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THE RATE AND DEGREE OF FOOD COMPENSATION ON ALTERATION OF ITS CALORIC DENSITY IN RATS

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Abstract : The ability to regulate energy level by male albino rats on administration of food with varying caloric densities, was studied. The animals fed different caloric density diets exhibited marked variations in their caloric in take in the initial stages which stablized after 5 to 10 days and maintained on lower mean caloric intake on diet having density of 2.63 Kcal/gm, and higher mean caloric intake on diet with density of 4.88 Kcal/gm. Similar variations in body weight were also evident with failure to maintain the body weight with caloric dilution.

Key words : food caloric density energy balance

INTRODUCTION

Rats fed *ad lib* on diets with varying caloric densities showed that within limits the animals eat to maintain the adult body weight (1). In growing rats (2,3,4,5) and also in man (6,7,8) the intake is increased commensurate with normal growth. Many workers subsequently observed that, within limits, the animals not only adjust caloric intake (4,5,9,10), but also some of the specific nutrients (11,12), metabolic rates (13) and body weight (11), in regulating energy balance.

In our study, it was however, observed that laboratory rats, having free access to food and water, do not adjust the energy intake promptly when fed food mixed with non-nutritive additives. The body weights were also not maintained at the control level. This prompted us to study the pattern of adjustment of food intake and body weight when the rats were presented with food in three different caloric densities. The present study mainly concentrates on the rate and degree of stabilization of food intake and body weights in rats administered diluted and concentrated food *ad libitum.*

METHODS

The study was performed on 19 adult, 120 days old male albino rats, grown in the laboratory, weighing between 180-200 gms. Each animal was housed in an individual plastic cage with light-dark cycles each of approximately 12 hours duration.

Powdered stock food (Hindustan Lever), having caloric density of 3.51 kcal/gm and water supplemented with vitamins were administered *ad lib* to all the animals during first 20 days. The daily caloric intake and body weights were computed.

Food mixed thoroughly with 25% kaolin powder (by weight) and attaining caloric value of 2.63 kcal/gm was administered to 11 animals selected from the group, from day 21 to 40. The animals were then kept on the original stock diet having 3.51 kcal/gm caloric density from day 41 to 60. The subjects were then presented with food mixed with 25% groundnut oil (by weight). This attained the caloric density of 4.88 kcal/gm. This feeding schedule was followed from day 61-76. The animals were then again kept on stock diet from day 77 to day 90.

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The remaining 8 rats were kept on stock food having caloric density of 3.51 kcal/gm and water administered *ad lib* from day 1 to day 90.

In all the animals food intake, caloric intake and body weights were recorded each day irrespective of caloric density of food.

RESULTS

Fig. 1 indicates that animals belonging to experimental and control groups exhibited increase in body weight by 15% during the initial normal food intake. When kept on dilution schedule the animals consumed the same quantity of food on the first day but showed improvement in caloric consumption during the subsequent period of 8 to 10 days (30th day). However, this caloric intake was stabilized at a lower level. Body weight on such a diet schedule showed initial biphasic response which was subsequently maintained at lower stabilized levels compared to the steadily increasing body weight pattern of control animals.

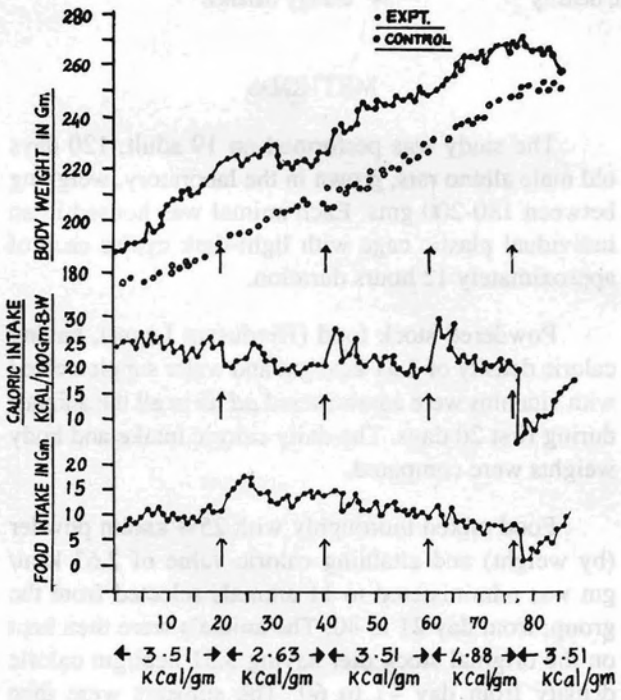

Fig. 1 : Pattern of alteration in Body weight, Caloric intake and food intake on administration of stock, dilute and concentrated food in 11 rats.

The body weights of 8 rats kept on stock diet is displayed with the body weight of the experimental animals.

The X-axis denotes the number of days after the rats attained 120 days of the age and fed with different caloric density diets.

The change of food schedule from dilute to the initial stock diet brought a slight increase in caloric intake on first two days and exhibited alterations for subsequent 8 days (ie upto about 50th day). Food consumption should a trend towards a decrease during the subsequent period upto 60th day. The body weight pattern showed slight increases and decreases corresponding to caloric intake as expected. The body weights exhibited slow and steady increase of about 2% as compared to more rapid growth curve pattern observed in the control animals, during the same period.

Subsequently administration of high caloric density food showed a marked increase of caloric intake on first 2 days but decreased slightly on 3rd and 4th day and increased on the following day. The caloric intake was stabilized on the 5th day and exhibited tendency to decrease during the subsequent period. The body weight increase was steadily maintained during this period with a total increment of approximately 6%.

The animals were then kept on stock diet. There was marked decrease (about 50%) in food intake and similar decrease (70%) in caloric consumption computed for 100 gm body weights on the first day. There was steady increase in caloric consumption during the subsequent 10 days attaining the steady weights on 86th day.

DISCUSSION

The present study shows that on decreasing the caloric density of food, the rats are unable to adjust the energy intake promptly during the initial period. It takes about 10 days to stabilize their caloric intake. However, this stabilization is at a lower level compared to the animals consuming diet of normal standard caloric density. This in turn reflects in alterations of body weight, which exhibited biphasic responses initially and later maintained their growth at a lower stabilized level.

On increasing the caloric value of the food, the animals did not adjust the energy intake promptly but took about 5 days to stabilize the caloric intake, which

initially affected the maintainance of normal body weight.

The present work does not confirm with the earlier report that changes in caloric density of food lead to rapid and complete caloric readjustments (14,15,16,17, 18), as the animals under the present study took about 5 to 10 days to stabilize their caloric intake.

It thus appears that the regulatory mechanism of food intake in albino rats is not so perfect as is generally beleived to be, and that it would be erroneous to alter the caloric value and anticipate that the animal would adjust and regulate the energy balance within 2-3 days.

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