

CURRICULUM VITAE

BERTOLO, Robert F.

Professor
 Canada Research Chair in Human Nutrition (2002-2013)
 Department of Biochemistry
 Memorial University of Newfoundland
 St. John's, NL
 Canada A1C 5S7

Phone: 1 (709) 864-7954 **Fax:** 1 (709) 864-2422 **Email:** rbertolo@mun.ca

Areas of Expertise: nutrition and development, amino acid and protein metabolism, amino acid kinetics, one-carbon metabolism, amino acid requirements, swine nutrition and metabolism, gastrointestinal physiology, parenteral nutrition, early origins of adult diseases

Education

Degree	Dates	Field	Supervisor	Institution
Doctorate	1994-1999	Metabolism and Nutrition	Ronald O. Ball, Paul B. Pencharz	University of Guelph
Masters	1992-1994	Metabolism and Nutrition	Stephanie A. Atkinson, William J. Bettger	University of Guelph
Bachelors	1987-1991	Multidisciplinary Study	NA	McMaster University

Research Training

Position	Dates	Institution	Department	Supervisor
Post-doctoral Fellow	1999-2002	University of Alberta	Agriculture, Food & Nutritional Science	Ronald O. Ball

Academic Positions Held

Position	Dates	Institution	Department
Head of Department	2023-24	Memorial University of Newfoundland	Biochemistry
Deputy Head - Graduate	2010-2022	Memorial University of Newfoundland	Biochemistry
Full Professor	2014-	Memorial University of Newfoundland	Biochemistry
Associate Professor	2008-2014	Memorial University of Newfoundland	Biochemistry
Assistant Professor	2002-2007	Memorial University of Newfoundland	Biochemistry

Adjunct Professor	2012-	University of New Brunswick-Saint John	Biology
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CURRENT RESEARCH SUPPORT

Funding Held (Last 5 years)::

Title of Project	Name of Recipient	Total Awarded	Dates and Duration	Granting Agency
<u>Operating</u>				
Dietary methyl supply and neonatal methionine metabolism during parenteral nutrition	Robert Bertolo	\$150,705/yr	5 years, 2022-27	Canadian Institutes of Health Research
Development of novel aquafeed made by two microbial oil sources as a sustainable high DHA and EPA contributors to improve stress resistance in freshwater aquaculture	Robert Bertolo	\$15,000	1 year, 2022	Mitacs - Accelerate Lab2Market (Industry Sponsor: Springboard Atlantic)
Development of a novel nutritional feed additive using guanidinoacetate and methionine for the poultry industry	Robert Bertolo	\$15,000	1 year, 2022	Mitacs - Accelerate Lab2Market (Industry Sponsor: Springboard Atlantic)
Creatine metabolism in young pigs	Robert Bertolo	\$48,000/yr	7 years, 2020-2027	NSERC Discovery
Parenteral nutrition and oxidant load in neonates	Robert Bertolo (PI), R Brown	\$15,000	1 year, 2019-2020	Janeway Research Foundation
Enhancing the availability of omega-3 fatty acids from marine sources.	Robert Bertolo (PI), SV Harding	\$70,000	2 years 2019-2022	MUN–OFI Vitamin Research Fund
Vitamin-rich fish meal to enhance the cardiovascular benefits of fish oil.	Robert Bertolo (PI), SV Harding	\$30,000	2 years 2018-2020	MUN–OFI Vitamin Research Fund
Creatine and citrulline supplementation in parenterally fed piglets.	Robert Bertolo (PI), L Huber	\$15,000	1 year, 2017-2018	Janeway Research Foundation

Methyl and methionine metabolism in neonates	Robert Bertolo	\$133,000/yr	4 years, 2015-2019	Canadian Institutes of Health Research
Creatine metabolism in young pigs	Robert Bertolo	\$25,000/yr	5 years, 2015-2020	NSERC Discovery

PUBLICATIONS

ARTICLES IN PUBLICATIONS: (Trainees Underlined)

79. Randunu RS, Alawaini K, Huber LA, Randell EW, Brunton JA, Bertolo RF. 2024. Feeding Parenteral Nutrition in the Neonatal Period Programs Dyslipidemia in Adulthood in Yucatan Miniature Pigs. *J Nutr*. 2024 Nov;154(11):3353-3364. doi: 10.1016/j.tjnut.2024.08.031. Epub 2024 Sep 11.
78. Asiriwardhana MU, Dinesh OC, Brunton JA, Bertolo RF. 2024. Dietary Methionine Enhances Portal Appearance of Guanidinoacetate and Synthesis of Creatine in Yucatan Miniature Piglets. *J Nutr*. 2024 May;154(5):1571-1581. doi: 10.1016/j.tjnut.2024.03.017.
77. Thera J, Kidd KA, Bertolo RF. 2024. Amino acid composition of aquatic invertebrates and other food web organisms. *Limnology and Oceanography*. Submitted 2024.
76. Bray SD, Aljaroudi A, Power KR, Dinesh OC, Brunton JA, Bertolo RF. 2024. Arginine or guanidinoacetic acid can serve as precursors for creatine synthesis in parenterally fed neonatal piglets, but only with excess methionine to facilitate transmethylation. *Clin Nutr* (under review).
75. Todd, A.M., Bertolo, R.F., Booth, V.K., Brown, R.J., Brunton, J.A., Cheema, S.K., Christian, S.L., Codner, M., Farahnak, Z., Harding, S.V., Hunt, D., Kakumani, P.K., Mayengbam, S., Mulligan, M.E., Park, J., Shahidi, F., Walters, B., Wilson, K.A., & Berry, M.D. 2023. Mapping a New Path to Student Success: Transforming an Undergraduate Biosciences Program Through a Collaborative Curriculum Redesign Process Education [abstract]. In: Abstracts of the 19th World Congress of Basic & Clinical Pharmacology 2023. *British Journal of Pharmacology*, 180, 597–598.
<https://doi.org/10.1111/bph.16108>
74. Asiriwardhana M, Bertolo RF. 2022. Guanidinoacetic acid supplementation: A narrative review of its metabolism and effects in swine and poultry. *Frontiers in Animal Science*. 3:972868.
73. Kirupananthan D, Bertolo RF, Brunton JA. 2022. Lysine dipeptide enhances gut structure and whole body protein synthesis in neonatal piglets with intestinal atrophy. *J Nutr*. 152(8):1843-1850
72. Shoveller AK, Pezzali JG, House JD, Bertolo RF, Pencharz PB, Ball RO. 2022. Methionine and cysteine oxidation are regulated in a dose dependent manner by dietary Cys intake in neonatal piglets receiving enteral nutrition. *PLoS One*. 17(10):e0275760.
71. Thera J, Kidd KA, Stewart R, Bertolo RF, O'Driscoll NJ. 2022. Using tissue cysteine to predict the trophic transfer of methylmercury and selenium in lake food webs. *Environ Pollut* 311:119936
70. Karthigesu K, Bertolo RF, Brown RJ. 2021. Parenteral nutrition and oxidant load in neonates. *Nutrients* 13(8):2631.
69. Bertolo RF. 2021. The multifactorial consequences of sulfur amino acid deficiency. *Am J Clin Nutr*. 114(3):839-840.
68. Dinesh OC, Kankayaliyan T, Rademacher M, Tomlinson C, Bertolo RF, Brunton JA. 2021. Neonatal piglets can synthesize adequate creatine, but only with sufficient dietary arginine and methionine, or with guanidinoacetate and excess methionine. *J Nutr*. 11;151(3):531-539. doi: 10.1093/jn/nxaa369
67. Robinson JL, McBreairty LE, Walsh CJ, Martin GM, Ryan RA, Brunton JA, Bertolo RF. 2020. Effects

- of supplemental creatine and guanidinoacetic acid on spatial memory and the brain of weaned Yucatan miniature pigs. PLoS One. Jan 6;15(1):e0226806. doi: 10.1371/journal.pone.0226806.
66. Fernandez MA, Bertolo RF, Duncan AM, Phillips SM, Elango R, Ma DWL, Desroches S, Grantham A, House JD. 2020. Translating "protein foods" from the new Canada's Food Guide to consumers: knowledge gaps and recommendations. Appl Physiol Nutr Metab. 45(12):1311-1323.
65. Randunu RS, Bertolo RF. 2020. The effects of maternal and postnatal dietary methyl nutrients on epigenetic changes that lead to non-communicable diseases in adulthood. Int J Mol Sci. 21(9):3290.
64. Dinesh OC, Brunton JA, Bertolo RF. 2020. The kidneys are quantitatively more important than pancreas and gut as a source of guanidinoacetic acid for hepatic creatine synthesis in sow-reared Yucatan miniature piglets. J Nutr. 150(3):443-449.
63. Thera J, Kidd KA, Bertolo RF. 2020. Amino acids in freshwater food webs: Assessing their variability among taxa, trophic levels, and systems. Freshwater Biol. 65(3):1101-1113.
62. Huber L, Lee T, LeDrew RL, Dodge ME, Brunton JA, Bertolo RF. 2019. Photoprotection, but not N-acetylcysteine supplementation, improves intestinal blood flow and hepatic lipid peroxidation during parenteral nutrition in neonatal piglets. J Pediatr Gastroent Nutr. 69:719-725.
61. Thera J, Kidd KA, Bertolo RF, O'Driscoll NJ. 2019. Tissue content of thiol-containing amino acids predicts methylmercury in aquatic invertebrates. Sci Total Environ 688:567-573.
60. Bertolo RF, Hentges E, Makarchuk M, Wiggins AKA, Steele H, Levin J, Grantham A, Gramlich L, Ma DWL. 2018. Key attributes of global partnerships in food and nutrition to align research agendas and improve public health. Appl Physiol Nutr Metab. 43(7):755-758.
59. Thera J, Kidd KA, Nosworthy MG, Bertolo RF. 2018. Evaluation of a performic acid oxidation method for quantifying amino acids in freshwater species. Limnology and Oceanography: Methods. 16(12):803-813.
58. Robinson JL, McBreairty LE, Randell EW, Harding SV, Bartlett RK, Brunton JA, Bertolo RF. 2018. Betaine or folate can equally furnish remethylation to methionine and increase transmethylation in methionine-restricted neonatal piglets. J Nutr Biochem. 59:129-135.
57. Dinesh OC, Bertolo RF, Brunton JA. 2018. Creatine supplementation to total parenteral nutrition improves creatine status and supports greater liver and kidney protein synthesis in neonatal piglets. Pediatr Res. 83(1-1):135-141. doi: 10.1038/pr.2017.208.
56. Thera J, Kidd KA, Dodge-Lynch ME, Bertolo RF. 2017. Quantification of sulphur amino acids by ultra-high performance liquid chromatography in aquatic invertebrates. Anal Biochem. 539:158-161. doi: 10.1016/j.ab.2017.10.022.
55. Myrie SB, McKnight LL, King JC, McGuire JJ, Van Vliet BN, Cheema SK, Bertolo RF. 2017. Intrauterine growth-restricted Yucatan miniature pigs experience early catch-up growth leading to greater adiposity and impaired lipid metabolism as young adults. Appl Physiol Nutr Metab 42(12):1322-1329. doi: 10.1139/apnm-2017-0311.
54. Munasinghe LL, Robinson JL, Harding SV, Brunton JA, Bertolo RF. 2017. Protein synthesis in mucin-producing tissues is conserved when dietary threonine is limiting in piglets. J Nutr. 147(2):202-210.
53. Ma DW, Bertolo RF, Robbins S, Marchand V, Duncan AM, Plourde M, Grantham A. 2017. Discussion of the Impact of CIHR Reforms on the Funding of Nutritional Sciences in Canada. Appl Physiol Nutr Metab.42(1):86-87.
52. Robinson JL, Bertolo RF. 2016. The pediatric methionine requirement should incorporate remethylation potential and transmethylation demands. Adv Nutr. 7(3):523-34.
51. Robinson JL, Bartlett RK, Harding SV, Randell EW, Brunton JA, Bertolo RF. 2016. Dietary methyl donors affect in vivo methionine partitioning between transmethylation and protein synthesis in the neonatal piglet. Amino Acids. 48(12):2821-2830.

50. Robinson JL, Harding SV, Brunton JA, Bertolo RF. 2016. Dietary methyl donors contribute to whole-body protein turnover and protein synthesis in skeletal muscle and the jejunum in neonatal piglets. *J Nutr.* 146(10):2007-2012.
49. McBreairty LE, Robinson JL, Harding SV, Randell EW, Brunton JA, Bertolo RF. 2016. Betaine is as effective as folate at re-synthesizing methionine for protein synthesis during moderate methionine deficiency in piglets. *Eur J Nutr.* 55(8):2423-2430.
48. Robinson JL, McBreairty LE, Randell E, Brunton JA, Bertolo RF. 2016. Restriction of dietary methyl donors limits methionine availability and affects the partitioning of dietary methionine for creatine and phosphatidylcholine synthesis in the neonatal piglet. *J Nutr Biochem.* 35:81-6.
47. McBreairty LE, Bertolo RF. 2016. The dynamics of methionine supply and demand during early development. *Appl Physiol Nutr Metab.* 41(6):581-7.
46. Bertolo RF, Ma DW. 2016. Advances in protein nutrition across the lifespan. *Appl Physiol Nutr Metab.* 41(5):563.
45. Deminice R, de Souza Padilha C, Sanches Cella P, Borges F, Costa Mendes da Silva LE, Jordao AA, Robinson JL, Bertolo RF; Cecchini R, Guarnier FA. 2016. Creatine supplementation prevents hyperhomocysteinemia, oxidative stress and cancer-induced cachexia progression in Walker-256 tumor-bearing rats. *Amino Acids.* 48(8):2015-24.
44. Nosworthy MG, Dodge ME, Bertolo RF, Brunton JA. 2016. Enterally delivered dipeptides improve small intestinal inflammatory status in a piglet model of intestinal resection. *Clin Nutr.* 35:852-8.
43. McBreairty LE, Robinson JL, Furlong KR, Brunton JA, Bertolo RF. 2015. Guanidinoacetate is more effective than creatine at enhancing tissue creatine stores while consequently limiting methionine availability in Yucatan miniature pigs. *PLoS One.* 2015; 10(6): e0131563.
42. Myrie SM, Bertolo RF, Moehn S, Ball RO. 2014. Barley does not change threonine requirement in growing pigs fed a barley-casein-based diet compared to a casein-based diet, as determined by the indicator amino acid oxidation method. *Livestock Sci.* 170:108–115.
41. Bertolo RF, Pencharz PB, Ball RO. 2014. Tissue mineral concentrations are profoundly altered in neonatal piglets fed identical diets via gastric, central venous or portal venous routes. *JPEN J Parenter Enteral Nutr.* 38(2): 227-35.
40. Dinesh C, Dodge ME, Baldwin MP, Bertolo RF, Brunton JA. 2014. Enteral arginine partially ameliorates TPN-induced small intestinal atrophy and stimulates hepatic protein synthesis in neonatal piglets. *JPEN J Parenter Enteral Nutr.* 38(8): 973-81.
39. McBreairty LE, McGowan RA, Brunton JA, Bertolo RF. 2013. Partitioning of [methyl-3H]methionine to methylated products and protein is altered during high methyl demand conditions in young Yucatan miniature pigs. *J Nutr.* 143(6):804-9.
38. Nosworthy MG, Bertolo RF, Brunton JA. 2013. Ontogeny of dipeptide uptake and peptide transporter 1 (PepT1) expression along the gastrointestinal tract in the neonatal Yucatan miniature pig. *Br J Nutr.* 110(2):275-81.
37. Bertolo RF, McBreairty LE. 2013. The nutritional burden of methylation reactions. *Curr Opin Clin Nutr Metab Care.* 16(1): 102-8.
36. Brunton JA, Baldwin M, Bertolo RF. 2012. Proline supplementation to parenteral nutrition results in greater rates of protein synthesis in the muscle, skin and small intestine in neonatal Yucatan miniature piglets. *J Nutr* 142(6):1004-8.
35. Myrie SB, McKnight LL, Van Vliet BN, King JC, McGuire JJ, Bertolo RF. 2012. Effects of a diet high in salt, fat and sugar on telemetry blood pressure measurements in conscious, unrestrained adult Yucatan miniature swine (*Sus scrofa*). *Comparative Med* 62(4):282-290.
34. Myrie SB, MacKay DS, Van Vliet BN, Bertolo RF. 2012. Early programming of adult blood pressure in

- the low birth weight Yucatan miniature pig is exacerbated by a post-weaning high-salt-fat-sugar diet. *Br J Nutr.* 108(7):1218-25. Epub 2011 Dec 16.
33. McKnight LL, Myrie SB, MacKay DS, Brunton JA, Bertolo RF. 2012. Glucose tolerance is affected by visceral adiposity and gender, but not birth weight or early nutrition, in Yucatan miniature pigs. *Appl Physiol Nutr Metab.* 2012 Feb;37(1):106-14. Epub 2012 Jan 11.
32. Alemmari A, Miller GG, Bertolo RF, Dinesh C, Brunton JA, Arnold CJ, Zello GA. 2012. Reduced aluminum contamination decreases parenteral nutrition associated liver injury. *J Pediatr Surg.* 2012 May;47(5):889-94.
31. Dodge ME, Bertolo RF, Brunton JA. 2012. Enteral feeding induces profound early intestinal adaptation in a neonatal piglet model of short bowel syndrome. *JPEN J Parenter Enteral Nutr.* 2012 Mar;36(2):205-12. Epub 2011 Dec 21. ***Featured in editorial (*JPEN J Parenter Enteral Nutr* 2012 36: 145).
30. MacKay DS, Brophy JD, McBreairty LE, McGowan RA, Bertolo RF. 2012. Intrauterine growth restriction leads to changes in sulfur amino acid metabolism, but not global DNA methylation, in Yucatan miniature piglets. *J Nutr Biochem.* Sep;23(9):1121-7. Epub 2011 Dec 1.
29. Myrie SB, McKnight LL, Van Vliet BN, Bertolo RF. 2011. Low birth weight is associated with reduced nephron number and increased blood pressure in adult Yucatan miniature swine. *Neonatology* 100:380-6.
28. Bertolo RF, Innis SM, Bell R, Ma DWL. 2010. Maternal nutrition: what do we know about maternal intake of macronutrients and their implications for long-term chronic disease risk? Maternal requirements for amino acids: thinking beyond growth. In-Touch, Heinz Infant Nutrition Institute Vol. 27, No. 2.
27. Brosnan JT, Wijekoon EP, Warford-Woolgar L, Trottier N, Brosnan ME, Brunton JA, Bertolo RFP. 2009. Creatine synthesis is a major metabolic process in neonatal piglets and has important implications for amino acid metabolism and methyl balance. *J Nutr* 139(7):1292-7.
26. Bertolo RF, Burrin DG. 2008. Comparative aspects of tissue glutamine and proline metabolism. *J Nutr* 138(10):2032S-2039S.
25. Nichols N, Bertolo RF. 2008. Luminal threonine concentration acutely affects intestinal mucosal protein and mucin synthesis in piglets. *J Nutr.* 138(7):1298-1303.
24. Myrie SB, Bertolo RF, Sauer WC, Ball RO. 2008. Effect of common anti-nutritive factors and fibrous feedstuffs in pig diets on amino acid digestibilities with special emphasis on threonine. *J Anim Sci* 86: 609-619.
23. Law GK, Bertolo RF, Adjiri-Awere A, Pencharz PB, Ball RO. 2007. Adequate oral threonine is critical for mucin production and gut function in neonatal piglets. *Am J Physiol Gastro Liver Physiol* 292(5): G1293-G301.
22. Moehn S, Bertolo RFP, Martinazzo-Dallagnol E, Pencharz PB, Ball RO. 2007. Metabolic availability of lysine in feedstuffs determined using oral isotope delivery. *Livestock Sci* 109: 24-26.
21. Brosnan JT, Brosnan ME, Bertolo RF, Brunton JA. 2007. Methionine: A metabolically unique amino acid. *Livestock Sci* 112(1): 2-7.
20. Moehn S, Bertolo RFP, Pencharz PB, Ball RO. 2005. Development of the indicator amino acid oxidation technique to determine the availability of amino acids from dietary protein in pigs. *J Nutr* 135(12): 2866-2870.
19. Bertolo RFP, Moehn S, Pencharz PB, Ball RO. 2005. Estimate of the variability of the lysine requirement of growing pigs using the indicator amino acid oxidation technique. *J Anim Sci* 83(11): 2535-2542.
18. Wilkinson DL, Bertolo RFP, Brunton JA, Shoveller AK, Pencharz PB, Ball RO. 2004. Arginine synthesis is regulated by dietary arginine intake in the enterally fed neonatal piglet. *Am J Physiol*

- Endocrinol Metab. 287(3): E454-E462.
17. Moehn S, Bertolo RFP, Pencharz PB, Ball RO. 2004. Pattern of carbon dioxide production and retention is similar in adult pigs when fed hourly, but not when fed a single meal. *BMC Physiology* Jul 8; 4(1): 11.
16. Moehn S, Bertolo RFP, Pencharz PB, Ball RO. 2004. Indicator amino acid oxidation responds rapidly to changes in lysine or protein intake in growing and adult pigs. *J Nutr.* 134: 836-841.
15. Cvitkovic S, Bertolo RFP, Brunton JA, Pencharz PB, Ball RO. 2004. Enteral tryptophan requirement determined by oxidation of gastrically or intravenously infused phenylalanine is not different from the parenteral requirement in neonatal piglets. *Pediatr Res.* 55: 630-636.
14. Coleman R, Bertolo RF, Moehn S, Leslie MA, Ball RO, Korver DR. 2003. Lysine requirements of pre-lay broiler breeder pullets: determination by indicator amino acid oxidation. *J Nutr* 133: 2826-9.
13. Bertolo RFP, Brunton JA, Pencharz PB, Ball RO. 2003. Arginine, ornithine and proline interconversion is dependent on small intestinal metabolism in neonatal pigs. *Am J Physiol Endocrinol Metab.* 284(5):E915-E922.
12. Tabiri HY, Bertolo RFP, Ball RO, Korver DR. 2002. Development of the indicator amino acid oxidation technique in chickens: L-[1-¹⁴C]phenylalanine infusion dose and phenylalanine oxidation. *Poultry Sci* 81: 1516-1521.
11. Tabiri HY, Bertolo RFP, Ball RO, Korver DR. 2002. Development of the indicator amino acid oxidation technique in chickens: calibration of oxidation system and determination of bicarbonate retention factor. *Poultry Sci* 81: 1020-1025.
10. Bertolo RFP, Bettger WJ, Atkinson SA. 2001. Divalent metals inhibit and lactose stimulates zinc transport across brush border membrane vesicles from piglets. *J Nutr Biochem* 12: 73-80.
9. Bertolo RFP, Bettger WJ, Atkinson SA. 2001. Calcium competes with zinc for a channel mechanism on the brush border membrane of piglet intestine. *J Nutr Biochem* 12: 66-72.
8. Ewtushik AL, Bertolo RFP, Ball RO. 2000. Intestinal development of early-weaned piglets receiving diets supplemented with selected amino acids or polyamines. *Can J Anim Sci* 80: 653-662.
7. Bertolo RFP, Brunton JA, Pencharz PB, Ball RO. 2000. Steady state is not achieved for most plasma amino acids during 12 hours of fasting in the neonatal piglet. *Pediatr Res* 48: 701-707.
6. Bertolo RFP, Pencharz PB, Ball RO. 2000. Organ and plasma amino acid concentrations are profoundly different in piglets fed identical diets via gastric, central venous or portal venous routes. *J Nutr* 130: 1261-1266.
5. Brunton JA, Bertolo RFP, Pencharz PB, Ball RO. 1999. Proline ameliorates arginine deficiency during enteral but not during parenteral feeding in neonatal piglets. *Am J Physiol* 277: E223-E231.
4. Bertolo RFP, Chen CZL, Pencharz PB, Ball RO. 1999. Small intestinal atrophy has a greater impact on nitrogen metabolism than liver bypass in piglets fed identical diets via gastric, central venous, or portal venous routes. *J Nutr* 129: 1045-1052.
3. Bertolo RFP, Pencharz PB, Ball RO. 1999. A comparison of parenteral and enteral feeding in neonatal piglets including an assessment of the utilization of a glutamine rich pediatric elemental diet. *JPEN J Parenter Enter Nutr* 23: 47-55.
2. Bertolo RFP, Chen CZL, Law G, Pencharz PB, Ball RO. 1998. Threonine requirement of neonatal piglets receiving total parenteral nutrition is considerably lower than that of piglets receiving an identical diet intragastrically. *J Nutr* 128: 1752-1759.
1. Wang Z, Atkinson SA, Bertolo RFP, Polberger S, Lonnerdal B. 1993. Alterations in intestinal uptake and compartmentalization of zinc in response to short-term dexamethasone therapy or excess dietary zinc in piglets. *Pediatr Res* 33:118-124.

INVITED PRESENTATIONS:

- Intestinal one-carbon metabolism, parenteral nutrition and programming of disease.*** Invited to the Canadian Nutrition Society Annual Conference, Gatineau, QC, May 2022.
- Developing and running a Harlow Campus-based field course in nutritional science: A practical overview of the planning, logistics, and running of a science focused Harlow Campus course.*** Department of Biochemistry Seminar Series. September 15, 2022.
- The impact of early nutritional insults and long-term consequences on health.*** Invited to the Animal Nutrition Conference of Canada (ANCC), Niagara Falls, ON, May, 2019.
- Roles of amino acids in one-carbon metabolism and nutrition.*** Invited to the American Society of Animal Science Annual Conference, Vancouver, BC, July 12, 2018.
- Early nutrition and adult diseases: Role of methionine metabolism.*** BioMedical Sciences Lecture Series, Memorial University of Newfoundland, St. John's, NL. November 2017.
- The metabolic burden of creatine synthesis.*** Invited to the International Symposium on the Role of Amino Acids and its Analogs on Animal Metabolic Regulation. Hosted by Ministry of Agriculture Feed Industry Centre at the China Agricultural University, Beijing, China, March 2015.
- Developmental Origins of Health and Disease: The Role of Methyl Metabolism.*** Invited to the Canadian Nutrition Society Annual Conference, Vancouver, BC, May 23-25, 2012.
- Small birthweight with early catch-up growth programs visceral adiposity and biomarkers of adult diseases in a Yucatan miniature pig model.*** Invited to the World Congress of Clinical Nutrition Annual Conference 2010, Ain Sukhna, Egypt. Sept 20, 2010.
- Early Nutrition and Longterm Consequences on Health: The Power of Micronutrients.*** Invited to SIAL Canada (international tradeshow dedicated to North American food industry professionals). Montreal, QC, April 22, 2010.
- Maternal nutrition: What do we know about maternal intake of micronutrients and their implications for long term chronic disease risk.*** Invited to the Canadian Society of Nutrition (CSCN - CSNS) Annual Scientific Session, Quebec City, QC, May 31, 2009.
- Early Nutrition and the Development of Adult Diseases: Where are We and What's Next?.*** Invited to the International Life Sciences Institute (North America) Annual Meeting, Tucson, Arizona, Jan 19-21, 2009.
- Early Programming of Metabolic Syndrome: The Role of Neonatal Nutrition.*** Invited to National Research Council-Institute for Nutrisciences and Health and UPEI, Charlottetown, PEI, Nov 6, 2008.
- What are the Research Priorities and Opportunities for Innovation: Cardiovascular Disease?*** Invited Panelist and Speaker for the International Life Sciences Institute (North America) Workshop: Early Risk Determinants and Later Health Outcomes: Implications for Research Prioritization and the Food Supply. Washington DC. July 7-9, 2008
- Early Programming of Adult Diseases: What's Next?*** Invited to IAMS pet food and teleconferenced to Proctor & Gamble, Dayton, Ohio. July 10, 2008.
- Early Origins of Adult Disease: Mechanisms and Models?*** Invited as Keynote Speaker for Life & Health Sciences Research Day, College of Medicine, University of Saskatchewan, Saskatoon, SK. March 2008.
- Comparative Aspects of Tissue Glutamine and Proline Metabolism.*** Invited to 7th Amino Acid Assessment Workshop, Tokyo, Japan. November 2007.
- Evidence for the Early Origins of Adult Diseases: From People to Pigs.*** Department of Biology,

Memorial University of Newfoundland, St. John's, NL. November 2007.

Neonatal Metabolism and the Origins of Adult Disease. 40th Anniversary Colloquium for Department of Biochemistry, Memorial University of Newfoundland, St. John's, NL. October 2007.

Methods to determine amino acid metabolic availability in diets for monogastrics. Symposium in The Science of Changing Climates Conference, Edmonton, AB. July 2004.

Do adult diseases begin in the womb? Canada Research Chair Public Lecture Series: New Hope for Old Foes. Presented October 22, 2003 in St. John's, NL.

MOST SIGNIFICANT RESEARCH CONTRIBUTIONS

1) Arginine requirement is dependent on synthesis from proline by a healthy neonatal gut. In a series of experiments, we conclusively demonstrated that arginine synthesis is inadequate in the neonate and proline can be converted to arginine only when gut metabolism is maintained. We were the first to convincingly show that arginine is absolutely essential in the neonate (*Am J Physiol* 277:E223, 1999) and using novel approaches (*Pediatr Res* 48:701, 2000) (*J Nutr* 130:1261, 2000), we demonstrated that the conversion from proline to arginine is completely dependent on the gut in the neonate (*Am J Physiol* 284:E915, 2003) and is regulated by arginine intakes (*Am J Physiol* 287:E454, 2004). These experiments demonstrating the importance of the gut as a metabolic organ introduced new concepts and hypotheses to the field of amino acid requirement research and I was invited to Tokyo to the 7th Amino Acid Assessment Workshop in November 2007 to review these concepts. More recently, we have demonstrated that proline (*J Nutr* 142:1004, 2012) and arginine (*JPEN* 38:973, 2014) are underfed in total parenteral nutrition (TPN). We demonstrated that creatine synthesis in the neonate consumes ~35% of the dietary intake of arginine which amounts to ~10% of that incorporated in protein (*J Nutr* 139:1292, 2009). We found that creatine synthesis is associated with arginine intake (*manuscript in preparation*). However, we also found that GAA or creatine does not spare arginine for protein synthesis but does limit GAA and hence creatine synthesis (*J Nutr submitted* 2019). And we recently completed a parenterally fed piglet study in which creatine added to TPN down-regulated creatine synthesis and spared arginine and/or methionine for protein synthesis (*Conference Publications* #6,18).

2) Importance of transmethylation to methionine requirement in pigs. We demonstrated that piglets synthesize most of their creatine needs and this potentially places an enormous burden on amino acid supply (*J Nutr* 139:1292, 2009). More recently, we established a novel hepatic infusion model to investigate the kinetic partitioning of methyl groups from methionine to phosphatidylcholine (PC), creatine and DNA. Using this model, we demonstrated that methyl groups needed for creatine synthesis can become limiting in the piglet liver and this has detrimental effects on methylation of other molecules as well as protein synthesis in both pre-weaned (*J Nutr* 143:804, 2013) and post-weaned (*PLoS One*, 2015) pigs and this effect is limited by dietary methyl donors (*J Nutr Biochem.* 35:81, 2016). There has never been an attempt to quantify methyl 'supply' and its relationship to methionine requirements. Moreover, the finding that the vast majority of methionine is used for transmethylation was unexpected and novel and has enormous implications for methionine requirement estimates and their relationship with diet quality. Several novel isotopic approaches were developed for these projects. This work led to NSERC-CRD funding with Evonik Industries to investigate creatine and its precursor, guanidinoacetate (GAA), as potential supplements for the pig industry and we found that GAA led to greater tissue creatine content, but at the expense of under-methylation of other molecules and lower protein synthesis. These two publications have been submitted in Fall 2019.

3) Development of the Yucatan miniature pig to investigate mechanisms behind the early origins of adult disease phenomenon. I developed the first miniature pig model of developmental origins of adult

disease. In this comprehensive model, intrauterine growth-restricted (IUGR) pigs were matched to large littermates and tested one year later for biomarkers of several chronic diseases. This study has demonstrated that IUGR pigs experience catch-up growth and develop early markers for hypertension (*Neonatology* 100:380, 2011; *Br J Nutr* 108:1218, 2012; *Comparative Med.* 62:282, 2012), dyslipidemia (*Brit J Nutr*, to be submitted) and obesity (*APNM* 37:106, 2012), establishing the miniature pig as a model for developmental programming of adult diseases including cognitive development (*Conference Publications* #9,15). These data have been presented at numerous international conferences and I have been invited many times as a speaker on this model. In another study, we also implicated methyl metabolism as a key mechanism of early programming of diseases since IUGR pigs had altered remethylation capacity (*J Nutr Biochem* 23:1121, 2012) and limited transmethylation capacity (*J Nutr* 143:804, 2013). Moreover, a hepatic microarray in IUGR and large piglets with the above phenotypes showed that the expression of several methyl-related enzymes is altered in IUGR pigs (*unpublished*); these data will be used to help identify potential targets to explore further. This model includes no less than six collaborators to help me investigate various aspects of disease development and has attracted CIHR funding and a Future Leader Award by the International Life Sciences Institute.

4) Guanidinoacetate is more effective than creatine. In recent studies, we demonstrated that guanidinoacetate (GAA), the precursor for creatine synthesis, is more effective as a dietary supplement than creatine at enhancing creatine stores and improving memory performance in pigs (*PLoS One* 10:e0131563, 2015; *PLoS One submitted*, 2019). We also showed that because GAA conversion to creatine is not feedback regulated, extra methionine is required to accommodate the increase in creatine stores (*J Nutr submitted*, 2019). This effectiveness of GAA was demonstrated in neonatal and older growing pigs. Moreover, we showed that GAA conversion to creatine is dependent on kidneys, rather than pancreas or gut (*J Nutr accepted* 2019).

5) A large proportion of the threonine requirement is for mucin synthesis by the small intestine. We demonstrated that because of gut atrophy, the threonine requirement of parenterally fed piglets is much lower than expected when compared to orally fed piglets (*J Nutr* 128:1752, 1998). These experiments were conducted in intravenously and intragastrically fed piglets and were the first experiments to directly quantify the dramatic effect of gut metabolism on amino acid requirements. Continuation of this research has led to the demonstration of differential effects of enteral versus parenteral threonine on gut mucin characteristics (*Am J Physiol* 292:G1293, 2007) and that the gut responds to luminal threonine concentrations alone (*J Nutr* 138:1298, 2008). In weaned pigs, we demonstrated that anti-nutritional factors, especially fibre, can substantially increase ileal threonine losses (*J Anim Sci* 86:609, 2008) to the point of potentially increasing threonine requirements (*Livestock Sci in press*, 2014). Moreover, we have shown in pre-weaned pigs that fibre will induce mucin synthesis directly via non-mTOR mechanisms (*Conference Publications* #14) and that the mucin-producing tissues of the body sequester dietary threonine for protein synthesis at the expense of other tissues (*Nutr Metab submitted* 2014; *Conference Publications* #19).

6) Development of amino acid kinetics approaches to determine amino acid requirements in new models. The new applications of the indicator amino acid oxidation technique required extensive infrastructure and methodological developments. I led development of this technique for use in TPN and gastrically fed piglets (*J Nutr* 128:1752, 1998) (*Pediatr Res* 55:630, 2004), young pigs (20-30 kg) (*J Nutr* 135:2866, 2005) (*J Anim Sci* 83:2535, 2005), sows (>200 kg) (*BMC Physiol* 4:11, 2004), and chickens (*Poultry Sci* 81:1020 and 1516, 2002) (*J Nutr* 133:2826, 2003). Included in these models, we advanced the approach by validating shortened adaptation times (*BMC Physiol* 4:11, 2004), using oral dosing to achieve better steady state (*J Nutr* 135:2866, 2005), determining requirements within individual animals to develop a better population variance (*J Anim Sci* 83:2535, 2005), rapidly

identifying limiting amino acids using indicator oxidation (*J Nutr* 137:1253, 2007), and using the flooding dose technique to determine arginine requirements for protein synthesis (*Book Chapter #9*). I have established myself as a developer of amino acid isotope techniques and this work will continue in my studies of methionine requirement and methyl metabolism using multiple isotope kinetics. Furthermore, my research into threonine requirements of the small intestine represents another advance in exploration of amino acid requirements. These approaches are immediately applicable to clinical populations using stable isotope methodology. Indeed, we successfully transferred many of these techniques to infants and children in research conducted by Dr. P Pencharz at the Hospital for Sick Children in Toronto. Knowledge of amino acid requirements in healthy infants and children, as well as in those with special metabolic considerations, is urgently required, according to the WHO/FAO.

TEACHING ACTIVITIES

Memorial University of Newfoundland:

HUBI 3003: Proteins in Health and Disease (2024-).

HUBI 4800: Capstone Honours course (2021-). Skills based course mentoring students through study design and critique.

HUBI 7000: Graduate Skills course (20188). All entering graduate students take this course which is based on key graduate skills and issues).

BIOC 4300: Advanced Nutrition: Current Controversies (2003-). 4th year Nutrition course. Skills-based course on evaluating literature, writing abstracts and disseminating information in oral and written formats.

BIOC 4242: Field Studies in Nutrition (2022-) (Co-taught). Field course taught at Harlow campus, UK.

BIOC 3203: Basic Human Nutrition (2013-) (Co-taught). 3rd year Nutrition course.

HUBI 2002/BIOC 2600: Introduction to Human Nutrition (2018-) (Co-taught). 2nd year Nutrition course.

BIOC 6400: Topics in Nutrition (2005-) (Co-taught). Graduate Nutrition course. Metabolic syndrome: mechanisms and origins.

MEDS: Biochemistry for Medical Students: Case Study facilitator (2018-)

BIOC 4211: Biochemical Research Techniques II (2012-18). Isotope kinetics techniques.

BIOC 4502: Current Topics in Nutrition (2005-2014) (Co-taught). 4th year Honours Nutrition course. Early origins of adult disease: an evaluation of the literature and concepts.

TRACK RECORD IN TRAINING

Graduate Students (Primary Supervision indicated with *):

<u>Name</u>	<u>Years</u>	<u>Degree</u>	<u>Title</u>	<u>Present Position</u>
Gatherall, Kaitlyn	2024-	MSc	Arginine requirements for non-protein metabolites	
Sepandifard, Reza	2024-	MSc	GAA tolerance in pigs	
Omeh, Isaac	2023-	PhD	Epigenetics and dietary methyl supply	

Da Silva, Asha	2023-	PhD	Methyl metabolism and programming of adult diseases	
Buxton, Adar	2023-	MSc	Creatine metabolism in CaCo2 cells	
Winsor, Cole	2023-	MSc	Inter-organ creatine metabolism	
Kumarasinghe, Thilini	2021-	PhD	Antioxidant vitamins and blood flow during TPN	
Wilkins, Simone	2019-21	MSc	Antioxidant vitamins in TPN	Medicine-MUN
Wilkins, Spencer	2019-21	MSc	Lipid emulsions and oxidative stress in TPN	Medicine-MUN
*Karthigesu, Kandeepan	2019-24	PhD	Oxidant load and TPN	Professor, Univ Jaffna, Sri Lanka
*Obade, Efe	2019-22	MSc	Pig model of lipid absorption	Technician, NL
Walsh, Kyla	2019-21	MSc	Fructose absorption in pigs	Teacher, Nova Scotia
*Clancy, Zack	2019-	PhD	Arginine and intestinal blood flow	Medicine-MUN
*White, Julia	2018-20	MSc	Glutathione and oxidative stress in TPN	Teacher, Ottawa
*Manoharan, Jagatheesan	2018-21	MSc	Lecithin and fish oil utilization in pigs	Veterinary Technician, Toronto
*Randunu, Raniru	2017-23	PhD	Programming of adult diseases by early TPN	PDF, MUN
*Alawaini, Khaled	2016-24	PhD	Betaine and transmethylation potential during TPN	On compassionate leave
*Asiriwardhana, Mahesha	2016-24	PhD	Methionine requirement for transmethylation pathways	Veterinary Technician, NL
*Huber, Lee-Anne	2016-17	PDF	Programming of adult diseases by early TPN	Assistant Professor, U of Guelph
*Kaur, Gagandeep	2017-19	MSc	Parenteral betaine as a strategy to prevent fatty liver and improve docosahexaenoic acid and arachidonic acid distribution in parenterally fed neonatal piglets	Research Technician, Alberta
Hurley, Martin	2016-19	MSc	Dipeptide competition in the gut	Physician, NL

*Anderson, Taylor	2015-16	MSc	Betaine supplementation in TPN	Withdrew – Physician, NL
*Bray, Scott	2014-16	MSc	Creatine synthesis and methionine partitioning during TPN in Yucatan miniature piglets	Physician, NL
Al Jaroudi, Welaa	2014-17	MSc	The interaction between lysyl-lysine and arginine in the neonatal Yucatan miniature pig small intestine	Medical School, Ireland
*Al Jaroudi, Alaa	2014-17	MSc	The sparing effects of creatine and its precursor guanidinoacetic acid on protein synthesis in a neonatal parenterally fed piglet model	Industry
Trevors, Alex	2014-17	MSc	Dipeptide transport in neonates	Teacher
Hall, Amanda (U Sask)	2012-17	PhD	Aluminum contamination of TPN products	Physician, Sask
Thera, Jennifer (UNB-Saint John)	2013-17	PhD	Among-lake variability in methylmercury and amino acids in aquatic invertebrates from Kejimikujik National Park	Research Associate, UNB-Saint John
*Bromley-Brits, Kelley	2012-13	PDF	Methyl metabolism and epigenetics	Administrator, MUN
*T. Kankayaliyan	2012-15	MSc	Creatine synthesis and amino acid sparing in neonatal piglets	Veterinarian, Calgary
Dinesh, Chandani	2012-18	PhD	Arginine metabolism and creatine biosynthesis in Yucatan miniature piglets	Government of Canada
Tennakoon, Bimal	2010-13	MSc	Dipeptide transport in Yucatan miniature piglet intestine	Veterinarian, NL
*Robinson, Jason	2009-15	PhD	The effects of dietary methyl donors on methionine partitioning in the neonatal piglet	Assistant Professor, Univ of PEI
*Tucker, Dwayne Brad	2009-12	MSc	Threonine utilization and effects of fibre	Lab technician, industry
*Munasinghe, Lalani	2009-13	MSc	Protein synthesis in mucin -producing tissues is conserved when dietary threonine is limiting	PhD, Univ of Alberta

Collins, Mark	2008-12	PhD	DNA methylation and methyl supply in pigs	Teacher, NL
*McBreairty, Laura	2007-14	PhD	Methionine metabolism in Yucatan miniature swine	Nursing Faculty, ON
Peddle, Shauna	2007-09	MSc	Toxin stimulated mucin synthesis in gut explants	Withdrew from MSc: Physician, NL
Dinesh, Chandani	2007-12	MSc	Intestinal metabolism of indispensable amino acids	Government of Canada
Nosworthy, Matt	2006-14	PhD	Peptide transport in the neonatal Yucatan miniature pig	Researcher, AAFC
Dodge, Elaine	2006-10	PDF	Enteral and parenteral nutrition and short bowel syndrome	Research Associate, Retired
Townsend, Mary	2006-08	MSc	Threonine requirement of the stressed gut	Nurse, Nova Scotia
*Mackay, Dylan	2006-8	MSc	Developmental origins of adult disease in the Yucatan miniature pig: The effects of pre-natal growth on glucose and methyl metabolism	Assoc Prof, Univ of Manitoba
*Myrie, Semone	2004-9	PhD	Developmental origins of cardiovascular disease in Yucatan miniature swine	Assoc Prof, Univ of Manitoba
*McKnight, Leslie	2004-7	MSc	The effects of fetal and post-natal growth rates on the development of type 2 diabetes in Yucatan miniature pigs	PhD Industry Scientist, Ontario
*Nichols, Natalie	2003-6	MSc	Approaches to isolate mucin and threonine utilization in the gut	MD recruitment, Central Health, NL

OTHER EVIDENCE OF IMPACT AND CONTRIBUTIONS

AWARDS

- Canadian Nutrition Society Fellow** (2021)
- President's Volunteer Leadership Award—Canadian Nutrition Society** 2017 (\$1000)
- Canada Research Chair** (Tier II) in Human Nutrition, **Renewal** 2008-13 (\$500,000)
- International Life Sciences Institute (ILSI-North America) Future Leader Award**, 2007-9 (\$30,000 USD operating grant). Given to promising nutrition and food scientists, in recognition for future scientific leadership in the field of nutrition. Based on recommendation by three senior colleagues and evaluation of novelty and relevance of research proposal.

- International Life Sciences Institute Future Leader Award; one of four short-listed applicants in North America, 2006.
- Canada Research Chair** (Tier II) in Human Nutrition, 2002-7 (\$500,000)
- Natural Sciences and Engineering Research Council (NSERC) of Canada **Post-Doctoral Fellowship**, 2000-2 (\$70,000)

RESEARCH SERVICE

Expert Panel Participant:

- Invited expert advisor for **CIHR-INMD New Investigator Workshop**, February, 2016, Kelowna, BC
- Invited expert advisor for **CIHR-INMD New Investigator Workshop**, February, 2015, Halifax, NS
- Invited expert advisor for **CIHR-INMD New Investigator Workshop**, February, 2014, Banff, AB
- Invited expert panelist for **ILSI North American Early Risk Determinants Workshop**, July 8-9, 2008, Washington, DC.

Society Activities:

- President**—Canadian Nutrition Society (CNS) (2013-2015)
- Vice President (Research)**—Canadian Nutrition Society (CNS) (2009-13)
- Committee memberships** Canadian Nutrition Society (CNS): Ethics; Medical School Nutrition program; Advisory; Foundation
- Co-Chair Canadian Nutrition Society (CNS) Workshop on Protein Foods and the Food Guide, Toronto, October 2019.
- Chair of the Canadian Nutrition Society Annual Meeting in St. John's, NL, June, 2014
- Co-Chair of the Canadian Nutrition Society Annual Meeting in Quebec, QC, May-June, 2013
- Co-Chair of the Canadian Nutrition Society Annual Meeting in Vancouver, May, 2012
- Co-Chair of the Canadian Nutrition Society Annual Meeting in Edmonton, AB, June 2-5, 2010
- Awards Committee co-chair for Canadian Nutrition Society (CNS) (2010-14)
- Awards Councillor** for the Canadian Society of Nutritional Sciences (CSNS) (2007-2009)
- Treasurer**—American Society for Nutrition (2024-)
- Chair** - American Society of Nutrition Publications Strategic Task Force (2024-25)
- American Society of Nutrition Finance Committee (2019-22)
- American Society of Nutrition Strategic Plan Implementation Advisory Group (2019-20)
- American Society of Nutrition Publications Strategic Task Force (2020-21)
- American Society of Nutrition Publications Management Committee (2013-2019); Chair (2016-2018)
- American Society of Nutrition—Search committee for editor of American Journal of Clinical Nutrition (2018)
- American Society of Nutrition—Steering committee for contract for professional journal management (2017)
- Invited Member of the Steering Committee for the Energy and Macronutrient Metabolism Research Interest Section (RIS) of the **American Society of Nutrition** (2006-2009)
- Vice-Chair-Public Sector** – Institute for the Advancement of Food and Nutritional Sciences - (2025-)
- Executive Council member** – Institute for the Advancement of Food and Nutritional Sciences - (2024-)
- Board of Trustees** – Institute for the Advancement of Food and Nutritional Sciences - (2020-)

- International Life Sciences Institute (North America) - Canadian Advisory Committee (2012-20); (Chair 2012-2015)

- President** - Danone Institute of Canada (2015-18)

- Danone Institute of Canada Scientific Advisory Council (2009-2014)

Review of Grant Applications:

- Member of the Biological Systems and Functions Evaluation Group peer review committee for NSERC (2022-26)*

- Member of the Nutrition, Food and Health peer review committee for CIHR (2017-20)*

- Committee Member of Foundation Grants review committee CIHR (2016-18)*

- Scientific Officer, Operating Grant: Programmatic Grants in Food & Health peer review committee for CIHR (Aug 2012 to May 2013)*

- Member of the Nutrition, Food and Health peer review committee for CIHR (Dec 2009–2011)*

- Invited Member of the Nutrition, Food and Health peer review committee for CIHR (May 2009)*

- Invited Member of the Nutrition, Food and Health peer review committee for CIHR (Dec 2008)*

- Invited Reviewer of the Nutrition, Food and Health peer review committee for CIHR (May 2008)*

- Invited Member of the Nutrition, Food and Health peer review committee for CIHR (May 2006)*

- Invited Member of the Nutrition, Food and Health peer review committee for CIHR (Nov 2006)*

- USDA—2 grants

- Michael Smith Foundation—5 grants/salary awards

- Canadian Breast Cancer Foundation—Ontario Region – 2 applications

- Alberta Innovates BioSolutions – 2 applications

- Dairy Farmers of Canada – 6 applications

- The Physicians' Services Incorporated Foundation– 1 application

- Danone Institute of Canada– Grants in aid, Leadership, Fellowship awards (Sept 2009–18) – 20 applications per year (Board member)

- NSERC Discovery grants - 25 applications (external review)

- NSERC Collaborative Research and Development grants - 7 applications (external review)

- MITACS – 20 applications

- Canada Research Chairs - 7 application (external review of Tier I and II applicants)