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Morphometry of isolated adipocytes from rats of two models of hypertension

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Abstract

The elevated sympathetic tone is present in metabolic disease (MD), and may be its major mechanism underlying, which can influence the adipocyte size. Our aim was to analyze area and diameter of isolated adipocytes of hypertensive rats. Hypertensive rats presented smaller adipocytes than their control, which can be related to MD metabolic alterations.

Key words: hypertension, adipocytes, rat

Introduction

Metabolic disease (MD) is a cluster of components including hypertension, obesity, and dyslipidemia**.** Some studies suggest the elevated sympathetic tone as the major mechanism, which can be found in MD as well as in its conditions separetely. Morphology of adipocytes from hypertensive subjects can be altered because of sympathetic activation, which can contribute to metabolic disturbances related to MD[1]. Therefore we aim to evaluate the morphology (diameter and area) of adipocytes isolated from epididymal, perirenal and mesenteric fat pads of rats of two models of hypertension: L-NAME -induced and genetic hypertension.

Results and Discussion

There were 4 groups in this study: wistar control (WC), L-NAME-induced hypertension (IH)[2], wistar kyoto control (WKC) and SHR genetic hypertension (GH) (CEUA: 2616-6). IH presented smaller area of perirenal adipocytes (chart 1b) and smaller area and diameter (chart 1c) of mesenteric adipocytes compared to WC, although there were no differences between their body weight and daily intake (chart 2). GH presented smaller area and diameter of adipocytes from all depots, compared to WKC (chart 1a, 1b, 1c), which corroborates with its lower body weight and daily intake (chart 2). The smaller adipocytes of IH can be explained by increased lipolytic activity, caused by high catecholamines due to elevated sympathetic activity, since there were no differences in body weight and daily intake. The smaller adipocytes of GH compared to WKC can be attributed to increased lipolysis similarly, in addition to lower lipogenesis caused by lower daily intake, which also resulted in lower body weight.

Chart 1: Area and diameter of isolated adipocytes from epididymal, perirenal and mesenteric depots

a)	Epididymal			
	WC	**IH**	**WKC**	**GH**
Area (μm^2)	4.285 ± 422	3.430 ± 302	4.846 ± 397	2.923* ± 201
Diameter (μm)	74 ± 10	66 ± 9	79 ± 10	61* ± 7
b)	**Perirenal**			
	WC	**IH**	**WKC**	**GH**
Area (μm^2)	4.606 ± 275	3.162# ± 291	5.209 ± 457	3.293* ± 242
Diameter (μm)	74 ± 13	63 ± 10	85 ± 21	65* ± 8
c)	**Mesenteric**			
	WC	**IH**	**WKC**	**GH**
Area (μm^2)	2.951 ± 201	2.228# ± 108	2.939 ± 218	1.937* ± 110
Diameter (μm)	62 ± 5	54# ± 4	62 ± 7	50* ± 5

Chart 2: Body weight and ingestion of rats from 2 models of hypertension

	WC	**IH**	**WKC**	**GH**
Body weight (g)	442 ± 12	408 ± 19	497$^{\alpha}$ ± 5	282*$^{\beta}$ ± 13
Ingestion/day/rat (g)	26 ± 0,6	24 ± 0,6	30 ± 0,9	22** ± 0,5

* WKC vs. GH (one way ANOVA, followed by Tukey test, p<0.05);
** WKC vs. GH (Kruskal-Wallis, followed by Dunn's test, p<0,05);
# WC vs IH (one way ANOVA, followed by Tukey test, p<0,05);
$^{\alpha}$ WC vs. WKC (one way ANOVA, followed by Tukey test, p<0,05);
$^{\beta}$ IH vs GH (one way ANOVA, followed by Tukey test, p<0,05).

Conclusions

Adipocyte size is a result of balance between lipolysis and lipogenesis of triacylglycerols, and therefore can contribute to elucidate metabolic adipose tissue alterations. In this study, we observed a reduction in size of adipocytes isolated from hypertensive rats, which was dependent on its location, and may be related to metabolic alterations MD.

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[2]Paulis, L., Pechanova, O., Zicha, J., *et al*., *J. Pineal Res.* 2010,*48*(2).