



Name: Nicole Cummings

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Major Professor: Dudley Lamming, Ph.D.

Degree Objective: Ph.D., Endocrinology and Reproductive Physiology

Background: B.S. Animal Science, Colorado State University

Current Research Project:

My work in the Lamming Lab focuses on the role of specific dietary amino acids in regulating metabolism and healthy aging. Previously, low protein diets have been found to increase lifespan and improve metabolic health in rodents, and correlate with a reduced risk of diabetes, cardiovascular disease and cancer in humans. Using a series of amino acid defined diets which enable us to reduce dietary consumption of the three branched chain amino acids (BCAAs; leucine, isoleucine and valine), we have determined that restriction of dietary BCAAs improves many parameters of glycemic control and body composition. These effects occur independently of overall protein consumption and known hormones which mediate the beneficial effects of a low protein diet. Future work will look at this phenotype to determine the molecular mechanisms responsible for the benefits of BCAA restriction. This research may offer a translatable dietary intervention for humans to promote a healthy metabolism and delay age-related disease.

Honors:

2015 Endocrinology and Reproductive Physiology Graduate Student Research Award
2016-present Kirschstein-NRSA Predoctoral Fellowship (T32 – NIH/NIA), UW Institute on Aging

Peer-reviewed Publications

(* indicates authors contributed equally, # indicates co-corresponding author):

Lamming DW[#], **Cummings NE**, Rastelli AL, Gao F, Cava E, Bertozzi B, Spelta F, Pili R, Fontana L[#]. Restriction of dietary protein decreases mTORC1 in tumors and somatic tissues of a tumor bearing mouse xenograft model. *Oncotarget*. 2015; 6(31):31233-40. doi: 10.18632/oncotarget.5180. Pubmed PMID: 26378060; PubMed Central PMCID: PMC4741600.

Arriola Apelo SI, Neuman JC, Baar EL, Syed FA, **Cummings NE**, Brar HK, Pumper CP, Kimple ME, Lamming DW. Alternative rapamycin treatment regimens mitigate the impact of rapamycin on glucose homeostasis and the immune system. *Aging Cell*. 2016; 15(1):28-38. doi: 10.1111/accel.12405. Epub 2015 Oct 13. PubMed PMID: 26463117; PubMed Central PMCID: PMC4717280.



Arriola Apelo SI, Pumper CP, Baar EL, **Cummings NE**, Lamming DW. Intermittent administration of rapamycin extends the lifespan of female C57BL/6J mice. *J Gerontol Biol Sci*. 2016; 71(7):876-81. doi: 10.1093/gerona/glw064. Epub 2016 Apr 18. PubMed PMID: 27091134; PubMed Central PMCID: PMC4906329.

Fontana L[#], **Cummings NE***, Arriola Apelo SI, Neuman JC, Kasza I, Schmidt BA, Cava E, Spelta F, Tosti V, Syed FA, Baar EL, Veronese N, Cottrell SE, Fenske RJ, Bertozzi B, Brar HK, Pietka T, Bullock AD, Figenshau RS, Andriole GL, Merrins MJ, Alexander CM, Kimple ME, Lamming DW[#]. Decreased consumption of branched chain amino acids improves glycemic control. *Cell Reports*. 2016; 16(2):520-30. doi: 10.1016/j.celrep.2016.05.092. Epub 2016 Jun 23. PubMed PMID: 27346343; PubMed Central PMCID: PMC4947548.

Cummings NE, Lamming DW. Regulation of metabolic health and aging by nutrient-sensitive signaling pathways. *Mol Cell Endocrinol*. 2016; pii: S0303-7207(16)30483-X. doi: 10.1016/j.mce.2016.11.014. [Epub ahead of print]. PubMed PMID: 27884780. PubMed Central PMCID: In progress.

Selected Poster Presentations and Talks (* = speaker, underline = presenter):

Local

Cummings, NE, Arriola Apelo, SI, Neuman, JC, Baar, EL, Syed, F, Brar, HK, Fenske, RJ, Kimple, ME, Lamming, DW. Decreased dietary intake of branched chain amino acids decreases mTORC1 signaling and improves glucose homeostasis. UW Madison Department of Medicine Research Day, May 2015.

Cummings, NE, Arriola Apelo, SI, Neuman, JC, Baar, EL, Syed, F, Brar, HK, Kimple, ME, Lamming, DW. Decreased dietary intake of branched chain amino acids decreases mTORC1 signaling and improves glucose homeostasis. Endocrinology and Reproductive Physiology Annual Symposium, June 2015.

Cummings NE*, Arriola Apelo SI, Neuman JC, Kasza I, Syed FA, Baar EL, Cottrell SE, Fenske RJ, Brar HK, Alexander CM, Kimple ME, Lamming DW. Decreased consumption of branched chain amino acids improves glycemic control. Endocrinology and Reproductive Physiology Seminar, September 2015.

Cummings NE*, Fontana L, Arriola Apelo SI, Neuman JC, Kasza I, Schmidt BA, Cava E, Spelta F, Tosti V, Syed FA, Baar EL, Veronese N, Cottrell SE, Fenske RJ, Bertozzi B, Brar HK, Pietka T, Bullock AD, Figenshau RS, Andriole GL, Merrins MJ, Alexander CM, Kimple ME, Lamming DW. Decreased consumption of branched chain amino acids improves glycemic control. Madison Veterans Affairs Research in Progress Meeting, February 2016.



Cummings NE, Fontana L, Barnes M, Cottrell SE, Konon E, Wu J, Arriola Apelo SI, Neuman JC, Kasza I, Schmidt BA, Syed F, Baar EL, Fenske RJ, Brar HK, Merrins MJ, Alexander CM, Kimple ME, Lamming DW. Improving metabolic health through decreased consumption of branched chain amino acids. UW-Madison Department of Medicine Research Day, June 2016.

Cummings NE*, Radcliff AB, Arriola Apelo SI, Brodbeck A, Sherman DS, Barnes ME, Konon EN, Wu J, Hacker TA, Lamming DW. Diets with altered macronutrients promote metabolic health and longevity in progeroid and aging mice. UW-Madison Department of Medicine Research Day, June 2016.

Cummings NE, Radcliff AB, Arriola Apelo SI, Sherman DS, Barnes ME, Wu J, Konon EN, Lamming DW. Improving glycemic control through reduction of specific dietary amino acids. Endocrinology and Reproductive Physiology Annual Symposium, June 2016.

Cummings NE*, Radcliff AB, Arriola Apelo SI, Brodbeck A, Sherman DS, Barnes ME, Konon EN, Wu J, Brinkman JA, Hacker TA, Lamming DW. Branched chain amino acid restriction in metabolism and healthy aging. Endocrinology and Reproductive Physiology Seminar, October 2016.

Regional

Cummings NE, Fontana L, Barnes M, Cottrell SE, Konon E, Wu J, Arriola Apelo SI, Neuman JC, Kasza I, Schmidt BA, Syed F, Baar EL, Fenske RJ, Brar HK, Merrins MJ, Alexander CM, Kimple ME, Lamming DW. Improving metabolic health through decreased consumption of branched chain amino acids. Central Society for Clinical and Translational Research Annual Meeting, Chicago, IL, April 2016.

Arriola Apelo SI, Neuman JC, Baar EL, Syed F, **Cummings NE**, Brar HK, Kimple ME, Lamming DW. An intermittent treatment regimen mitigates the deleterious effects of rapamycin, Central Society for Clinical and Translational Research Annual Meeting, Chicago, IL, April 2016.

National

Arriola Apelo SI, Neuman JC, Baar EL, Syed F, **Cummings NE**, Brar HK, Pumper CP, Kimple ME, Lamming DW. Alternative rapamycin treatment regimens mitigate the impact of rapamycin on glucose homeostasis and extend lifespan. Gerontological Society of America 68th Annual Scientific Meeting, Orlando, FL, November 2015.

Cummings NE, Radcliff AB, Sherman DS, Barnes ME, Konon EN, Wu J, Lamming DW*. Decreased consumption of specific macronutrients promotes metabolic health and longevity, American Aging Association 45th Annual Meeting, Seattle, WA, June 2016.

Cummings NE, Radcliff A, Brodbeck A, Sherman D, Barnes M, Konon E, Williams E, Wu J, Hacker T, Lamming DW. Intervening in Hutchinson-Gilford Progeria Syndrome by reduction of specific dietary amino acids. Cold Spring Harbor Mechanisms of Aging Meeting, Cold Spring Harbor, NY, September 2016.



Cummings NE, Radcliff AB, Arriola Apelo SI, Konon EN, Williams EM, Sherman DS, Barnes ME, Wu J, Lamming DW*. Decreased consumption of specific macronutrients promotes metabolic health and longevity, Cold Spring Harbor Mechanisms of Aging, Cold Spring Harbor, NY, September 2016.

Arriola Apelo SI*, Pumper CP, **Cummings NE**, Lin A, Baar EL, Lamming DW. Female sex hormones alter the metabolic impact of hepatic Rictor deletion, Cold Spring Harbor Mechanisms of Aging, Cold Spring Harbor, NY, September 2016.

Teaching and Mentorship:

Sara Cottrell, Rural and Urban Scholars in Community Health (RUSCH) Program, Summer 2015

Macy Barnes, Undergraduate Research Project, Fall 2015

Barnes ME, **Cummings NE**, Lamming DW. *Branched chain amino acid restriction as a novel therapy for pre-diabetes*. Introductory Biology 152 Undergraduate Research Poster Presentation, Madison WI, December 2015.

Elizabeth Konon, Undergraduate Research Project, Spring 2016

Konon E, **Cummings NE**, Lamming DW. *The impact of essential amino acids on glycemic control*. Introductory Biology 152 Undergraduate Research Poster Presentation, Madison WI, April 2016.

Elizabeth Williams (*née* Elizabeth Hebda), Shapiro Summer Research Program, Summer 2016

Professional Memberships:

International Society on Aging and Disease, 2016-Present

Certifications:

Research Mentor Training Program, WISCIENCE Center, UW-Madison, 2016

ERP Service:

ERP Student Committee, 2014-2016

ERP Recruitment Volunteer, 2015-2016