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Evaluation of the role of interesterified fat in metabolic parameters and cellular adipose tissue stress pathways.

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Abstract

The western lifestyle is characterized with increased intake of processed and ultraprocessed foods, which have trans fat in their composition. As an alternative to the of trans fat, interesterification is one of the process that have being used by the food industry for the production of plastic fats and trans free. Thus, the aim of this study was to evaluate the role of interesterified fat on metabolic parameters, lipid profile and cellular stress markers in white adipose tissue in mice.

Key words:

Interesterified fat, palm oil, white adipose tissue

Introduction

The random chemical interesterification promotes the rearrangement of hydrolyzed fatty acids in the glycerol backbone generating physical and chemical alterations in triacylglycerol (TAG) due to its new configuration. Lipids are known to be involved in many process of regulation of homeostasis and in several cellular activities, but the excess of fat can lead to development of obese phenotype and it consequences, but the role of interesterified fat in metabolism is not elucidated. Thus, the aim of this work was to evaluate the composition of dietary palm oil and metabolic parameters of mice fed with interesterified fat.

Results and Discussion

Male Swiss mice with 6-weeks old were randomly divided into four experimental groups submitted to either control palm oil diet (PO), control interesterified palm oil diet (IPO), high fat diet, with 60% of palm oil (POHFD) or high fat diet with 60% of interesterified palm oil (IPOHFD) for 8 weeks. Fasting glucose and serum lipid was evaluated after 8 weeks of diet and body mass gain was evaluate weekly. Fatty acid profile was determined by gas chromatography.

Table 1. Regioespecific distribuition of fatty acids obtained from dietary sources: palm oil (PO) and interesterified palm oil (IPO)

Position of fatty acids	PO	IPO
SAFA sn-1,3	77.6	24.2
UNSAFA sn-1,3	22.4	75.8
Σ (%)	100.0	100.0
SAFA sn-2	18.1	65.9
UNSAFA sn-2	81.9	34.1
Σ (%)	100.0	100.0

SAFA: saturated fatty acids; UNSAFA: unsaturated fatty acids.

The most abundant fatty acids on palm oil were palmitic acid and oleic acid. After interesterification, IPO (65.9%) showed that the content of saturated fatty acids in sn-2 position were higher than PO (18.1%).

Table 2. Body mass gain, adiposity, serum TG and CHOL and fasting glucose after 8 weeks of diet.

	PO	IPO	POHFD	IPOHFD
Body mass (g)	8,2 ± 1,9^{c}	10,9 ± 3,9^{b}	18,5 ± 3,9^{a}	18,2 ± 4,4^{a}
Food intake (kcal/week)	26,5 ± 3,2^{a}	26,6 ± 6,0^{a}	20,0 ± 1,9^{b}	20,4 ± 1,3^{b}
Epididymal (%)	4,0 ± 1,0^{a}	4,1 ± 0,5^{a}	5,1 ± 0,8^{a}	5,2 ± 1,1^{a}
Retroperitoneal (%)	1,0 ± 0,2^{a}	0,9 ± 0,2^{a}	1,2 ± 0,3^{a}	1,1 ± 0,3^{a}
Serum TG (mg/dL)	108,0 ± 15,0^{a}	119,2 ± 14,2^{a}	93,9 ± 11,7^{a}	87,0 ± 14,0^{a}
Serum CHOL-T (mg/dL)	167,9 ± 5,7^{a}	177,1 ± 10,5^{a}	175,5 ± 14,2^{a}	178,7 ± 15,1^{a}
Fasting glucose (mg/dL)	166,3 ± 6,2^{b}	214,7 ± 15,4^{a}	246,7 ± 17,75^{a}	219,1 ± 13,6^{a}

TG: triglycerides; CHOL: total cholesterol

The IPO group showed higher body mass and increased fasting glucose compared with PO. The POHFD and IPOHFD did not show any differences.

Conclusions

These partial results indicate that the replacement of unmodified PO with IPO, which contain increased content of SFA in the sn-2 position, on a normocaloric and normolipidic diet could negatively modulate metabolic parameters.

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