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Original Article

Comparison of the Effects of Coconut Oil and Soyabean Oil on TSH Level and Weight Gain in Rabbits

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Abstract:
The present study was conducted on 12 albino rabbits of either sex and weighing between 1-1.5kg to see the influence of coconut oil and soyabean oil on serum TSH levels and weight gain for a period of 12 weeks. The rabbits were divided into 2 groups of six each. Rabbits in group 1 were fed on coconut oil and in group 2 were fed on soyabean oil in addition to their standard diet. At the end of 12 weeks we found that rabbits fed on soyabean oil had significant increase in TSH levels (p= 0.003) and gained more weight (p=0.000) when compared to rabbits fed on coconut oil.
Key Words: Coconut oil, Soyabean oil, Thyroid stimulating hormone, Weight

Introduction:

Diet plays a major role in thyroid health. For decades we have known that low iodine uptake leads to low thyroid function and eventually to goiter. Iodized salt was intended to solve this problem but it has not been the answer. There are number of foods known as goitrogens that block iodine. Many dietary oils can negatively affect thyroid health. The vast majority of fats in our diet are composed of molecules known as long chain triglycerides (LCT). We cook with them everyday and they are plentiful in commercially prepared foods. The most common oil used in cooking preparation is the soyabean oil (poly unsaturated) that contains LCT.(1)

The rise of industrialization and corporate farming has drastically changed our dietary habits (poly unsaturated) from what out ancestor ate (saturated).(1) With these changing dietary habits, the incidence of obesity is increasing and hence increased risk of mortality from diabetes, coronary artery disease and cancer.(2)

It has been observed that obesity increased directly in proportion to ratio of unsaturated oil to saturated oil in the diet. Soyabean oil (unsaturated) has long chain fatty acids i.e. linoleic and linolenic acid that contains 9 calories per gram where as coconut oil (saturated) has short chain fatty acids and medium chain fatty acids that contains 6 calories per gram and hence, less energy.(3) The medium change fatty acids are known to increase metabolism and promote weight loss.(4) Coconut oil reduces food intake by extending post meal satiation period.(5)

The consumption of saturated fats has shown to assist in regulating the healthy functioning of the thyroid gland and combating the hypothyroid like symptoms such as fatigue, weight gain, water retention that may arise through a modern diet high in polyunsaturated fats.(6) The thyroid hormone is formed in the gland by the action of a protein digestive enzyme and unsaturated fats inhibit that enzyme. (4) Many studies have shown that diet high in polyunsaturated fatty acids have adverse effects on the thyroid gland (7,8) causing hypothyroid like symptoms weight gain, edema and hypercholesterolemia. Soya contains phytoestrogens. In the 1960's when soya was introduced into infant formulas, it was shown that soya was goiterogenic and caused goiter in babies.(1)

However, no attempt has been made to compare the effect of coconut oil (saturated) with soyabean oil (unsaturated) on thyroid function and weight gain. So, this study was planned.

Material and Methods:

Twelve albino rabbits of either sex weighing between 1-1.5kg were studied for a period of 12 weeks. The rabbits were housed under standard laboratory conditions at ambient temperature (25°C – 28°C). After an initial period of acclimatization for 2 weeks to laboratory conditions the rabbits were randomly divided into two groups of six each.

Group 1/Coconut Oil Group – The rabbits in this group were fed on standard diet mixed with 10 ml coconut oil/day as fat component for 12 weeks in the diet.

Group 2/Soyabean Oil Group (SO) – The rabbits in this group were fed on standard diet mixed with 10 ml soyabean oil/day as fat component for 12 weeks in the diet.

Standard (Gold Mohur) diet was obtained from All India chemicals and scientific co., New Delhi. The composition of standard diet was – crude protein 20%, ether extract 3.5%, crude fibre 12%, ash 8%, calcium 1.2%, Phosphorous 0.6%, BFE 47%, ME 3000cal/kg.

Procedure for feeding oil – 10ml oil was taken with the help of syringe and was mixed with standard diet in the morning at 10 o'clock and was then given to rabbits in group 1 and group 2.

The study was approved by institutional ethics committee. As per the section 14 of the prevention of "Cruelty of animal act, 1960" the rabbits were closely supervised by the supervisors of the work.

Rabbits were placed in individual restraining cage and xylene was applied over the ear. Blood samples of 5ml were collected from marginal vein of ear lobe of each rabbit in the plain test tube under aseptic conditions using disposable needle. Blood samples were collected at 0 weeks and after 12 weeks in each group. Blood samples were allowed to clot at room temperature and serum was separated by centrifugation at 3000 rpm for 10 minutes.

Estimation of serum TSH levels was done by using autoanyalyser ELECSYS 1010 based on Sandwich Principle.

Sandwich Principle : Total duration of assay: 18 min.

- 1^{st} incubation: 50µL of sample, a biotinylated monoclonal TSH specific antibody and a monoclonal TSH specific antibody labeled with a rutenium complex react to form a sandwich complex.
- 2^{nd} incubation: After addition of streptavidin-coated microparticles, the complex becomes bound to the solid phase via interaction of biotin and streptavidin.
- The reaction mixture was aspirated into the measuring cell where the microparticles were magnetically captured onto the surface of electrode. Unbound substances were then removed with Procell. Application of a voltage to the electrode then induces chemiluminescent emission which was measured by the photomultiplier.

Online Journal of Health and Allied Sciences

- Results were determined via a calibration curve which was instrument specifically generated by 2 – point calibration and a master curve provided via the reagent barcode.

Weight of rabbits was measured by using electronic weighing scale at the start of study and at the end of 12 weeks. The values obtained were analyzed by using 't' test.

Results:

Table 1 shows Mean (±S.D.) value of serum TSH levels (ulU/ml) in group 1 and 2 at 0 weeks and at 12 weeks. There was highly significant (p=0.001) decrease in serum TSH levels in group 1 after 12 weeks (0.029±0.0165) as compared to at 0 weeks (0.073±0.0273). In group 2 there was significant increase (p=0.010) in serum TSH levels after 12 weeks (0.178±0.0893) as compared to 0 weeks (0.069±0.0256).

Table 2 shows the mean (±S.D.) of weight (kg) in group 1 & 2 at 0 and 12 weeks. Rabbits in group 1 had significantly (p= 0.001) less gain in weight after 12 weeks whereas rabbits in group 2 had significantly more gain in weight (p=0.000).

Table 3 shows the comparison of mean TSH levels and weight gain in group 1 & 2 after 12 weeks. There was significant decrease (p= 0.003) in TSH in group 1 (0.029±0.0165) as compared to group 2 (0.178±0.0893) after 12 weeks. Weight was significantly (p=0.000) increased in group 2 (1.70±0.1828) as compared to group 1 (1.48 ±0.1032).

Table 1: Mean (± standard deviation) of serum TSH levels (ulU/ml) in group 1& 2 at 0 weeks and at 12 weeks

	0 Weeks	12 Weeks	't' value	p value
Group 1	0.073± 0.0273	0.029± 0.0165	6.324	0.001
Group 2	0.069 ±0.0256	0.178 ±0.0893	3.996	0.010

Table 2: Mean (± standard deviation) of weight (kg) in group 1&2 at 0 weeks and at 12 weeks

	0 Weeks	12 Weeks	't' value	Pvalue
Group1	1.35 ±0.1140	1.48 ±0.1032	6.325	0.001
Group2	1.25 ±0.2222	1.70± 0.1828	8.714	0.000

Table 3: Comparison of mean TSH levels and weight gain in group 1 & 2 after 12 weeks.

Parameters	Group1(n=6)	Group2(n=6)	Comparision
TSH(ulU/ml)	0.029± 0.0165	0.178 ±0.0893	p=0.003
Weightgain(Kg)	1.48 ±0.1032	1.70± 0.1828	p=0.000

Discussion

Dietary fatty acids have marked influence on body weight and functioning of thyroid gland. The results of our study showed that serum TSH levels were significantly increased (p=0.003) and weight gain was significantly more (p=0.000) after 12 weeks in rabbits fed on soyabean oil as compared to those fed on coconut oil.

The cause of this may be attributed to the fact that the unsaturated fats slow the metabolism (9) by blocking the secretion of thyroid hormone, their movement in the circulatory system and the response of tissues to the hormone.(10) On the other hand, tissue response to thyroid hormone is actually enhanced by saturated fatty acids.(9) It is quickly metabolized and functions as an antioxidant.(10) Similar elevated TSH levels were observed by other workers on feeding 30gm of soyabean/day for 1 month. One month after stopping the soyabean consumption, individual TSH values decreased to original levels and goiters were reduced in size.(11)

Increased weight gain in soyabean oil (Polyunsaturated) is due to the presence of linolic and linolenic acids, long chain fatty acids that have an antithyroid effect.(1) Medium chain fatty acid in coconut oil increase energy expenditure due to their unique absorption, metabolic rate and greater thermogenic effect.(12,13) The postprandial thermo genesis and a lower respiratory quotient, indicates increased fat oxidation leading to less fatty acid deposition. Medium chain triglycerides alter the lipolytic sensitivity to catecholamines.(14)

Various researchers have found that medium chain triglycerides fed rats gained less weight as compared to either saturated or long chain triglyceride fed rats.(15)

In conclusion, saturated fats (coconut) decrease serum TSH levels and cause less gain in weight where as unsaturated fats (soyabean) increase serum TSH levels and more gain in weight thus leading to hypothyroidism like symptoms. The cause of increased incidence of hypothyroidism and weight gain now a days may be due to increased commercialization of soyabean oil and soya products. Thus, the concept of using polyunsaturated fat

in the diet and avoiding saturated fat completely from the diet should be changed to use of both saturated and unsaturated fats.

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