Development Award**

Role: Principal Investigator
Mesenchymal Stem Cells and the Epigenetic Programming of Neonatal Adiposity

This grant is awarded to exceptional junior faculty members for the conduct of research focused in areas that will help improve the diagnosis, treatment, or management of cardiovascular disease and/or diabetes in women. The goal of this project is to identify differences in mesenchymal stem cell adipogenesis, based on mother's obesity status, that potentially contribute to the developmental programming of neonatal adiposity.

$25,000 direct costs, no indirect costs

Pending

Extramural

Submitted
Mar 2022
5th Percentile

NIH R01 NIMHD
Role: Co-Principal Investigator

Principal Investigators: Kristen Boyle, PhD; Sonja Entringer, PhD; Pathik Wadhwa, PhD

Biological Embedding of Social Disadvantage in Human Stem Cells: Implications for Health Disparities

The goal of this project is to test hypotheses in a cohort of 240 mother-child dyads about the impact of maternal exposure to social disadvantage during pregnancy on offspring mesenchymal progenitor/stem cells, on newborn body composition (adipose tissue mass) and glucose-insulin regulation as the clinical outcome of interest, and on maternal-fetal gestational biology as the proximate transmission pathway of interest.

Submitted
Jan 2022

Diabetes Research Center, Anschutz Medical Campus
Role: Co-Investigator

Principal Investigator: Emily Bates

Determining the effect of in utero CBD exposure on eating behaviors, obesity, and insulin resistance.

Cannabidiol consumption is increasing nationally among the general population and among pregnant women specifically, which could increase child obesity and later life diabetes risk. Yet very little is known about the offspring health risks of prenatal cannabidiol use. The goal of this pilot project is to determine whether and how prenatal cannabidiol exposure increases offspring obesity and metabolic disease in mice.

To Resubmit
Oct. 2022

NIH R01 NIDDK
Role: Co-Principal Investigator

Principal Investigators: Kristen Boyle, PhD; Suzanne Phelan, PhD; Leanne M. Redman, PhD

Effect of Gestational Weight Maintenance and Metabolic Health on offspring Phenotype: An Ancillary Study to the Healthy Mamas Randomized Controlled Trial

This project is ancillary to a newly funded randomized controlled feeding study that will maintain maternal weight during pregnancy in women with obesity. The goal of this ancillary project is to determine the effects of the intervention and pre-intervention maternal health on infant obesity-related outcomes, including epigenetic and metabolic molecular phenotypes. Results from this study will determine whether maternal lifestyle intervention, exclusively in women with obesity, will improve offspring obesity risk.

To Resubmit Oct. 2022

NIH R01 NIEHS
Role: Co-Principal Investigator

Principal Investigators: Anne Starling, PhD; Kristen E. Boyle, PhD

Prenatal POPs exposure and Child obesity and metabolic disruption: Linking functional outcomes, DNA methylation, and epidemiologic approaches

The goal of this project is to determine whether maternal exposure to persistent organic pollutants is associated with child adiposity and metabolic health outcomes. In addition, this project will determine whether DNA methylation outcomes are mechanistically linked to phenotypic adiposity outcomes using primary umbilical cord-derived mesenchymal stem cells.

To resubmit Feb 2023

NIH R01 NIDDK
Role: Co-Principal Investigator

Principal Investigators: Wei Perng, PhD; Kristen Boyle, PhD; Anne Starling, PhD

Perinatal mechanisms underlying development of childhood obesity: Epidemiologic analyses and nested in vitro studies in the Healthy Start Pre-Birth Cohort.

This project is ancillary to the Healthy Start pre-birth cohort. The goal of this research is to identify shared and unique causal mechanisms underlying three established perinatal risk factors of childhood obesity: an obesogenic maternal metabolic milieu during pregnancy, rapid adiposity gain from birth through early childhood, and neighborhood environmental and social context.

PUBLICATIONS

- 31 peer-reviewed publications, 12 as first-author or senior author
- >2,600 citations, with >1,700 in Thompson Reuters-indexed journals
- *h*-index: 15 (Google Scholar = 18)
- * indicates mentee

Peer-Reviewed

1. Berggren JR, **Boyle KE**, Chapman WH, Houmard JA. Skeletal muscle lipid oxidation and obesity: influence of weight loss and exercise. *Am J Physiol Endocrinol Metab*, *294*(*4*):*E726-32*, 2008. PMID: 18252891.

2. Hittel DS, Berggren JR, Shearer J, **Boyle KE**, and Houmard JA. Increased secretion and expression of myostatin in skeletal muscle from extremely obese women. *Diabetes*, *58(1):30-8*, 2009. PMID: 18835929.

3. Anderson EJ, Conniff ME, **Boyle KE**, Woodlief TL, Kane DA, Price III JW, Ravinovitch PS, Szeto HH, Houmard JA, Cortright RN, Wasserman DH, and Neufer PD. Mitochondrial H_2O_2 emission and cellular redox state link excess fat intake to insulin resistance. *J Clin Invest*, 119(3):573-581, 2009. PMID: 19188683. ***Web of Science: Top Cited in the Field*.

4. Howe HR III, Heidal K, Choi MD, Kraus RM, **Boyle KE**, and Hickner RC. Increased adipose tissue lipolysis after a 2-week high-fat diet in sedentary overweight/obese men. *Metabolism*, 60(7):976-81, 2011. PMID: 21040937.

5. **Boyle KE** and Friedman JE. Maternal obesity and oxidative stress in the fetus: Mechanisms underlying early life shifts in skeletal muscle metabolism. *Fetal Matern Med Rev* 22:219–246, 2011. *Review*.

6. **Boyle KE[#]**, Canham JP, Consitt LA, Zheng D, Koves TR, Gavin TP, Holbert D, Neufer PD, Muoio DM, and Houmard JA. A high fat diet elicits differential responses in genes coordinating lipid oxidative metabolism in the skeletal muscle of lean and obese humans. *J Clin Endocrinol Metab*, 96(3):775-81, 2011. PMID: 21190973. [#]corresponding author.

7. **Boyle KE[#]**, Zheng D, Anderson EJ, Neufer PD, and Houmard JA. Mitochondrial lipid oxidation is impaired in cultured myotubes from obese humans. *Int J Obes* (Lond.) 36:1025-31, 2012. PMID: 22024640. [#]corresponding author.

8. **Boyle KE[#]**, Newsom SA, Janssen RC, Lappas M, and Friedman JE. Skeletal muscle MnSOD, mitochondrial complex II, and SIRT3 enzyme activities are decreased in maternal obesity during human pregnancy and gestational diabetes mellitus. *J Clin Endocrinol Metab*. 98(10):E1601, 2013. PMID: 23956348. [#]corresponding author.

9. Newsom SA, **Boyle KE**, and Friedman JE. Sirtuin 3: A major control point for obesity-related metabolic diseases? *Drug Discov Today Dis Mech* 10:e35-e40, 2013. *Review*. PMID: 23997790.

10. **Boyle KE[#]**, Hwang H, DeVente JM, Barbour L, Hernandez T, Mandarino LJ, Lappas M and Friedman JE. Gestational diabetes is characterized by reduced mitochondrial protein expression and altered calcium signaling proteins in skeletal muscle. *PLoS*

One. 9(9):e106872, 2014. PMID: 25216282. #corresponding author. ***Top 25% most cited PLOS ONE articles*.

11. Schlaepfer IR, Glode LM, Hitz CA, Pac CT, **Boyle KE**, Maroni P, Deep G, Agarwal R, Lucia SM, Cramer SD, Serkova NJ, and Eckel RH. Inhibition of lipid oxidation increases glucose metabolism and enhances 2-deoxy-2-[18F]-fluoro-D-glucose uptake in prostate cancer mouse xenografts. *Mol Imaging Biol*. 17(4):529-38, 2015. PMID: 25561013.

12. Baker P*, **Boyle KE*#**, Muoio DM, Houmard JA, Friedman JE. Metabolomic analysis reveals altered skeletal muscle amino acid and fatty acid handling in obese humans. *Obesity* 23(5):981-8, 2015. PMID: 25864501. *equal author contribution, #corresponding author.

13. Boyle KE#, *Patinkin ZW, Shapiro ALB, Baker PR II, Dabelea D, Friedman JE. Mesenchymal Stem Cells from Infants Born to Obese Mothers Exhibit Greater Potential for Adipogenesis: The Healthy Start BabyBUMP Project. *Diabetes*. 65(3):647-59, 2016. PMID: 26631736. #corresponding author. ***Featured in Nature Reviews Endocrinology. ***F1000 Recommended Exceptional New Finding*.

14. *Shapiro ALB, **Boyle KE**, Dabelea D, *Patinkin ZW, De la Houssaye B, Ringham BM, Glueck D, Barbour LA, Norris J, Friedman JE. Nicotinamide promotes adipogenesis in umbilical cord-derived mesenchymal stem cells and corresponds to neonatal adiposity: The Healthy Start BabyBUMP Project. *PLoS One*. 11(7):e0159575, 2016. PMID: 27414406.

15. **Boyle KE**, Friedman JE, Underkofler C, Houmard JA, and Rasouli N. Fenofibrate increases skeletal muscle fatty acid oxidation in obese, insulin resistant humans. *Horm Metab Res*. Jan;49(1):50-57, 2017. PMID: 28103623.

16. Cavalli G, Justice JN, **Boyle KE**, D'Alessandro A, Eisenmesser EZ, Herrera JJ, Hansen KC, Nemkov T, Stienstra R, Garlanda C, Mantovani A, Seals DR, Dagna L, Joosten LA, Ballak DB, Dinarello CA. Interleukin 37 reverses the metabolic cost of inflammation, increases oxidative respiration, and improves exercise tolerance. *Proc Natl Acad Sci USA.* 114(9):2313-2318, 2017. PMID: 28193888.

17. **Boyle KE#,** *Patinkin ZW, *Shapiro ALB, Bader C, Vanderlinden, L Kechris K, Janssen RC, Ford RJ, Smith BK, Steinberg GR, Davidson EJ, Yang IV, Dabelea D, Friedman JE. Maternal obesity alters fatty acid oxidation, AMPK activity, and associated DNA methylation in mesenchymal stem cells from human infants. *Mol Metab,* 6(11):1503-1516, 2017. PMID: 29107296 #corresponding author.

18. Baker PR II, *Patinkin ZW, *Shapiro ALB, De La Houssaye, B, Woontner M, **Boyle KE**, Vanderlinden L, Dabelea D, and Friedman JE. Maternal Obesity and Increased Neonatal Adiposity Correspond with Altered Infant Mesenchymal Stem Cell. *JCI Insight*, 2(21), 2017. PMID: 29093265.

19. Reusch JEB, Kumar TR, Regensteiner JG, Zeitler PS, and Conference Participants (31 other authors, including Boyle KE). Identifying the Critical Gaps in Research on Sex Differences in Metabolism Across the Life Span. *Endocrinology*, 159(1):9-19, 2018. *Review*. PMID:29300998.

20. Bruce KD, Gorkhali S, Given K, Coates AM, **Boyle KE**, Macklin WB, Eckel RH. Lipoprotein Lipase is a feature of alternatively-activated microglia and may facilitate lipid

uptake in the CNS during demyelination. *Front Mol Neurosci*. 2018 Mar15;11-57, 2018. PMID: 29599706.

21. **Boyle KE**, Magill-Collins MJ, Newsom SA, Janssen RC, Friedman, JE. Maternal Fat-1 Transgene Protects Offspring from Excess Weight Gain, Oxidative Stress, and Reduced Fatty Acid Oxidation in Response to High-Fat Diet. *Nutrients*, 2020 Mar 14;12(3):767. PMID: 32183350.

22. *Keleher MR, Erickson K, Kechris K, Yang IV, Dana Dabelea D, Friedman JE, **Boyle KE**, and Jansson T. Associations between the activity of placental nutrient-sensing pathways and neonatal and postnatal metabolic health: the ECHO Healthy Start cohort. *Int J Obes (Lond).* 2020 Nov;44(11):2203-2212. PMID: 32327723.

23. Starling AP, Liu C, Shen G, Yang IV, Kechris K, Borengasser SJ, **Boyle KE**, Zhang W, Smith HA, Calafat AM, Hamman RF, Adgate JL, and Dabelea D. Prenatal Exposure to Per- and Polyfluoroalkyl Substances, Umbilical Cord Blood DNA Methylation, and Cardio-Metabolic Indicators in Newborns: The Healthy Start Study. *Environ Health Perspect*. 2020 Dec;128(12):127014. doi: 10.1289/EHP6888. PMID: 33356526.

24. *Keleher MR, Erickson K, Smith HA, Kechris KJ, Yang IV, Dabelea D, Friedman JE, **Boyle KE**, and Jansson T. Placental Insulin/IGF-1 Signaling, PGC1α, and Inflammatory Pathways are Associated With Metabolic Outcomes at 4-6 years of Age: The ECHO Healthy Start Cohort. Accepted: *Diabetes*, 2021. DOI: 10.2337/db20-0902, PMID: 33414248.

25. Erickson ML, *Patinkin ZW, *Duensing A, Dabelea D, Redman LM, and **Boyle KE**. Maternal metabolic health drives mesenchymal stem cell metabolism and infant fat mass at birth. *JCI Insight*. 2021 Jul 8;6(13):146606. PMID: 34061777.

26. Flanagan EW, Most J, Altazan AD, **Boyle KE**, Redman LM. A role for the early pregnancy maternal milieu in the intergenerational transmission of obesity. In Press: *Obesity*.

27. Starling AP, Liu C, Shen G, Yang IV, Kechris K, Borengasser SJ, Boyle KE, Zhang W, Smith HA, Calafat AM, Hamman RF, Adgate JL, and Dabelea D. Prenatal Exposure to Per- and Polyfluoroalkyl Substances, Umbilical Cord Blood DNA Methylation, and Cardio-Metabolic Indicators in Newborns: The Healthy Start Study. Environ Health Perspect. 2020 Dec;128(12):127014. doi: 10.1289/EHP6888. PMID: 33356526 PMCID: PMC7759236

28. Francis EC, Dabelea D, **Boyle KE**, Jansson J, Perng W. Maternal Diet Quality Is Associated with Placental Proteins in the Placental Insulin/Growth Factor, Environmental Stress, Inflammation, and mTOR Signaling Pathways: The Healthy Start ECHO Cohort. *J Nutr*. 2022 Mar 3;152(3):816-825. PMID: 34850052.

29. Chaves AB, Weyrauch LA, Zheng D, Biagioni EM, Krassovskaia PM, Davidson BL, Broskey NT, Boyle KE, May LE, Houmard JA. Maternal aerobic exercise improves glucose partitioning and insulin action in offspring mesenchymal stem cells: The ENHANCED by Mom Study. *J Clin Endocrinol Metab*. 2022 Jul 14;107(8):e3353-e3365. PubMed PMID: 35511592.

30. Chaves AB, Zheng D, Johnson HA, Bergman BC, Patinkin ZW, Zaegel V, Biagioni EM, Krassovskaia P, Broskey NT, May LE, Dabelea D, Houmard JA, **Boyle KE**. Infant

mesenchymal stem cell insulin action is associated with maternal plasma free fatty acids, independent of obesity status: The Healthy Start Study. *Diabetes*. 2022 Aug 1;71(8):1649-1659. PubMed PMID: 35621990.

31. Gyllenhammer LE, Picard M, McGill MA, **Boyle KE**, Vawter MP, Rasmussen JM, Buss C, Entringer S, Wadhwa PD. Prospective association between maternal allostatic load during pregnancy and child mitochondrial content and bioenergetic capacity. *Psychoneuroendocrinology*. 2022 Jul 15;144:105868. PubMed PMID: 35853381.

Book Chapters

1. Consitt LA, **Boyle KE**, and Houmard JA. Exercise as an effective treatment for type 2 diabetes. In Contemporary Endocrinology: Type 2 Diabetes Mellitus: An Evidence-Based Approach to Practical Management. Eds. Feinglos MN & Bethel MA. Humana Press; Totowa; NJ, pgs 135-150, 2008.

2. Janssen RC and **Boyle KE**. Microplate Assays for Spectrophotometric Measurement of Mitochondrial Enzyme Activity. Ed. D'Alessandro A. *Methods in Molecular Biology: High-Throughput Metabolomics*, Humana Press. 2018.

Scientific Abstracts (Boyle KE presented if type of presentation is indicated)

1. **Boyle KE**, Thuma JR, and Loucks AB. Short-term effects of low energy availability on ghrelin reflect effects on body size, not leptin or insulin. 2003 American College of Sports Medicine 50th Annual Meeting, San Francisco, CA. Oral Presentation.

2. Loucks AB, **Boyle KE**, Gendelman S, Thuma JR, Wiese T, and Wolke ET. Low energy availability suppressed LH pulse frequency in younger but not older women. The Endocrine Society's 86th Annual Meeting, New Orleans, June 2004. Abstract #: P2-534, pg. 440.

3. Redman LR, Laughlin GA, **Boyle KE**, and Loucks AB. 24-h mean ghrelin concentrations are normal in amenorrheic athletes. The Endocrine Society's 86th Annual Meeting, New Orleans, June 2004. Abstract #: P2-254, pg. 367.

4. Molskness SM, Berggren JR, Bajpeyi S, **Boyle KE**, Newton C, Tanner CJ, and Houmard JA. Effect of 10 days of training on fat oxidation in diabetics. American Diabetes Association's 66th Scientific Sessions, Washington D.C., June 2006. Abstract #: 21-LB.

5. **Boyle KE**, Canham JP, Consitt LA, Zheng D, Gavin TP, and Houmard JA. Evidence for metabolic inflexibility in response to dietary lipid with obesity. APS Intersociety Meeting: The Integrative Biology of Exercise V, Hilton Head, September 2008. Abstract #: 22.15. Poster Presentation.

6. Anderson EJ, **Boyle KE**, Houmard JA, and Neufer PD. Excess dietary fat depletes glutathione, increases mitochondrial oxidant emitting potential and shifts redox balance to a more oxidized state in human skeletal muscle. Experimental Biology, San Diego, April 2008. Abstract #: 958.7, S374.

7. **Boyle KE**, Zheng D, Anderson EJ, Neufer PD, and Houmard JA. Mitochondrial function is impaired in cultured myotubes from obese humans. International Biochemistry of Exercise Conference, University of Guelph, Ontario, Canada, June 2009. Abstract #: 14. Oral Presentation.

8. Anderson EJ, **Boyle KE**, Houmard JA, and Neufer PD. Obesity is associated with reduced glutathione content, increased mitochondrial H_2O_2 emitting potential and a more oxidized redox environment in human skeletal muscle. 2008 American Diabetes Association's 68th Scientific Sessions, San Francisco, CA.

9. Kwak H-B, Thalacker-Mercer A, Anderson EJ, **Boyle KE**, Houmard JA, Cortright RN, Bamman MM, and Neufer PD. Simvastatin Impairs ADP-Stimulated Mitochondrial Respiration and Alters Apoptotic Signaling and Morphology in Human Skeletal Myotubes. 2009 American Diabetes Association's 69th Scientific Sessions, New Orleans, LA.

10. Kwak H-B, Lin C-T, Kane DA, Lee N-S, **Boyle, KE**, Houmard JA, Cortright RN, Neufer PD. Simvastatin Increases Mitochondrial Oxidative Stress and Reduces Mitochondrial Ca2+ Retention Capacity in Human Skeletal Myotubes, 2010 American College of Sports Medicine 57th Annual Meeting, Baltimore, MD.

11. **Boyle KE**, Hwang H, DeVente JM, Barbour L, Hernandez T, Bowen B, Zhengping Y, Mandarino LJ, and Friedman JE. Quantitative Proteomic Profile in Skeletal Muscle from Women with Gestational Diabetes Reveals Potential for Reduced Mitochondrial Function, 2010 American Diabetes Association 70th Scientific Sessions, Orlando, FL. Oral Presentation.

12. **Boyle KE**, Heerwagen MJ, and Friedman JE. Transgenic mice enriched for omega-3 fatty acids show improved skeletal muscle mitochondrial fuel switching in response to high-fat diet. August 2011, FASEB Summer Research Conference: Nutrient Control of Metabolism and Cell Signaling, Steamboat Springs, CO. Oral Presentation.

13. Schlaepfer IR, **Boyle KE**, Glode ML and Eckel RH, Role of Lipid Oxidation in Cancer Metabolism, August 2011 Kern Lipid Conference, Vail, CO.

14. **Boyle KE**, Houmard JA, Friedman JE, and Rasouli N. Fenofibrate increases lipid oxidation in human skeletal muscle, Poster Presentation at 2012 American Diabetes Association 72nd Scientific Sessions, Philadelphia, PA. Poster Presentation.

15. **Boyle KE**, Newsom SA, Janssen RC, Lappas M, and Friedman JE. Decreased SIRT3 activity contributes to oxidative stress and reduced mitochondrial enzyme activity in skeletal muscle of obese pregnant women. *2013 American Diabetes Association 73nd Scientific Sessions, Chicago, IL* Poster Presentation.

16. Baker PR II, **Boyle KE**, Buti AL, Dabelea D, Barbour LA, Friedman JE. Stem Cells from Offspring of Mothers Demonstrate Evidence for Developmental Programming in Obesity. 2014 American Society of Human Genetics, San Diego, CA.

17. Baker PR II, **Boyle KE**, Shapiro ALB, Patinkin ZW, Dabelea D, and Friedman JE. Maternal Obesity Influences Amino Acid Metabolism in Offspring Umbilical Derived Stem Cells. 2015 Keystone Symposia: Diabetes and Metabolic Dysfunction, Santa Fe, NM.

18. Baker PR II, **Boyle KE**, Shapiro ALB, Patinkin ZW, Dabelea D, and Friedman JE. Maternal Obesity and Newborn Adiposity Correlate with Amino acid and Acylcarnitine Metabolism in Mesenchymal Stem Cells. 2015 Society for Inherited Metabolic Disease, Salt Lake City, UT.

19. **Boyle KE**, Patinkin Z, Shapiro ALB, Dabelea D, Friedman JE. Human mesenchymal stem cells from offspring of obese mothers have increased adipogenesis and evidence for insulin resistance: The Healthy Start Study. *2015 American Diabetes Association 75th Scientific Sessions, Boston, MA. Oral Presentation at President's Oral Session*.

20. Shapiro ALB, **Boyle KE**, Dabelea D, Patinkin Z, Glueck D, Barbour LA, Norris J, Friedman JE. Nicotinamide promotes adipogenesis in umbilical cord-derived mesenchymal stem cells and corresponds to neonatal adiposity: The Healthy Start study. *2015 American Diabetes Association 75th Scientific Sessions, Boston, MA*.

21. **Boyle KE**, Patinkin ZW, Shapiro ALB, Baker PR II, Dabelea D, Friedman JE. Disrupted GSK-3β/β-catenin signaling induces greater adipogenesis in mesenchymal stem cells derived from babies of obese women: The Healthy Start BabyBUMP Project. *2015 The Obesity Society ObesityWeek 2015, Los Angeles, CA. Late Breaking Oral Presentation.*

22. **Boyle KE**, Patinkin ZW, Shapiro ALB, Vanderlinden L, Kechris K, Dabelea D, & Friedman JE. DNA hypermethylation of metabolic genes corresponds to lower fatty acid oxidation in mesenchymal stem cells from infants of obese mothers: The Healthy Start BabyBUMP Project. *2016 Obesity and Adipose Tissue Biology, Keystone Symposia, Banff, Alberta, CA. Oral presentation.*

23. Baker PR II, Patinkin ZW, Shapiro ALB, De La Houssaye, B, Woontner M, **Boyle KE**, Dabelea D, and Friedman JE. Dysregulated Lipid Metabolism in Adipocyte Differentiated Umbilical Derived Mesenchymal Stem Cells Predicts Increased Infant Adiposity at 5 Months of Age. *2016 American Diabetes Association 76th Scientific Sessions, New Orleans, LA.*

24. **Boyle KE**, Patinkin ZW, Shapiro ALB, Yang I, Davidson B, Vanderlinden L, Kechris K, Dabelea D, & Friedman JE. DNA Hypermethylation Corresponds to Differences in Metabolism and Cellular Differentiation in Mesenchymal Stem Cells from Infants Born to Obese Mothers: The Healthy Start BabyBUMP Project. *2016 American Diabetes Association 76th Scientific Sessions, New Orleans, LA. Oral Poster Presentation.*

25. **Boyle KE**, Patinkin ZW, Shapiro ALB, Yang I, Davidson B, Vanderlinden L, Kechris K, Dabelea D, & Friedman JE. Reduced fatty acid oxidation in mesenchymal stem cells from infants of obese mothers corresponds to DNA hypermethylation of genes regulating fatty acid metabolism: The Healthy Start BabyBUMP Project. *2016 Perinatal Biology Symposium, Aspen, CO. Poster Presentation.*

26. Cavalli, G, Ballak D, Justice JJ, **Boyle KE**, D'Alessandro A, Joosten LA, Dagna L, C. A. Dinarello CA. Interleukin 37 reverses the metabolic cost of inflammation, increases oxidative respiration, and improves exercise tolerance. *2017 European League Against Rheumatism (EULAR) Congress, Madrid, Spain.*

27. Patinkin ZW, Bader C, Dabelea D, **Boyle KE**. Oxidative Stress Linked to Lower Mitochondrial Fat Oxidation in Human Mesenchymal Stem Cells from High Adiposity Infants Born to Mothers with Obesity: The Healthy Start BabyBUMP Project. *2017*

American Diabetes Association 77th Scientific Sessions, San Diego, CA. Late Breaking Poster Presentation.

28. Keleher M, Friedman JE, Dabelea D, and **Boyle KE**. Maternal glucose and insulin are associated with AMPK and GSK3β proteins in human umbilical cord derived mesenchymal stem cells: The Healthy Start ECHO Cohort *2019 American Diabetes Association 79th Scientific Sessions, San Francisco, CA*

29. Keleher M, Shubhangi S, Brown A, Duensing A, Dabelea D, and **Boyle KE**. Maternal Obesity Linked to Hypertrophy in Adipogenic Infant MSCs: The Healthy Start ECHO Cohort, *ObesityWeek 2019, Las Vegas, NV. Oral Presentation*.

30. Chaves AB, Johnson JA, Zheng D, Dabelea D, Houmard JA, and **Boyle KE**. Infant Mesenchymal Stem Cell Insulin Sensitivity Is Associated with Maternal Plasma-Free Fatty Acids, Independent of Obesity Status: The Healthy Start Study. American Diabetes Association 80th Scientific Sessions, 2020. Poster#: 1328.

31. Duensing AM, Dabelea D, **Boyle KE**. Infant MSC Metabolism Correlates With Maternal Glucose and Offspring Adiposity: Healthy Start Study. The Obesity Society, ObesityWeek 2020.

32. Starling AP, Glueck DH, Allshouse WB, **Boyle KE**, Bloemsma LD, Hamman RF, Adgate JL, Dabelea D. Prenatal exposure to per- and polyfluoroalkyl substances and child adiposity at age 5 years: a multipollutant analysis. International Society for Environmental Epidemiology Meeting 2021.

33. Erickson ML, Dobias D, Dabelea D, Broussard JL, **Boyle KE.** Circadian Clock Gene Amplitude is Linked to Fat Stores in Mesenchymal Stem Cells from Human Infants. Society for Research on Biological Rhythms, Biennial Conference 2022.

34. Huff KK, Roell K, Bulka CM, **Boyle KE**, Breton CV, Burt AA, Dabelea D, Kahn LG, Karagas MR, Ladd-Acosta C, Marsit CJ, Niemiec S, Volk HE, O'Shea TM, Fry RC. Maternal pre-pregnancy obesity and gestational diabetes: associations with epigenetic gestational aging in the placenta, American Diabetes Association 82nd Scientific Sessions, 2022.

35. Gyllenhammer LE, Keleher MR, Wood C, Yang IV, Friedman JE, Janssen J, Dabelea D, Kechris K, **Boyle KE**. The Umbilical Cord Mesenchymal Stem Cell Transcriptome is Associated With Childhood Adiposity Gain. Submitted to The Obesity Society ObesityWeek 2022, San Diego, CA.

36. Waldrop S, Wood C, Niemiec S, Yang IV, Kechris K, Borengasser SJ, Dabelea D, and **Boyle KE**. Triglyceride and Insulin in Late Gestation Associate with Cord Blood DNA Methylation of Genes Regulating Adipogenesis, Nutrient Metabolism, and Immune Function and with Later Offspring Adiposity at 5 Months of Age. Submitted to The Obesity Society ObesityWeek 2022, San Diego, CA.

Abstracts (Non-Competitive)

1. **Boyle KE**, Heerwagen MJ, and Friedman, JE. Maternal Inflammation Programs Offspring Skeletal Muscle Metabolism, Regardless of Postnatal Diet. Annual BIRCWH Scholars Meeting, Washington D.C., October 2013. *Poster Presentation*.

2. **Boyle KE**, Hwang H, DeVente JM, Barbour L, Hernandez T, Mandarino LJ, Lappas M and Friedman JE. Proteomic analysis reveals reduced mitochondrial protein expression and altered calcium signaling proteins in human skeletal muscle during gestational diabetes Center for Women's Health Research Women's Health Research Day 2013. *Poster Presentation, Poster Award.*

3. **Boyle KE**, Patinkin ZW, Shapiro ALB, Vanderlinden L, Kechris K, Dabelea D, & Friedman JE. Maternal obesity programs reduced fatty acid oxidation and DNA hypermethylation of metabolic genes in infant umbilical cord derived mesenchymal stem cells: The Healthy Starty BabyBUMP Project. 2016 University of Colorado School of Medicine Department of Pediatrics Research Day. *Poster Presentation*.

4. Buti AL, **Boyle KE**, Dabelea D, Gleuck D, Barbour LA, Norris J, and Friedman JE. Nicotinamide and its effect on adipogenesis in human umbilical cord-derived mesenchymal stem cells: The Healthy Start Study. Translational Science Conference, Washington D.C., 2014.

5. **Boyle KE**, Patinkin ZW, Shapiro ALB, Vanderlinden L, Kechris K, Dabelea D, & Friedman JE. Maternal obesity programs reduced fatty acid oxidation and DNA hypermethylation of metabolic genes in infant umbilical cord derived mesenchymal stem cells: The Healthy Start BabyBUMP Project. *2016 University of Colorado School of Medicine Department of Pediatrics Research Day, Aurora, CO. Poster Presentation.*

6. Quist RE, Patinkin ZW, and **Boyle KE**. Mesenchymal Stem Cells of Infants Born to Mothers with Obesity may Provide Clues to Future Obesity Risk: The Healthy Start BabyBUMP Project. 2016 University of Colorado 19th Annual Research and Creative Activities Symposium.

7. **Boyle KE**, Patinkin ZW, Shapiro ALB, Yang I, Davidson B, Vanderlinden L, Kechris K, Dabelea D, & Friedman JE. Reduced fatty acid oxidation in mesenchymal stem cells from infants of obese mothers corresponds to DNA hypermethylation of genes regulating fatty acid metabolism: The Healthy Start BabyBUMP Project. *2016 Center for Women's Health Research Day, Aurora, CO. Poster Presentation, Poster Award.*

8. Salzmann-Sullivan M, Su L-J, Jihye Kim, **Boyle K**, Lam E, Flaig T, and Schlaepfer IR. CPT1A and AR blockade result in differential regulation of genetic and metabolic pathways in castration resistant prostate cancer cells. *2018 University of Colorado Department of Medicine Research Day.*

9. Shubhangi S, Keleher M, Duensing A, Dabelea D, and **Boyle KE**. Adipogenic Differentiating Mesenchymal Stem Cells from Infants of Obese Mothers Have Greater Lipid Content and Cell Size in 3-Dimensional Culture, *Aspen Snowmass Perinatal Biology Symposium 2019, Snowmass CO. Poster Presentation*.