

5th International Immunonutrition Workshop, 6–8 April 2011, Puerto Vallarta, Mexico

Effect of a high carbohydrate diet and exercise on the oxidant/antioxidant status and lymphocyte phenotype of Balb/c mice intestine

A. L. Guadarrama-López¹, R. Valdés-Ramos¹, A. Kormanovski², B. E. Martínez-Carrillo^{1,2},
I. I. Aranda-González¹ and T. R. Cruz-Hernández²

¹Center for Research and Graduate Studies in Health Sciences, Faculty of Medicine, Universidad Autónoma del Estado de México, Toluca, México and ²Posgrado en Investigación, Escuela Superior de Medicina, Instituto Politécnico Nacional, México DF, México

In Mexico, obesity has increased in all social levels, to the point that we are the country with the largest percentage of obese adults in the world⁽¹⁾. According to the nutritional transition theory, the stage of predominance of chronic diseases is characterised by an increase in the intake of simple carbohydrates the decrease in the intake of non-industrialised cereals and tubers, as well as an increase in the consumption of animal origin foods⁽²⁾. These changes have moved research to evaluate the oxidant–antioxidant system and the immune response of different types of diets in human subjects as well as in experimental models⁽³⁾.

The objective of this study was to evaluate the effect of a high carbohydrate diet and exercise on intestinal oxidant–antioxidant system and on lamina propria and cellular phenotype in a murine model. Three-week old male Balb/c mice were fed a high carbohydrate diet (HCD) with or without moderate exercise (E) during 9 weeks. Protein (carbonyls) and unsaturated fatty acid (TBARS) stress indicators, total antioxidant status (TAS) and catalase, glutathione peroxidase and superoxide dismutase activity were measured in intestinal homogenates. Intestinal carbonyls (12.8, SD 0.97 nmol/mg) and TBARS (6.16, SD 0.59 nmol/mg protein) were higher (F 49.62, $P < 0.001$ and F 15.00, $P < 0.001$, respectively) in the controls compared with all experimental groups. The highest (F 3.59, $P = 0.026$) TAS value was found in the HCD without exercise group (41.9, SD 3.68 nm/mg protein); in the experimental groups, all antioxidant enzymes were significantly lower compared with controls (data not shown). Lamina propria lymphocytes were isolated for phenotyping by flow cytometry, data are shown in percentage of cells.

	C		HCD		E		HCDE		F	P
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
CD3+	57.5	2.9	54.1	8.5	44.0**	16.6	21.6**	6.8	57.0	0.001*
CD3+/CD4+	16.7	2.3	3.7	1.3	12.0**	8.5	2.9**	1.8	7.3	0.004*
CD3+/CD8+	4.5	1.1	9.1**	3.3	9.2**	4.6	3.3**	2.9	12.9	0.001*

Values are percentage and SD for two experiments. ANOVA was used to determine the effect of diet and exercise $P < 0.05$. Selected data are significantly different (** $P < 0.05$) by Tukey's *post hoc*. C, control diet without exercise; HCD, high carbohydrate diet without exercise; E, control diet with exercise; HCDE, high carbohydrate diet with exercise.

Lamina propria phenotyping showed lower CD3+, CD3+/CD4+ and CD3+/CD8+ in experimental groups *v.* controls. The non-enzymatic portion was capable of counteracting the effect of diet, exercise and the combination of both. Cell populations were modified by diet and exercise but did not show an improvement in the immune system.

1. Valdés-Ramos R, Martínez-Carrillo BE, Aranda-González II *et al.* (2010) *Proc Nutr Soc* **69**, 644–650.
2. Hawkesworth S, Danglur AD, Johnston D *et al.* (2010) *Phil Trans R Soc B* **365**, 3083–3087.
3. Sies H, Stahl W & Sevanian A. (2005) *J Nutr* **135**, 969–972.