



RACP Foundation Research Awards

FINAL REPORT

Project / Program Title	The potential of carnosine supplementation to reduce cardiometabolic risk: a double-blind randomised controlled trial	
Name	A/Prof Barbora de Courten,	
Award Received	2016 RACP/Foundation for High Blood Pressure Research Establishment Fellowship	
Report Date	19 January 2017	
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Administering Institution	Monash University	
Funding Period	Start Date:	1 January 2016
	Finish Date:	31 December 2016

PROJECT SUMMARY

Carnosine, a naturally occurring substance in our tissues, is available as a safe over-the-counter food supplement. Carnosine was shown to prevent type 2 diabetes and cardiovascular disease in animal studies. Our project tested carnosine's effectiveness in reducing risk factors for diabetes and cardiovascular disease in humans. This has important clinical and public health implications, for safe and affordable prevention of diabetes and cardiovascular disease by already available means.

PROJECT AIMS / OBJECTIVES

To establish whether carnosine supplementation given for 12 weeks to healthy overweight and obese individuals on a high AGE diet will:

1. improve insulin sensitivity and insulin secretory function
2. decrease blood pressure and improve lipid profile
3. decrease plasma inflammatory markers

SIGNIFICANCE AND OUTCOMES

Type 2 diabetes (DM2) is a national and global health priority area. With increasing obesity and sedentary lifestyle, the prevalence of DM2 is increasing. Importantly, DM2 is a major risk factor for cardiovascular morbidity and mortality. This results in a substantial health and financial burden across the healthcare system. Primary prevention of DM2 has focused on weight loss and

physical activity: effective but costly, with low uptake and sustainability. Additional strategies are urgently needed: low-cost and safe approaches that are easy to implement at a population level and work synergistically with exercise.

Carnosine (β -alanyl-L-histidine) is a naturally occurring dipeptide, abundant in mammalian muscle and brain tissues. Already available as an over-the-counter food supplement, carnosine has been safely and successfully used in sport to increase exercise capacity.

Carnosine supplementation has been shown to prevent DM2, cardiovascular risk factors, and cardiovascular disease (CVD) in rodents, by reducing chronic low-grade inflammation (CLI), oxidative stress and the formation of advanced glycation endproducts (AGEs). CLI, oxidative stress and AGEs are associated with obesity and appear to increase the risk of DM2 and CVD. Our team's novel human data provided first evidence that carnosine supplementation reduces the risk for DM2 and CVD. This research has important clinical and public health implications for the prevention of DM2 and CVD – through safe, readily available, and low cost carnosine supplementation.

PUBLICATIONS / PRESENTATIONS

Publications:

1. de Courten B, Jakubova M, de Courten MPJ, Vallova S, Kurdiová T, Krumpolec P, Everaert I, Garzon D, Barbaresi S, Derave W, Teede H, Aldini G, Ukropec J, Ukropcova B “Effects of carnosine supplementation on glucose metabolism in sedentary individuals with overweight and obesity: Pilot Clinical Trial, *Obesity*, 2016, 24, 1027-1034.
2. Just Kukurova I, Valkovic L, Ukropec J, de Courten B, Chmelik M, Ukropcova B, Trattinig S, Krššák M: Improved spectral resolution and high reliability of in vivo ¹H MRS at 7T allows characterization of effect of acute exercise on carnosine in skeletal muscle. *NMR Biomedicine*, 2016, 29(1):24-32.
3. Baye E, Teede H, Ukropcova B, Ukropec J, Derave W, Aldini A, de Courten B: “Physiological and therapeutic effects of carnosine on cardiometabolic risk and diseases”, *Amino Acids*, 2015, in press.
4. de Courten B, Regazzonia L, Garzon D, Altomare A, Marinello C, Jakubova M, Vallova S, Krumpolec P, Carini M, Ukropec J, Ukropcova B, Aldini G: “A carnosine intervention study in overweight human volunteers: bioavailability and reactive carbonyl species sequestering effect”, *Scientific reports*, 2016, in press
5. Hipkiss AR, Baye E, de Courten B: Carnosine and the processes of ageing. *Maturitas*, 2016, in press.
6. Baye E, Ukropec J, de Courten M, Aldini G, Derave W, Ukropcova B, de Courten B: Effect of carnosine supplementation on the plasma lipidome in overweight and obese non-diabetic adults: a pilot randomised controlled trial, submitted
7. de Courten B, Ukropec J, de Courten M, Aldini G, Derave W, Ukropcova B.: Effect of carnosine supplementation on inflammation markers in overweight and obese non-diabetic adults, submitted.

Oral presentations:

1. Barbora de Courten: “Carnosine: Novel Therapy for Prediabetes”, Australian Diabetes Association, New Orleans, 2016

Submitted presentations this year:

2. Estifanos Baye, Jozef Ukropec, Maximilian PJ de Courten, Barbara Ukropcova, Barbora de Courten. Effect of carnosine supplementation on the plasma lipidome in overweight and obese adults. American Diabetes Association Annual Conference, San Diego, California, USA, 2017.
3. Barbora de Courten, Jozef Ukropec, Maximilian PJ de Courten, Barbara Ukropcova. Effect of carnosine supplementation on plasma inflammation markers in overweight and obese adults. American Diabetes Association Annual Conference, International Diabetes Federation Conference, Abu Dhabi, United Arab Emirates, 2017.
4. Estifanos Baye, Jozef Ukropec, Maximilian PJ de Courten, Barbara Ukropcova, Barbora de Courten. Effect of carnosine supplementation on the plasma lipidome in overweight and obese adults. International Congress on Carnosine and Anserine, Louisville, Kentucky, USA, 2017.
5. Barbora de Courten, Jozef Ukropec, Maximilian PJ de Courten, Barbara Ukropcova. Effect of carnosine supplementation on plasma inflammation markers in overweight and obese adults. American Diabetes Association Annual Conference, International Diabetes Federation Conference, International Congress on Carnosine and Anserine, Louisville, Kentucky, USA, 2017.