

BIOGRAPHICAL SKETCH

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NAME: **Paul S. MacLean**

eRA COMMONS USER NAME (credential, e.g., agency login): **HSC.MACLEAN.PAUL**

POSITION TITLE: **Professor of Medicine and Pathology**

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Brigham Young University, Provo, UT	BS	05/1992	Exercise Physiology
Brigham Young University, Provo, UT	MS	05/1994	Endocrine Physiology
East Carolina University BSOM, Greenville, NC	PhD	12/1999	Biochemistry
East Carolina University BSOM, Greenville, NC	Fellow	07/2001	Metabolism

A. Personal Statement

On this project, I will serve as PI and Director of the Colorado Nutrition Obesity Research Center (**NORC**). I am a tenured Professor of Medicine and Pathology with over 30 years of experience studying nutrition, metabolism, and obesity. My research pursues a better understanding of the biological drivers of weight regain after weight loss and how obesity impacts women's health across the lifespan. My interdisciplinary, collaborative research program has been continually funded by the NIH since 2004. Currently, I lead a team of obesity and cancer researchers on a project that merges preclinical and clinical studies to advance our understanding of overnutrition and intermittent fasting on breast cancer (NIH R01 CA258766), and I am a Project Lead for a team science grant focused on bioenergetic and cardiometabolic consequences of the loss of ovarian function (**SCORE**, NIH U54 AG062319). I have been actively involved in the NORC's cores, its day-to-day operations, and its strategic investments for two decades, and I have been serving as the NORC Director since 2018. As the Director of Research and Education Integration for the Anschutz Health and Wellness Center (**AHWC**), I am well-positioned to coordinate collaborative efforts between the NORC and the AHWC to maximize the NORC's impact on the Anschutz Medical Campus. I have a successful track record of leveraging institutional funds, forming strong collaborative partnerships with campus leaders, and building and supporting interdisciplinary teams to advance the science of nutrition and obesity.

As the Colorado NORC Director, I bring a wealth of mentoring experience and leadership to support the career development of our early-stage investigators. For the Colorado Clinical Translation Science Institute (**CTSI**), I am Co-Director of the PreK Program, Associate Director of both Pre- and Post-Doctoral T32s, and Associate Director for the K12 Research Scholar Program. I have mentored over 30 scientists at the undergraduate, graduate, post-graduate, and junior faculty levels, and I serve as an Advisor for two mid-career K24 clinician scientists who are developing the next generation of patient-oriented researchers. My trainees have successfully acquired mentored training grants/fellowships through the NIH (TL1, T32, F31, F32, K99/R00, Diversity Supplement, SCORE Scholar Award, K01, BIRCWH K12, and KL2) and other training programs (VA CDA2, Komen CDA, Thorkilldensen Foundation, the American Institute for Cancer Research, the Bec.as-Fullbright Argentine Presidential Fellowship program, and the Endocrine Society). The majority of my trainees have been women, and a significant number have been from underrepresented minority groups or from disadvantaged backgrounds. Many have moved on to successful academic research careers.

Given my track record of leadership, success with team science, mentoring experience, and my relationships with key campus leaders and national NORC communities, I am well-qualified and ideally positioned to lead the Colorado NORC during the next funding cycle. My work and reputation are known within the scientific community to the extent that I have been invited to lead and participate in a number of interdisciplinary reviews and working groups, which have advanced our understanding of overnutrition and its metabolic consequences:

Current and Recently Completed Research Projects to Highlight

Ongoing Projects (*mentored career development awards and fellowships)

- NIH P30 DK48520 (NORC)** MacLean 8/1/20 – 7/31/25
Colorado Nutrition Obesity Research Center
This is a center grant to foster collaborative, interdisciplinary, translational research in nutrition among NIH funded researchers studying nutrition and obesity. The grant supports core laboratories and a pilot program.
Roles: Center Director, Associate Director of Energy Balance Assessment core
- NIH/NCI R01 CA258766** MacLean, Kabos, Catenacci 1/1/22 – 12/31/26
Novel Dietary Interventions for Reducing Obesity-Associated Breast Cancer.
This project will examine the utility of intermittent fasting and time-restricted feeding as strategies for preventing breast cancer recurrence in patient-derived xenograft models and breast cancer survivors, while elucidating the role of cancer-associated fibroblasts in obesity-associated breast cancer.
- NIH U54 AG062319 (SCORE)** Kohrt (MacLean PI of Project 2) 9/20/12 – 8/31/28
Bioenergetic and Metabolic Consequences of the Loss of Gonadal Function.
The CO-SCORE contains 3 integrated R01-equivalent, translational research projects examining the impact of gonadal aging on the regulation of bioenergetics, abdominal adiposity, and metabolism.
- NIH R01 DK111622** Catenacci 7/01/17 – 6/30/22
Comparison of Weight Loss Induced by Intermittent Fasting Versus Daily Caloric Restriction in Individuals with Obesity: A 1-Year Randomized Trial
This clinical study examines a novel dietary intervention for the treatment of obesity, and the biological, behavioral, psychosocial, and environmental predictors of treatment response. *Role: Co-investigator*
- NIH R01 CA241156** Wellberg 7/1/19 – 6/30/24
Growth Factor Signaling in Obesity Associated Breast Cancer
This project examines the role of FGF and FGF receptor signaling in obesity-associated mammary tumor promotion and endocrine therapy resistance. *Role: Co-investigator*
- *NIH/NCATS UM1TR004399** Sokol 9/15/23 – 7/31/30
Colorado Clinical Translational Science Institute (CCTSI)
This center grant fosters clinical/translational research and education through institutional training programs, research cores, and pilot programs. *Roles: Co-Director of Pre-K Program;*
- *NIH/NIDDK P30 DK48520-26S2** Wilkerson 2/1/21 – 1/31/23
Diversity Supplement to the Colorado Nutrition Obesity Research Center
This supplement supports Dr. Rochelle Cason-Wilkerson through protected time and research resources as she develops her independent research program. *Role- Co-Mentor and parent grant PI*
- *NIH F31 CA261053** Ward 4/15/21 – 4/14/23
Altered Lipid Metabolism in Luminal Breast Cancer Stem Cells and Endocrine Resistance
This is a pre-doctoral NRSA fellowship supporting the training of Ashley Ward who is pursuing a PhD in the Cancer Biology graduate program. *Role- Co-mentor with Sartorius*
- *NIH K12 TR004412** Burnham (K12 for Libby) 12/1/23 – 11/30/28
CTSA K12 Program at University of Colorado Denver
This is an institutional career development program that supports junior faculty members who are developing their independent research programs in clinical and translational science.
Role: Mentor for Andrew Libby; Associate Director of the Program
- *NIH T32 TR004367** Cicutto 9/20/23 – 8/31/28
CTSA Predoctoral T32 at University of Colorado Denver
This is an institutional training program that provides fellowship and research support for graduate students studying clinical and translational science.
Role: Associate Director
- *NIH K12 TR004366** Cicutto 9/18/23 – 6/30/28
CTSA Postdoctoral T32 at University of Colorado Denver
This is an institutional training program that provides fellowship and research support for postdoctoral fellows studying clinical and translational science.
Role: Associate Director

Highlighted Citations

- a. Heitmann BL, Westerterp KR, Loos RJF, Sørensen TIA, O' Dea K, **MacLean PS**, Jensen TK, Eisenmann J, Speakman JR, Simpson SJ, Reed DR, Westerterp-Plantenga MS. Obesity: Lessons from evolution and the environment. *Obesity Rev* 13(10):910-922, 2012.
- b. **MacLean PS**, Wing RR, Davidson T, Epstein L, Goodpaster B, Hall KD, Levin BE, Perri MG, Rolls BJ, Rosenbaum M, Rothman AJ, Ryan D. NIH working group report: Innovative research to improve maintenance of weight loss. *Obesity* 23(1):7-15, 2015.
- c. **MacLean PS**, Rothman AJ, Nicastrò HL, Czajkowski SM, Agurs-Collins T, Rice EL, Courcoulas AP, Ryan DH, Bessesen DH, Loria CM. The Accumulating Data to Optimally Predict Obesity Treatment (ADOPT) Core Measures Project: Rationale and Approach. *Obesity Suppl 2*: S6-S15, 2018.
- d. Castillo-Mancilla JR, Erlandson KM, Hecker ER, Komaie G, Shomaker LB, Cicutto L, Mankin G, **MacLean PS**. Outcomes of a Career Development Award (Pre-K) Mock Review Program for Postdoctoral Fellows and Early-Career Faculty. *Acad Med* 98(11):1313-1318, 2023.

B. Positions, Scientific Appointments, and Honors

Positions and Employment

2019-	Director of Research and Education Integration, Anschutz Health and Wellness Center
2018-	Director, Colorado Nutrition Obesity Research Center
2018-	Associate Director, K12 Research Scholar Training Program, Colorado CTSI
2015-	Co-Director, Colorado CTSI PreK Program
2014-2018	Associate Director, Colorado Nutrition Obesity Research Center
2014-	Professor of Medicine and Pathology, Division of Endocrinology, Metabolism, and Diabetes, University of Colorado School of Medicine
2013-	Graduate Faculty Member, Program on Integrated Physiology
2011-2015	Director, Program on Energy Metabolism, Colorado Obesity Research Initiative
2008-2019	Research Director, Division of Endocrinology, Metabolism, and Diabetes, Department of Medicine, UC Denver
2007-2014	Associate Professor of Medicine, Div. of Endocrinology, Metabolism, and Diabetes, UC Denver
2006-2013	Graduate Faculty Member, Physiology and Biophysics
2006-	Co-Chair, Institutional Animal Care and Use Committee, Office of the Vice Chancellor of Research, UC Denver
2004-2007	Director, Center for Human Nutrition Animal Facility, UCHSC
2004-2019	Associate Director, Molecular & Cellular Analytical Core, Colorado NORC
2004-2023	Associate Director, Energy Balance Assessment Laboratory, Colorado NORC
2004-2012	Graduate Faculty Member, Clinical Sciences Program, UC Denver
2001-2007	Assistant Professor of Medicine, Division of Endocrinology, Metabolism, and Diabetes, UC Denver, Denver, CO

Other Experience and Professional Memberships

2020-	NIH Ad Hoc Reviewer: Study Sections ZRG1 OBT-B 55 R; DDK-B; 10 ZCA1 SRB-A (01) S; ZCA RTRB-B (01)R; Mechanistic Studies of SARS-CoV-2/COVID-19
2019-2022	Chair, Science Development Committee, The Obesity Society
2017-2019	Chair, Co-Chair, The Obesity Society, ObesityWeek 2018 and 2019 Program Committees
2016-2021	Co-Chair, NIH Working Panel (Bethesda, MD), "ADOPT Core Measures Project"
2016-2019	The Obesity Society, Obesity Week Program Planning Committee
2015	Panel Member, NIH Working Group, "Appetite Regulation, It's Complicated"
2014	Co-Chair, NIH Working Group, "Innovative Research to Improve Maintenance of Weight Loss"
2014	Co-organizer, RACMEM 2014 (Tokyo, Japan) 2 nd International Conference on "Recent Advances and Controversies in the Measurement of Energy Metabolism"
2013-2017	NIH Regular Reviewer Study Section DDK-B
2012-2013	NIH Ad Hoc Reviewer: Study Sections ZRG1 IPOD, ZRG1 EMNR-E10 B, ZRG1 OTC-C (02) M, DDK-B, ZRG1 EMNR-E (90) S
2011	Co-organizer, RACMEM 2011 (Maastricht, The Netherlands) "Recent Advances and Controversies in the Measurement of Energy Metabolism"
2009-2013	Editorial Board Member, <i>Am J Physiol Regul Integr Comp Physiol</i>
2009	Co-Chair, FASEB Summer Research Conference (Snowmass Village, CO) "The Physiological Basis for Obesity Therapeutics" R13 NIH DK084625 (MacLean)
2009-	American Society for Nutrition, Member

2008-2012 NIH Regular Reviewer, Study Section ZRG1 EMNR E10/11 B
 2008 Co-Chair, RACMEM 2008 (Denver, Colorado) "Recent Advances and Controversies in the Measurement of Energy Metabolism"
 2006 NIH Ad Hoc Reviewer, Study Section DDK-B
 2004-2008 American College of Sports Medicine, Member
 2000- American Physiological Society, Member
 2000- The Obesity Society, Member
 1999-2004 American Diabetes Association, Member
 1997-1999 President and Executive Council Member, Doctoral Student Association, ECU BSOM

Honors

2020 Outstanding Leadership, Colorado Nutrition Obesity Research Center
 2018 Outstanding Mentor of the Year, Division of Endocrinology, Metabolism, and Diabetes
 2016 Outstanding Mentor Award, Colorado Nutrition Obesity Research Center
 2010 PhD Teaching and Research Award, Department of Medicine, UC Denver School of Medicine
 2009 Mead-Johnson Award for Excellence in Nutrition Research, American Society for Nutrition
 2006 Kern Aspen Lipid Conference Travel Award
 2004 Outstanding Teaching Award, Clinical Sciences Program, University of Colorado
 2002-2003 Research Career Enhancement Award, American Physiological Society
 1999-2001 Mentored Fellowship, American Diabetes Association

C. Contribution to Science (representative from 127 total publications; *indicates publication with mentees)

1. Metabolic Disease, the Menopausal Transition, and Postmenopausal Breast Cancer. I have published a series of papers utilizing female DIO models to study the sex-specific effects of the DIO phenomenon and the effects of pre-existing obesity on the metabolic consequences of the loss of ovarian function, including the first report of a DIO model that measured intake, expenditure, and fuel utilization, across the estrus cycle and after the loss of ovarian function. Merging the models of obesity (DIO), menopause (surgical ovariectomy), and breast cancer (n-methylnitrosourea), we pursued a better understanding of the tumor promoting effects of obesity after the loss of ovarian function. More recently, we have developed a novel DIO xenograft model (DIOX) for use with patient-derived breast tumors (PDX) to study the distinct molecular mechanisms of obesity- and diabetes-related mammary tumor promotion and endocrine therapy resistance. We have ongoing studies in the DIOX model examining how time-restricted feeding and intermittent fasting affect obesity-associated tumor promotion.

- a. *Giles ED, Wellberg EA, Astling DP, Anderson SM, Thor AD, Jindal S, Tan AC, Schedin PS, **MacLean PS**. Obesity and overfeeding affecting both tumor and systemic metabolism activates the progesterone receptor to contribute to postmenopausal breast cancer. *Cancer Res* 15;72(24):6490-501, 2012. (Cover)
- b. *Wellberg EA, Kabos P, Gillen AE, Jacobsen BM, Brechbuhl HM, Johnson SJ, Rudolph MC, Edgerton SM, Thor AD, Anderson SM, Elias A, Zhou XK, Iyengar NM, Morrow M, Falcone DJ, El-Hely O, Dannenberg AJ, Sartorius CA, **MacLean PS**. FGFR1 underlies obesity-associated progression of ER-positive breast cancer after estrogen deprivation. *JCI Insight* 3(14). pii: 120594, 2018.
- c. *Wellberg EA, Corleto KA, Checkley LA, Jindal S, Johnson G, Higgins JA, Obeid S, Anderson SM, Thor AD, Schedin PJ, **MacLean PS**^A, Giles ED^A. Preventing ovariectomy-induced weight gain decreases tumor burden in rodent models of obesity and postmenopausal breast cancer. *Breast Cancer Res* 24(1):42, 2022. (^Aco-senior authors)
- d. *Libby AE, Solt C, Jackman M, Sherk V, Foright RM, Johnson GC, Nguyen TT, Breit M, Hulett N, Rudolph M, Roberson PA, Wellberg E, Jambal P, Scalzo RL, Higgins J, Kumar TR, Wierman ME, Pan Z, Shankar K, Klemm DJ, Moreau KL, Kohrt WM, **MacLean PS**. Effects of Follicle Stimulating Hormone on Energy Balance and Tissue Metabolic Health After Loss of Ovarian Function. *Am J Physiol Endocrinol Metab* 326(5):E626-E639, 2024.

2. Exercise, Sex Differences, and the Biological Drive to Regain Weight After Weight Loss. Over the past two decades, I have published a series (40+) papers focused on the biological drivers of weight regain and how exercise counters this biological drive to facilitate weight loss maintenance. I developed an experimental paradigm of weight regain after weight loss utilizing rats and mice with a polygenic/epigenetic predisposition for obesity when challenged with an obesogenic environment and utilized this paradigm of weight regain to characterize the metabolic adaptations to weight loss and their role in driving weight regain. I employed *in vivo* nutrient tracers with indirect calorimetry to show that obesity-prone rats have an inherent impairment in fat oxidation, how this is exacerbated after weight loss, and how the suppression of dietary fat oxidation facilitates weight regain. My work was the first to show that after energy-restricted weight loss, regular exercise attenuated weight regain by reducing appetite and increasing expended energy above and beyond the energetic cost of the

exercise bout in a sexual dimorphic manner. More recently, I have leveraged these observations to the interpretation of clinical studies of weight loss and weight loss maintenance and to understanding the individual variability in treatment response.

- a. ***MacLean PS**, Bergouignan A, Cornier M, Jackman MR. Biology's response to dieting: the impetus for weight regain. *Am J Physiol Regul Integr Comp Physiol* 301(3):R581-600, 2011.
- b. *Presby DM, Checkley LA, Jackman MR, Higgins JA, Jones KL, Giles ED, Houck JA, Webb PG, Steig AJ, Johnson GC, Rudolph MC, MacLean PS. Regular exercise potentiates energetically expensive hepatic de novo lipogenesis during early weight regain. *Am J Physiol Regul Integr Comp Physiol* 317(5):R684-R695, 2019.
- c. *Foright RM, Johnson GC, Kahn D, Charleston CA, Presby DM, Bouchet CA, Wellberg EA, Sherk VD, Jackman MR, Greenwood BG, **MacLean PS**. Compensatory eating behaviors in male and female rats in response to exercise training. *Am J Physiol Regul Integr Comp Physiol* 319(2):R171-R183, 2020.
- d. *Presby DM, Rudolph MC, Sherk VD, Jackman MR, Foright RM, Jones KL, Houck JA, Johnson GC, Higgins JA, Neuffer PD, Eckel RH, **MacLean PS**. Lipoprotein Lipase Overexpression in Skeletal Muscle Attenuates Weight Regain by Potentiating Energy Expenditure. *Diabetes* 70(4):867-877, 2021.

3. Obesity, Mammary Gland Development, and Lactation. I have utilized the DIO models and an innovative approach of combining in vivo nutrient tracers with indirect calorimetry to examine how obesity, diabetes, and high fat feeding affect maternal energy balance, milk production, and nutrient metabolism in nursed offspring. We were the first to show distinct effects of maternal high fat feeding and maternal obesity on lactation performance and offspring metabolism. My studies have pursued the underlying cause of the lactation impairment that occurs with obesity and diabetes and its consequences for postnatal programming of disease.

- a. Neville MC, Webb P, Ramanathan P, Mannino MP, Pecorini C, Monks J, Anderson SA, **MacLean PS**. The insulin receptor plays an important role in secretory differentiation in the mammary gland. *Am J Physiol Endo Metab* 305(9):E1103-14, 2013.
- b. *Rudolph MC, Young BE, Lemas DJ, Palmer CE, Hernandez TL, Barbour LA, Friedman JE, Krebs NF, **Maclean PS**. Early infant adipose deposition is positively associated with the n-6 to n-3 fatty acid ratio in human milk independent of maternal BMI. *Int J Obesity* 41(4):510-517, 2017.
- c. *Rudolph MC, Jackman MR, Presby DM, Houck JA, Webb PG, Johnson GC, Soderborg TK, de la Houssaye BA, Yang IV, Friedman JE, **MacLean PS**. Low Neonatal Plasma n6/n3 PUFA Ratios Regulate Offspring Adipogenic Potential and Condition Adult Obesity Resistance. *Diabetes* 67(4):651-661, 2018.
- d. *Martin Carli JF, Trahan GD, Jones KL, Hirsch N, Rolloff KP, Dunn EZ, Friedman JE, Barbour LA, Hernandez TL, **MacLean PS**, Monks J, McManaman JL, Rudolph MC. Single Cell RNA Sequencing of Human Milk-Derived Cells Reveals Sub-Populations of Mammary Epithelial Cells with Molecular Signatures of Progenitor and Mature States: a Novel, Non-invasive Framework for Investigating Human Lactation Physiology. *J Mammary Gland Biol Neoplasia* (4):367-387, 2020.

4. Transdisciplinary Research on Nutrition, Obesity, and Metabolic Diseases. I facilitate research through my work in the NORC's cores, and I am charged with fostering interdisciplinary and translational research collaborations that study nutrition and obesity. I regularly collaborate with internal and external scientists and have applied my expertise in basic, preclinical, and clinical research.

- a. Lanaspa-Garcia MA, Kuwabara M, Andres-Hernando A, Li N, Cicerchi C, Jensen T, Orlicky DJ, Roncal-Jimenez CA, Ishimoto T, Nakagawa T, Rodriguez-Iturbe B, **MacLean PS**, Johnson RJ. High salt intake causes leptin resistance and obesity in mice by stimulating endogenous fructose production and metabolism. *Proc Natl Acad Sci USA* 115(12):3138-3143, 2018.
- b. Stanislawski MA, Frank DN, Borengasser SJ, Ostendorf DM, Ir D, Jambal P, Bing K, Wayland L, Siebert JC, Bessesen DH, **MacLean PS**, Melanson EL, Catenacci VA. The Gut Microbiota during a Behavioral Weight Loss Intervention. *Nutrients* 13(9):3248, 2021.
- c. Hopp K, Catenacci VA, Dwivedi N, Kline TL, Wang W, You Z, Nguyen DT, Bing K, Poudyal B, Johnson GC, Jackman MR, Miller M, Steele CN, Serkova NJ, **MacLean PS**, Nemenoff RA, Gitomer B, Chonchol M, Nowak KL. Weight loss and cystic disease progression in autosomal dominant polycystic kidney disease. *iScience* 25(1):103697, 2021. eCollection 2022.
- d. Gilley SP, Zarate MA, Zheng L, Jambal P, Yazza DN, Chintapalli SV, **MacLean PS**, Wright CJ, Rozance PJ, Shankar K. Metabolic and fecal microbial changes in adult fetal growth restricted mice. *Pediatr Res* 95(3):647-659, 2024.

Complete List of Published Work in MyBibliography: [Publications for PS MacLean](#)