Sinigrin affects thyroid hormone level and lipid Metabolism in the rat

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INTRODUCTION

Glucosinolates (GLS) make a group of compounds characteristic for the plants of cruciferous family like horseradish, mustards (black, brown), turnip, cabbage, brussels sprouts, kale, collards and cauliflower, rapeseed. They are present in many foods that are consumed almost daily by people and they are also used as a source of protein for animals and poultry like deffated meal from rapeseed (1).

In response to tissue discruption glucosinolates (GLS) are degraded by thioglucosidase, releasing a range of highly reactive breakdown products like isothiocyanates, nitriles, thiocyanates (2).

In the present study we explored the effect of SINIGRIN after one and two weeks treatment on lipid metabolism and changes of plasma thyroid hormone levels (T3, T4, fT3, fT4). Sinigrin is not present in rapeseed but may contaminate commercial rapeseed rations as a result of the presence of mustard (3).

MATERIAL AND METHODS

The experiment was conducted in vivo on 32 male Wistar rats with an initial body weight of 140 ± 5 the animals were divided into 4 groups (n=8) and were maintained under standard condition. Sinigrin was given during one and two weeks. The animals from two control groups were given water intragastrically in dose 1ml/100g body weight. The sinigrin was dissolved in water and was given in dose 2mg/100g body weight by oral administration during one and two weeks. Body weights of the individual rats were recorded every two days. After appropriate time the animals were decapitated and their serum and liver were collected for analysis. The serum was used for the estimation of plasma thyroid hormone levels, free

fatty acids, triglycerides, phospholipides, total cholesterol, free cholesterol and esterified cholesterol contents.

Thyroid hormone levels (T3, fT3, T4, fT4) were determinated using a radioimmunoassay kit (Swierk, Poland).

Free fatty acids were determined according to Duncombe (4).

Glucose was photocolorimetrically assayed by means of the enzymatic method with glucose oxidase and o-dianisidine.

Total, free and esterfied cholesterol was measured by the enzymatic method of Richmond (5).

Phospholipides and triglicerides were determinated enzymatically using kits provided by BioMerieux.

The amount of triglycerides and total cholesterol in liver were determined similarly as in serum after extraction of lipids using the method of Folch et all (1975)(6). Folch's extract was evaporated before use. The amount of liver glycogen was determined as glucose after extraction in 30 % KOH and hydrolysis with amyloglucosidase.

Sinigrina and the remaining analytical reagents were obtained from Sigma.

Statistical analysis

The results were subjected to statistical analysis by one factor analysis of variance. The correlation coefficient (r) between the determined parameters was calculated at a level of significance of $P<0.05$.

RESULTS

The obtain results (table 1) has shown that when sinigrin is supplied to rats at that dose 2 mg/100g body weight it is a material factor interfering in lipid metabolism. It pertaines to influence of sinigrin only after two weeks treatment. Sinigrin administration increased significantly free fatty acids, total cholesterol and esterfied cholesterol concentration on the contrary the level of triglycerides was decreased considerably. This changes were not significant in group of animals being fed of sinigrin during one week but in this group of rats the considerable increase of T3 was noticed in serum in comparison with control group.

Tab. 1. Influence of sinigrin on thyroid hormon levels and lipid metabolism

PARAMETER	**SINIGRIN [2 mg/100g b.w.] 1 WEEK**		**SINIGRIN [2 mg/100g b.w.] 2 WEEK**	
	CONTROL GROUP	EXPERIMENTAL G.	CONTROL G.	EXPERIMENTAL G.
SERUM				
T3 [nmol/l]	**1.92 ± 0.14** ^{A}	**2.93 ± 0.64** ^{B}	1.63 ± 0.07	1.98 ± 0.04
FT3 [pmol/l]	7.05 ± 0.28	7.09 ± 0.24	6.50 ± 0.18	6.63 ± 0.15
T4 [nmol/l]	59.59 ± 1.59	64.85 ± 4.99	62.65 ± 4.61	73.60 ±3.68
fT4 [pmol/l]	32.26 ± 2.07	31.69 ± 1.69	34.49 ± 2.45	31.01 ± 1.16
FFA [mmol/l]	0.23 ± 0.03	0.20 ± 0.01	**0.13 ± 0.01**^{A}	**0.31 ± 0.03**^{B}
Glucose [mmol/l]	4.46 ± 0.25	4.50 ± 0.23	5.27 ± 0.22	5.07 ± 0.17
TG [mmol/l]	0.40 ± 0.09	0.39 ± 0.04	**0.44 ± 0.05**^{A}	**0.27 ± 0.02**^{B}
Phospholipides [mmol/l]	0.93 ± 0.06	0.9 ± 0.04	0.89 ± 0.04	0.96 ± 0.04
Total Cholesterol [mmol/l]	1.02 ± 0.05	1.06 ± 0.04	**0.87 ± 0.02**^{A}	**1.12 ± 0.03**^{B}
Estrified Cholesterol [mmol/l]	0.64 ± 0.04	0.63 ± 0.02	**0.57 ± 0.01**^{A}	**0.85 ± 0.02**^{B}
LIVER				
TG [mg/1g b.w.]	15.62 ± 2.36	15.98 ± 1.93	15.73 ± 0.70	17.02 ± 1.05
Cholesterol [mg/1 g b.w.]	**2.46 ± 0.11**^{A}	**2.20± 0.06**^{B}	2.11 ± 0.04	2.19 ± 0.08
Glycogen [µmol/g b.w.]	48.95 ± 3.05	47.89± 0.76	**45.00 ± 0.60**^{A}	**52.30 ± 2.63**^{B}

Values are means ± SEM for eight animals; means with different letters are significantly different ($P<0.05$)

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