

# EFFECT OF A GROWTH-INHIBITING DIET ON CONNECTIVE TISSUE OF THE SKIN IN ALBINO RATS OF DIFFERENT AGES

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The collagen content in the skin of albino rats rises on the average by 29% by the age of 12 months, thereafter remaining constant.

The hexosamine content falls by 21% by the age of 3 months, and also remains unchanged thereafter. A growth-inhibiting diet (deficient in calorific value) has no effect on the collagen and hexosamine content in the skin of albino rats.

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Considerable changes in the quantitative content of collagen, procollagen, elastin, and ground substance of the connective tissue take place with age [1, 3]. Loss of ground substance by the tissues as old age approaches leads to disturbances of their permeability and adversely affects their metabolism [6, 8].

The object of this investigation was to study age changes in the content of collagen, the main connective tissue protein, and of hexosamine, a component of the ground substance, and to examine the effect of a growth-inhibiting diet on these indices.

Such a diet produces changes in many different indices: metabolism, state of the endocrine glands, etc. [2, 5]. For that reason the study of the state of the connective tissue in animals with inhibition of growth is of definite interest.

## EXPERIMENTAL METHOD AND RESULTS

Experiments were carried out on albino rats aged 3, 12, and 24 months. Rats aged 1, 3, 12, and 24 months acted as controls. The collagen content was determined by the method of McFarlane and Guest [9] and the hexosamine content by Smits' method [10].

Figures showing changes in the collagen content in animals under normal conditions and when kept on a diet deficient in calorific value are given in Table 1.

The collagen content increased with age, especially from 1 to 3 months, when it rose by 19.31%; from 3 to 12 months some increase continued to take place (by 9.52%), but after 12 months the collagen content showed no further change until old age. Hence, the total content of collagen in the skin increased with age on the average by 30%, in agreement with results obtained by another method [1] and also with results obtained by other workers [6-8].

In rats with inhibition of growth no difference in the collagen content of the skin compared with normal animals was observed.

Results showing changes in the hexosamine content of the connective tissue are summarized in Table 2. They show that the hexosamine content fell by 21% until the age of 3 months, thereafter remaining practically constant until old age. No abnormality was observed in the experimental animals.

With age, therefore, there is an accumulation of the connective-tissue protein collagen, accompanied by a decrease in the hexosamine content. This correlates with the results of other investigations [11].

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TABLE 1. Effect of Growth-Inhibiting Diet on Collagen Content of Skin of Albino Rats at Different Ages (in mg/g dry tissue)

Age (in months)	Control			Experiment		
	collagen content	increase as percent of value at preceding age	P when A = 2.11	collagen content	increase as percent of value at preceding age	P when A = 2.086
3	403.29					
1	481.17	19.31	8.42	487.88		
12	526.97	9.52	3.50	523.54	7.04	2.43
24	525.78	0.0	0.0	531.07	0.0	0.0

Legend: here and in Table 2, P denotes significance of difference found in experiment; A minimal value of significance of difference as determined by Student's method [4].

TABLE 2. Effect of Growth-Inhibiting Diet on Hexosamine Content of Skin of Albino Rats at Different Ages (in mg/g dry tissue)

Age (in months)	Control			Experiment
	hexosamine	change relative to previous age, in percent	P when A = 2.091	hexosamine
1	6.793			
3	5.370	-21.00	3.445	5.607
12	5.277	-1.8	0.0	5.415
24	5.618	+6.4	0.0	5.403

TABLE 3. Hexosamine/Collagen Ratio ( $\times 10^{-3}$ ) under Normal Conditions and in Animals on Growth-Inhibiting Diet

Age	1 month	3 months	12 months	24 months
Control	16.08	11.15	10.01	10.68
Experiment	-	11.08	10.34	10.17

To assess the loss of ground substance by the connective tissue with age, the hexosamine/collagen ratio was calculated. The results obtained are given in Table 3.

With age, as Table 3 shows, the content of ground substance in the connective tissue falls considerably.

With respect to the indices investigated, a growth-inhibiting diet thus had no effect on the typical relationships of development of the normal (control) animals with age.

In all probability some differences exist in the skin of albino rats with inhibited growth and normal aging animals. This is suggested by a number of features distinguishing the experimental animals from the controls: the thick, softer, and lighter hair, even in old rats, compared with the thin, coarse, yellowish hair of normal rats at the age of 24 months. In addition, in the elasticity and thickness of the skin the experimental animals appeared much "younger" than the controls. Clearly different indices of the state of the connective tissue must be chosen to determine the causes of these differences.

Changes in the total content of ground substance of the connective tissue cannot give a complete picture of the trend of processes taking place in it during aging and in the course of exposure of the animal to various influences.

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