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EFFECT OF SUCRALOSE CONSUMPTION ON BODY WEIGHT- A NOVEL EXPERIMENT ON WISTAR ALBINO RATS

Anatomy

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ABSTRACT

Sucralose is the latest and most popular within the family of artificial sweeteners. It's rapidly increasing use as a routine table top sweetener among the fitness conscious individuals is attributed to the general notion that it is non caloric substitute of sugar and hence leads to weight loss. But some of the latest research has revealed that it causes weight gain. Thus, the present study was designed to provide an insight into this question of immense societal relevance- Whether sugar free ingestion causes weight gain or weight loss? Six experimental rats were administered sucralose at the dose of 3gm/kg/day for 30 days dissolved in distilled water. Food intake, Water consumption and Weights recorded each day were tabulated and compared between control and experimental groups. Food intake per day was found to be comparable in both the groups. Water intake in experimental rats was more in sucralose treated rats than control ones with p value 0.004. No significant difference in the weights of experimental and control rats was observed. The present study suggests no effect on body weight after sucralose ingestion. But the question whether sucralose causes any change in the body weight and glucose homeostasis needs to be revisited and reinvestigated.

KEYWORDS:

Sucralose, weight loss, obesity, Sugar free

INTRODUCTION

Sucralose as a general purpose sweetener was approved by U.S Food and Drug Administration in 1999. It came into the market with brilliant attributes. It is 600 times sweeter than sugar[1]. It is poorly absorbed and excreted unchanged in feces[2]. It is stable at high temperature and low pH thus ideal for baking[3]. It does not cause dental caries[4] and is safe for consumption in diabetes[5] and does not affect insulin level[6]. With such a set of metabolic and chemical properties, it came to be increasingly embraced by diabetic as well as fitness conscious individuals. The fact that sucralose is formed by chlorination of sucrose and is non caloric made it an ideal replacement of sugar in the era of high prevalence of obesity and associated morbidities. But the recent researches has revealed that sucralose ingestion is related with weight gain and increased propensity to cause Type 2 DM[7,8,9]. Weight gain is mainly attributed to either disturbing the glucose homeostasis by increasing the availability of GLUT2 receptors[7], or by damaging of the gut microbiota[8], thus increasing inflammation and possibility of metabolic syndrome or by disturbing the appetite control and the ability to regulate calorific intake[9]. Due to the availability of contradictory research outcomes, the present study was conducted to objectively demonstrate weights after taking sub lethal dose of pure sucralose taking wistar albino rats as experimental models.

METHODS

Inbred adult wistar albino rats of either sex weighing between 150-200 grams were procured from Animal house of University College of Medical Sciences, Delhi after taking approval from institutional ethical committee. CPCSEA guidelines for care of animals were duly followed. Animals were kept in separate cages under normal lighting conditions. They were given food and water ad libitum. The food and water intake were measured each day. The body weight were recorded each day and correlated with the food and water intake. Group 2 was given sucralose orally by gavage in the dose of 3g/kg/day dissolved in distilled water for 30 days. Group 1 received equal quantity of distilled water by the same route and they served as controls. Food intake, Water intake and Weight gain after 30 days were recorded and tabulated. The values were compared between experimental and control rats using unpaired student t test and p values were obtained.

RESULTS

All the rats were found to be playful and active in both the groups. No apparent change was observed in their behaviour.

Mean daily food intake for control and experimental rats is shown in Table 1. The average food intake by the control group was 26.87 ± 0.8 gm/day and that of the experimental group was 27.72 ± 0.78 gm/day. No significant difference was observed in the mean daily food intake values of control and experimental groups with p value of 0.118.

Table 1: Mean daily food intake (gm) of control and experimental groups

	Rat 1	Rat 2	Rat 3	Rat 4	Rat 5	Rat 6
Control	27 ± 3.27	26 ± 3.79	27 ± 3.09	28 ± 2.95	25.9 ± 1.93	27.3 ± 2.70
Exp.	27 ± 2.40	28 ± 4.00	28 ± 6.68	29 ± 2.61	27 ± 2.43	27.3 ± 2.64
p-value	0.118					

Mean daily water intake for control and experimental rats is shown in Table 2. The average water intake by the control group was 23.91 ± 0.68 ml/day and that of the experimental group was 34.33 ± 1.25 ml/day. The mean daily water intake of experimental group was found to significantly more than in control group with p value of 0.004.

Table 2: Mean daily water intake (ml) of control and experimental groups.

	Rat 1	Rat 2	Rat 3	Rat 4	Rat 5	Rat 6
Control	23 ± 2.27	24 ± 2.54	25 ± 2.38	24.5 ± 2.73	23.4 ± 2.53	23.53±2.15
Exp.	35 ± 4.6	34 ± 4.52	32 ± 4.09	36 ± 4.18	35 ± 4.73	34 ± 4.42
p-value	0.004					

Total weight gain during the experiment in control and experimental groups is shown in Table 3. The average weight gain in the control group in 30 days was 56.67 ± 4.38 gm and that of the experimental group was 60.67 ± 3.25 gm. No significant change in the weight gain was observed between control and experimental rats with p value of 0.109.

Table 3: Weight gain (gm) in 30 days in control and experimental groups.

	Rat 1	Rat 2	Rat 3	Rat 4	Rat 5	Rat 6
Control	52	54	56	53	64	61
Exp.	57	63	62	58	66	58
p-value	0.109					

DISCUSSION AND CONCLUSION

No significant difference in the food intake was found in control and experimental rats. This finding is similar to the finding of previous

authors[10] who attributed this to the fact that sucralose was given by gavage and hence not tasted. Thus, quantity of food intake remains unaltered. [11] administered sucralose to albino rats by mixing it with food and found decrease in food intake. The author[11] explained that sucralose mixing with the food altered the palatability of it. Hence, in the present study, oral gavage was used to administer sucralose rather than mixing it with the food.

Weight gain during the duration of the experiment in sucralose treated rats was found to be similar as compared to controls. Thus, the mechanisms explained by authors[7,8,9] to hypothesize the body weight gain after sucralose ingestion needs to be relooked and investigated further. No significant change in the body weight after sucralose intake can be explained by the findings that sucralose ingestion does not cause any change in plasma glucose levels, HbA1C, Serum c peptide values[5].

There was a significant increase in the water intake in sucralose treated rats as compared to controls in the present study. Increase in the water intake in sucralose treated animals could be attributed to the presence of non- digestible, osmotically active substance which causes water retention[12].

The fact that there was no apparent abnormality in the behaviour of the animals and no mortality, it can be said that sucralose is safe at least for a period of one month in sub lethal doses, as used in the present study. LD_{50} of sucralose is greater than 10gm/Kg body weight in rats[10] and the animals in the present study were fed on 3gm/Kg body weight.

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