Alteration of Glucose Metabolism in Long-term Dietary Experiment

Zuzana Brnoliakova, Sonam Kapoor, Karol Svik, Lukas Slovak, Lucia Rackova

Institute of Experimental Pharmacology and Toxicology,

Center of Experimental Medicine, Slovak Academy of Sciences,

Dubravska cesta 9, 841 03 Bratislava, Slovak Republic



Introduction

- The field of ageing research has been rapidly advancing in recent decades. The experimental studies have shown the beneficial effects of various dietary patterns on metabolic outcomes. The improvement of eating habits might serves as anti-aging prevention and treatment strategy for metabolic disorders.
- We have focused on the investigation of guided nutritional intervention´s impact, the effect of high fat diet (HFD), on the fundamental metabolic parameters as well as on the glucometabolic hormones.

The goal of our study was to contribute to the elucidation of interrelationship between glycosylation alterations and pathophysiology in rats in a long-term study.

Methods

- Parent animals were fed either standard diet (CON) or HFD (1% cholesterol and 7.5% lard) before mating, their offsprings were fed either CON (CON-CON) or HFD (HFD-HFD) for 18 months.
- The non-invasive blood pressure and heart rate were measured by tail-cuff plethysmography in 6th and 15th month of the experiment (**Fig. 1** & **Fig. 2**).
- The serum levels of glucagon, glucagon-like peptide-1 (GLP-1), grehlin, leptin and plasminogen activator inhibitor 1 (PAI-1) were assessed by magnetic bead–based immunoassays on Bio-Plex 200 systems (Bio-Rad, U.S.) at the age of 1st and 15th months (**Fig. 3**).
- The plasmatic levels of total cholesterol (TC), triacylglycerides (TAG), low density lipoprotein (LDL-C), high density lipoprotein (HDL-C), adipose triglyceride lipase (ATGL), C-reactive protein (CRP) and tumor necrosis factor alpha (TNF-α) were assessed by ELISA kits in 1st and 15th month (**Table 1**).
- The data were statistically evaluated using GraphPad Prism 6 Software (La Jolla, U.S.A), expressed as means ± SEM. Welch´s unpaired *t*-test was used, the level of $p < 0.05$ was considered as statistically significant difference.

Results

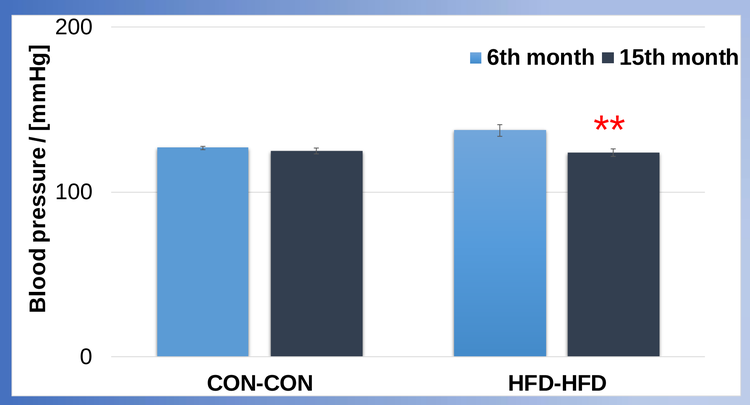


Fig. 1: Systolic blood pressure of rats´s offsprings: 15th *vs* 6th months.

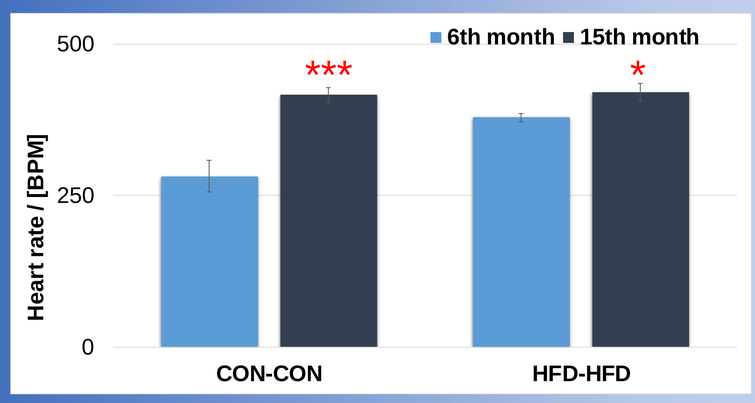


Fig. 2: Heart rate of rats´s offsprings: 15th *vs* 6th months.

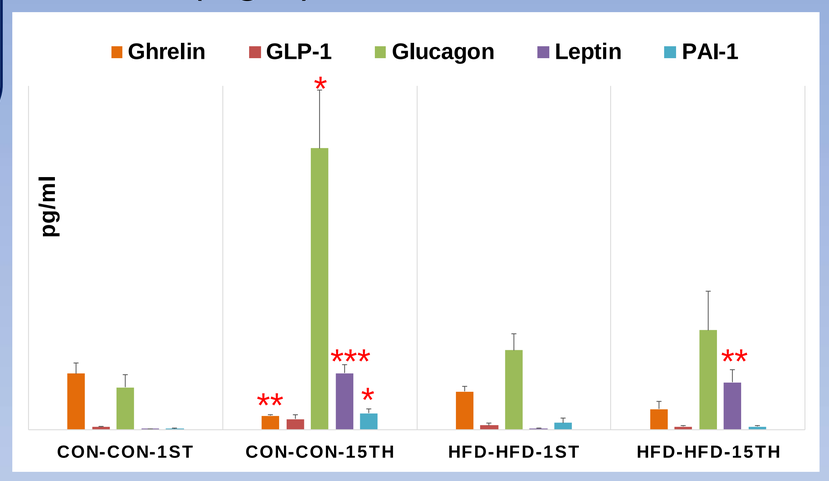


Fig. 3: Glucometabolic hormones in offspring animals: 15th *vs* 1st month.

		AVG 1st month	SEM	AVG 15th month	SEM
CRP	[ng/ml]				
	CON-CON	**0,02**	0,04	**0,32** ***	0,04
	HFD - HFD	**0,20**	0,06	**0,28**	0,12
TNF-α	[pg/ml]				
	CON-CON	**Not detected**	-	**Not detected**	-
	HFD - HFD	**Not detected**	-	**Not detected**	-
ATGL	[ng/ml]				
	CON-CON	**3,10**	0,48	**10,46** ***	1,38
	HFD - HFD	**25,44**	10,70	**72,28** *	18,70
HDL	[ng/ml]				
	CON-CON	**148,24**	22,82	**142,52**	31,12
	HFD - HFD	**264,04**	25,30	**170,38** *	24,82
LDL	[µg/ml]				
	CON-CON	**13,76**	1,12	**8,72** *	1,58
	HFD - HFD	**12,32**	1,58	**5,90** **	1,48
TChol	[mmol/Ll]				
	CON-CON	**0,67**	0,04	**1,01** ***	0,07
	HFD - HFD	**0,82**	0,04	**0,91**	0,10
TRG	[mmol/Ll]				
	CON-CON	**0,26**	0,03	**0,92** ***	0,05
	HFD - HFD	**0,42**	0,03	**0,72** **	0,09

Table 1.: Metabolic parameters in offspring animals: 15th *vs* 1st month.

Conclusions

- Our data indicates that the metabolic, diet related disturbances, leads to significant alterations in glucose metabolism regulation in rats. Although various interacting mechanisms have already been proposed, the role of these modifications is still not well understood.
- In conclusions, data indicates the important role of systemic glucose metabolism regulation and suggests its importance within age and metabolic disorders.
- Interactions with glucose metabolism might represent the potential pharmacological target to focus on in further research strategies.

Acknowledgements

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