



Comparison the Effect of Cow ghee with Other Diets on the Obesity of Syrian Hamsters

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ABSTRACT

Aims It seems that there is a causal link between dietary fat and body weight. Overweight obesity is the biggest nutrition-related problem in developed countries and the rapid summation of obesity is taking place in their populations. The aim of this study was to compare the effect of different diets on the obesity of Syrian hamsters.

Materials & Methods This experimental study conducted on 48 N-Mary male Syrian hamsters with an average weight of 25-30g. Mice were randomly divided into 6 groups (each 8); control, corn oil, olive oil, cow ghee, sheep ghee and, cholesterol. All the samples were weighted before and after the 2 months period of treatment. Data was analyzed by SPSS 16 software using paired T and Kruskal-Wallis tests.

Findings The mean weights of all groups were significantly increased after the treatment in compared to before. Only significant overweight compared to control group was seen in CG group ($p < 0.007$). The amounts of water consumption were significantly lower in OO (63.3 ± 6.5 ml; $p < 0.043$) and CO (61.5 ± 6.8 ml; $p < 0.027$) groups compare to control (95.6 ± 10.3 ml).

Conclusion High-fat diet can causes weight gain, especially cow ghee has more prominent role in the weight gaining.

Keywords Olive Oil; Corn Oil; Health Promotion; Ghee; Cholesterol

CITATION LINKS

[1] Dietary fat plays a major role in obesity: No. Obes Revi [2] Weight, weightchange, and coronary heart disease in women: risk within the 'normal' weight range [3] Prevention of Chronic Disease by Means of Diet and Lifestyle Changes [4] Guidelines for healthy weight [5] Weight gain as a risk factor for clinical diabetes in women [6] Weight and osteoarthritis [7] Time trends in obesity: An epidemiological perspective [8] Epidemiologic studies of coronary heart disease and stroke in Japanese men living in Japan, Hawaii and California: Prevalence of coronary and hypertensive heart disease and associated risk factors [9] Diet and health: Implications for reducing chronic disease risk [10] Effect of the amount and type of dietary fat on cardiometabolic risk factors and risk of developing type 2 diabetes, cardiovascular diseases, and cancer: a systematic review [11] The role of low-fat diets in body weight control: A meta-analysis of ad libitum dietary intervention studies [12] Macronutrient balances and obesity: The role of diet and physical activity [13] Effect of age, sex, and site on the cellularity of adipose tissue in mice and rats rendered obese by a high-fat diet [14] Diet-induced adipocyte number increase in adult rats: A new model of obesity [15] Body weight regulation in obese and obese-reduced rats [16] Development of dietary obesity in rats: Influence of amount and composition of dietary fat [17] Persistent obesity in rats following a period of consumption of a mixed, high energy diet [18] Dynamics of recovery of body composition after overfeeding, food restriction or starvation of mature female rats [19] Changes in feeding efficiency and carcass composition in rats on repeated high-fat feedings [20] Effect of the composition of the diet on energy intake [21] Nutrition evaluation of dietary fat substitutes [22] Dietary composition, substrate balances and body fat in subjects with a predisposition to obesity [23] Substrate and Energy Metabolism in Man [24] Effect of corn oil, olive oil and sheep's and cow's ghee on the expression of apoB protein [25] Apolipoprotein B and cardiovascular disease risk: position statement from the aacc lipoproteins and vascular diseases division working group on best practices [26] Dietary fat, genetic predisposition, and obesity: lessons from animal models [27] Effects of butter naturally enriched with conjugated linoleic acid and vaccenic acid on blood lipids and LDL particle size in growing pigs [28] Palmitic acid and linoleic acid metabolism in Caco-2 cells: Different triglyceride synthesis and lipoprotein secretion

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Introduction

The prevalence of overweight in the people of rich countries with high-fat intake is more than poor countries with low-fat intake. This expressed of the fact that there is a causal link between dietary fat and body weight [1].

In US and many other rich countries, excess body fat is responsible for 30-40% of coronary heart diseases [2, 3], many cancers, e.g. breast, colon, endometrium and kidney [4], many cases of adults-onset diabetes [5] and part of disabling osteoarthritis [6]. Thus, overweight obesity is the biggest nutrition-related problem in developed countries and the rapid summation of obesity is taking place in their populations [7].

Genetic factors affect the incidence of obesity in individuals, but usually not considered for high rate of increase in body fat in most progressed countries [8]. Although it seems that fat dietary, among other lifestyle factors, has positive relation with the high rate of obesity, but it is not associated with risk of cardiovascular diseases [9] and incidence of cancer [10]; So, reducing the obesity is the primary justification for recommendations of low fat intake. Some nutritionists believe that the reduction in the percentage of energy obtained from fat, decreases the body weight and significantly reduces the prevalence of obesity, spontaneously [11, 12].

Researches and experiments on animals have shown that high-fat diet increases the number of fat cells (adipocytes) and replace high-fat diet with low-fat diet, may (but not always) reverse the process of obesity. Study on mice and rats have shown that, receiving high-fat meals in a long time leads to increasing the number of fat cells and these cells will have remained after the reducing of fat diet [13-17]. Rats which have been fed with high-fat diet will not get back to their basis weight after receiving low-fat diet [17] and will not lose weight and be controlled after receiving high-fat diet for more than 7 months [18,19].

Several mechanisms have been suggested to elucidate why high-fat intake might cause increased body fat [20, 21]. Fat dietary is providing high energy (38kJ/g) compare to carbohydrate or protein (17kJ/g) and is the most energy-dense macronutrient. Fats consumption is increased due to being known for their great taste and pleasant of foods. Incidentally, results of studies under careful

metabolic conditions for short periods have shown that carbohydrates procreate a greater thermogenic effect than fats, proposing that fat dietary is more effective in being assembled as body fat [22] and if the carbohydrate intake is regulated, individuals on a high-fat diet would tend to expend more total energy from carbohydrates than someone on a low-fat diet [23].

Traditional methods are still used to produce animal ghee and butter in Iran which are different from industrial methods. Fatty acids types quantitatively changed in traditional method, which increases the short- and medium-chain fatty acids and reduces long-chain fatty acids. These changes, in addition to nutrition value increasing, reduce the side effects [24]. Because animal ghee is mostly used in rural and tribal areas and some special cities, the investigation of the effect of cow ghee consumption on weight and obesity is worth full. So, the aim of this study was to compare the effect of different diets on the obesity of Syrian hamsters.

Materials & Methods

This experimental study conducted on 48 N-Mary male Syrian hamsters with an average weight of 25-30g. After two weeks of adaption with animal room condition (22±1°C and 12h interval of light & dark) mice were randomly divided into 6 groups (each 8); control (100% chow), CO (90% chow + 10% corn oil), OO (90% chow + 10% olive oil), CG (90% chow + 10% cow ghee), SG (90% chow + 10% sheep ghee), CH (90% chow + 8% corn oil + 2% cholesterol).

The hamsters accessed to their diet without any limitation during 2 month period of the test but water consumption was measured once per week by graduated cylinders (250ml). All the samples were weighted before and after the 2 months period of treatment by digital equipment with accuracy of 0.01 (Adam; UK).

Data was analyzed by SPSS 16 software using paired T (comparing before and after treatment weight in groups) and Kruskal-Wallis (comparing weight difference and water consumption between the groups) tests.

Findings

The mean weights of all groups were significantly increased after the treatment in

compared to before. Only significant overweight compared to control group was seen in CG group ($p < 0.007$); CG overweight had also significant differences with CO ($p < 0.03$), OO ($p < 0.023$), SG ($p < 0.0001$), and CH ($p < 0.004$) groups (Figure 1).

Figure 1) Comparison of the mean weights (gram) of 6 groups before and after the treatment by paired T test

Group	Before	After	p Value
Control	28.13±6.92	32.75±7.32	$p < 0.006$
CO	26.50±4.47	31.63±8.03	$p < 0.001$
OO	28.38±5.76	32.88±5.74	$p < 0.0001$
CG	25.38±6.23	33.63±5.29	$p < 0.0001$
SG	32.00±6.89	34.63±6.09	$p < 0.007$
CH	32.88±4.75	36.63±7.02	$p < 0.001$

The amounts of water consumption were significantly lower in OO (63.3 ± 6.5 ml; $p < 0.043$) and CO (61.5 ± 6.8 ml; $p < 0.027$) groups compare to control (95.6 ± 10.3 ml) and no other significant differences were seen between other groups.

Discussion

In this study, the weight of Syrian hamsters was analyzed in 6 different groups before and after treatment with different diets and the results showed that cow ghee cause more weight gain compare to other diets which is not matched with Contois *et al.* [25] which have reported no significant change for cow ghee. Several species of hamster show obesity due to a high-fat diet fed [26]. Borer has shown that supplementation of normal laboratory diet with sunflower oil causes obesity without consuming too much energy [26]. Similarly, Wade & Hamilton have reported that a high fat diet to Syrian or Golden hamsters is leading to profound obesity [26]. However, in another study by Haug *et al.* on pigs using a butter enriched c9, t11-CLA and VA, no weight increase have seen [27]. van Greevenbroek *et al.* have shown that CaCO₂-treated cells incubated with palmitat, synthesizes more phospholipids and few triglycerides and phospholipids primary remain in these cells and change the morphology of cells [28]. As palmitat is the highest fatty-acid in cow ghee, retention of phospholipids and increase of body weight is expected. Cow ghee increases the Apo B48 expression compatible with increase of body weight, because increasing of Apo B48 level cause to absorption of high fat [24]. Cow ghee rich palmitat participates in

phospholipids synthesis and cause overweighting of the cell and body weight subsequently.

As the water consumption was low in all groups, it suggests that retention and storage of fat need lower water compare to carbohydrates.

It is suggested that the VLDL diameter is measured after the use of different oils. And also the effect of net oils on cell lines derived from hepatocytes and enterocytes can be investigated.

Conclusion

High-fat diet can causes weight gain, especially cow ghee has more prominent role in the weight gaining.

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Conflicts of Interests: There were no conflicts of interests.

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