EFFECT OF A CARIES-INDUCING DIET ON DYNAMIC ENDURANCE

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Experiments on Wistar rats have shown that caries-inducing diets (Sharpenak, Stephan, and Tamura) always considerably reduce dynamic working capacity. The diets of Hoppert and Begel'man caused virtually no decrease in the dynamic working capacity of rats.

Ability to do muscular work is reduced by unfavorable environmental conditions. Among other environmental factors affecting ability to do muscular work, the composition and character of the food has been mentioned [16, 17]. Studies of the effect of individual food constituents on the state of the body and ability to do muscular work [4, 11, 15] have demonstrated the adverse effect of food deficient in protein [3].

Diets deficient in protein and containing an excess of purified and unpurified carbohydrates have been used for the production of experimental caries [1, 5, 14, 18, 19]. Changes in the state of the vital organs and systems of animals kept on a caries-inducing diet have been described [2, 8, 10].

Data concerning the effect of various caries-inducing diets on dynamic endurance in animals are described below.

EXPERIMENTAL METHOD AND RESULTS

Changes in tone of the voluntary muscles were studied by the "revolving rod" method [13]. The state of the animals' skeletal musculature was assessed from the ability of the animals to stay for a given time on a rod revolving at a speed of 8 rpm.

Experiments were carried out on 120 Wistar albino rats receiving various caries-inducing diets and accordingly divided into six groups. Each group consisted of 20 rats. The animals of group 1 (control) received a normal diet. The animals of group 2 received Hoppert's diet: cornflour (60%), powdered milk (30%), linseed flour (6%), wheat flour (3%), 1% sodium chloride solution; rats of group 3 received Begel'man's diet: sucrose (54%), casein (18.5%), powdered wheat bread (18.5%), vegetable oil (5%), mixed salts (4%), and polyvitamins (1 tablet per 100 g diet). The rats of group 4 were kept on Sharpenak's diet: wheat (50%), sugar (32%), vegetable oil (15%), 3% sodium chloride solution; the rats of group 5 received Stephan's diet: sucrose (66%), powdered milk (32%), dry liver concentrate (2%); the rats of group 6 received Tamura's diet: carbohydrate (64%), casein (20%), fat (10%), salt mixture (5%), choline chloride (0.5%), vitamin solution (0.5%). Animals weighing 61-136 g were used in the experiments.

Ability to do muscular work by animals kept on the various diets was determined after training for 1 and 30 days. Before training began, the animals received the various diets for 120 days. The results were subjected to statistical analysis [7].

The experimental results (Table 1) show that all caries-inducing diets studied reduce the dynamic endurance of the experimental animals to a varying degree. The index of working capacity of the rats receiving Sharpenak's, Stephan's, and Tamura's diets (groups 4, 5, and 6) differed significantly from the corresponding index of the animals of the control group. The time during which the animals receiving Hoppert's and

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TABLE 1. Weight and Ability to Do Muscular Work of Rats Kept on Various Diets (M ± m)

Group	Caries-inducing diet	1st day of experiment		Last (30th) day of experiment		
		body wt. (in g)	duration of work (in min)	body wt. (in g)	duration of work (in min)	P
1	Control	136±3,8	11±1,0	182±6,6	99±10,0	—
2	Hoppert's	80±2,4	10±0,8	104±3,3	86±10,0	>0,2
3	Begel'man's	73±3,0	7±0,8	92±3,9	84±10,0	>0,2
4	Sharpenak's	61±2,2	3±0,2	73±3,0	71±7,9	<0,001
5	Stephan's	87±3,9	4±0,9	101±4,7	69±8,6	<0,001
6	Tamura's	83±2,8	3±0,7	94±1,8	50±4,0	<0,001

Begel'man's diets (groups 2 and 3) were able to remain on the rod was only slightly less than that for animals of the control group. After training for 30 days, animals of all groups were able to remain on the rod for a significantly longer time. This is in agreement with the observations of Rylova [9], who found that training increases the maximum duration of this type of work up to 2-4 h, whereas during the first days of training the time did not exceed a few minutes.

The observed differences in the ability of animals of the different groups to do muscular work correlate with the dynamics of their gain in weight. For instance, despite significant retardation in growth of the animals kept on the caries-inducing diets, the time during which they remained on the rod increased by 8.6-23 times, whereas this index in the rats of the control group increased by only 9 times. Statistical analysis gave a coefficient of correlation ($r = -0.77$) reflecting a significant ($P < 0.001$) inverse relationship between the indices of dynamic working capacity and gain in weight. Some explanation of this fact may be obtained from the work of Comfort [12], who showed that an unbalanced diet, although adversely affecting certain physiological indices (weight, height, etc.) has no inhibitory action on the activity of animals. This may account for the relative increase in dynamic endurance of the animals kept on caries-inducing diets in the present experiments.

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