



RACP Foundation Research Awards

FINAL REPORT

Project / Program Title	Carnosine supplementation to prevent type 2 diabetes by improving insulin sensitivity and/or secretion in overweight humans	
Name	A/Prof Barbora de Courten	
Award Received	2015 Diabetes Australia Research Establishment Fellowship	
Report Date	3 March 2016	
Chief Investigator / Supervisor	Prof Helena Teede	
Administering Institution	Monash University	
Funding Period	Start Date:	1 January 2015
	Finish Date:	31 December 2015

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

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

1. Stegen S, Everaert I, Deldicque L, Ukropec J, Vallova S, Ukropcova B, de Courten B, Derave W.: "Response of muscle histidine-containing dipeptides to dietary induced changes in glucose tolerance. ", Plos one, 2015, 10(3):e0121062.
2. de Courten B, Kurdiova T, de Courten MPJ, Belan V, Everaert I, Vician M, Teede H, Derave W, Aldini G, Ukropec J, Ukropcova B " Muscle Carnosine Is Associated with Cardiometabolic Risk Factors in Humans, Plos one, 2015, in press.
3. de Courten B, Jakubova M, de Courten MPJ, Vallova S, Kurdiova 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, in press.
4. 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.
5. 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.

Oral presentations

1. Regazzonia L, de Courten B, Garzon D, Altomare A, Marinello C, Carinia M, Ukropec J, Ukropcova B, Aldini G: "Carnosine intervention study on obese volunteers: bioavailability and reactive carbonyls species sequestering effect", Recent developments in pharmaceutical analyses, Perugia, 2015
2. Barbora de Courten: "Carnosine: Novel therapy for chronic diseases", Australian Diabetes Society, Adelaide, Australia, 2015
3. Barbora de Courten: "Carnosine: Novel Therapy for Prediabetes", Australian Diabetes Association, New Orleans, 2016

Posters

1. Barbora de Courten, Maximilian de Courten, Helena Teede, Inge Everaert, Wim Derave, Michaela Jakubova, Patrik Krumpolec, Silvia Vallova, Giancarlo Aldini, Jozef Ukropec, Barbara Ukropcova: Carnosine supplementation improved insulin resistance in overweight and obese humans, American Diabetes Association meeting, Boston 2015.
2. Jozef Ukropec, Ivica Just-Kukurova, Patrik Krumpolec, Barbora deCourten, Milan Sedliak, Ladislav Valkovic, Matej Vajda, Miroslav Vlcek, Wim Derave, Giancarlo Aldini, Martin Krssak,

Barbara Ukropcová: Effect of submaximal exercise on muscle carnosin: the role of carnosine supplementation. ECO Prague 2015.