

## THE EFFECT OF THYMECTOMY AND SPLENECTOMY UPON THE ACTIVITY OF CERTAIN ENZYMES IN THE AORTA OF WHITE ALBINO RATS

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The relationship existing between atherosclerotic processes and changes in the cholesterol content of the vascular wall and in the enzymes, regulating these processes, has been studied by numerous investigators (Miller and assoc., Leites, Portman and Alexander, Klimov and Lovjanina, Isachenko, Garbuzov and assoc., Zemplyeni and assoc., Marhova and assoc.). The data reported by Pansky and assoc., concerning the effect of the thymus upon the carbohydrate metabolism processes and our personal data about the influence of thymectomy upon the cholesterol content in the aortic wall warrant the assumption that the thymus does exert an influence also upon enzymic processes. It is interesting to find out whether this effect is related to the immune capabilities of the thymus, which are altered in postnatal thymectomy, or else, it is manifested independently of them in the later periods of life. It has neither been clarified hitherto, whether this effect of the thymus is related to the characteristic features of a lymphatic organ, or other factors exist conditioning this influence.

Proceeding from the background thus outlined, we assumed the task to trace the activity changes of 5'nucleotidase and adenylypyrophosphatase (adenosinetriphosphatase) within the aortic wall of rats, thymectomized at the age of 15 days. Investigations were also carried out on a series of splenectomized animals, aged 15 days, in order to prove whether these changes are conditioned by the lymphatic character of the said gland or by some other factor.

### Material and Method

The experiments were carried out on a series comprising 77 unbred white rats, distributed into three groups: the animals of the first group were subjected to thymectomy at the age of 15 days; the second group — splenectomized, similarly at the age of 15 days and the third group — control animals of the same age group. The animals were sacrificed on the 30th, 50th and 70th day after the operative intervention or — on the 45th, 65th and 85th day of life with the chief goal to follow-up the alteration of enzymatic activity with the growth of the animals. After killing through exsanguination, the entire aorta was used for determination of the 5'nucleotidase activity after the method of Ahmed and Reis (1958) and the adenylypyrophosphatase — after the method of Banga and Novotni, as modified by Zemplyeni and assoc. (1962). Determination of the protein nitrogen was made according to Lowry (1951).

### Results and Discussion

The adenylypyrophosphatase (adenosinetriphosphatase) activity in the control animals (Diagram 1) reveals no alterations whatsoever, determined by the age of the animals. The nature of the activity of this enzyme appears to be quite different in thymectomized animals. At the age of 45 days, the values are very near to those in the control animals of the same age-group.

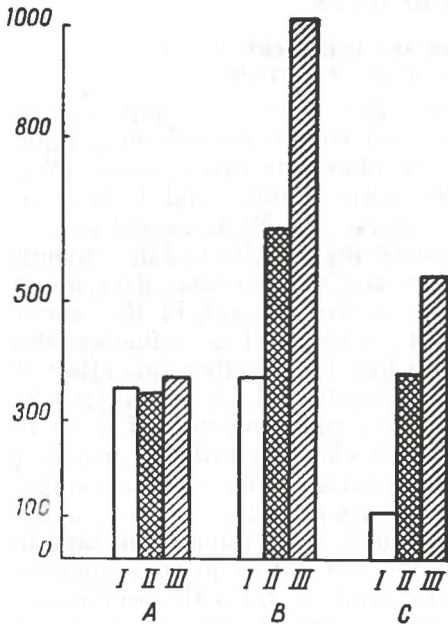


Diagram 1. Changes in the adenosinetriphosphatase activity  
 a) controls; b) thymectomized and c) splenectomized. I group — aged 45 days, II — 65 days and III — 85 days.

However, with aging the enzymatic activity is substantially enhanced and at the age of 85 days it is triple as compared to the initial level on one hand, and in comparison with the control animals, on the other. This fact demonstrates the great influence exerted by thymectomy upon the adenosinetriphosphatase activity. Bearing in mind that this enzyme participates in the splitting of adenosinetriphosphate (ATP), the inference might be reached that thymectomy, carried out on the 15th day of life accounts for intensification of the metabolism of substances within the aortic wall. It is well known from literature reports on the problem (Miller, 1963, 1963 a, Comsa, 1959) that thymectomy, performed 48 hours after the birth of the rats does not cause wasting-syndrome and by no means leads to changes of the immunologic capacities of the organism. This finding warrants the assumption that the changes in the substance metabolism induced within the aortic wall are not dependent on the factor responsible for the wasting-syndrome or regulating the immunologic reactivity of the organism. Probably, an additional factor is concerned, influencing the metabolic processes in rather advanced age. The nature of the adenylypyrophosphatase activity alterations does not warrant the accepting of a relationship existing between the changes observed and the lymphoid structure of the thymus gland. The activity of the enzyme in splenectomized rats at the age of 45 days is very low (Diagram 1). This could be explained with certain changes, taking place within the organism and ensuing the comparatively severe operative intervention, such as splenectomy. In the 65-day-old animals, the activity is levelled with that in the controls of the same age. At 85-day age, the level is higher as compared to that in the control animals of the same age, but twice as lower as that in thymectomized animals.

The results of the investigation on the 5'nucleotidase activity within the aortic wall are analogical. The fact that the values for all three groups of animals differ merely insofar the 85-day age-group is concerned is chara-



cteristic for the changes in the activity of this enzyme: the highest activity is established in thymectomized (0.494), in splenectomized it is lower (0.402) and lowest in the control animals (0.290).

It is evident from the data herein reported, that thymectomy and splenectomy, carried out at the age of 15 days, exert a continuous effect upon the adult organism and account for alteration of the characteristics of the adenylypyrophosphatase and 5'nucleotidase activity within the aortic wall. It is obvious that this effect could be hardly associated to the factor determining the thymus as an important regulating organ of immunologic responsiveness of the organism, for it is chiefly manifested in neonatally thymectomized animals in which the immunologic reactivity is restored up to a great extent with aging. It is moreover, rather difficult to connect this action of the thymus with the qualities of a primarily lymphatic organ, such as have been ascribed to it by some authors (Miller, 1963). It is probable that it exerts a general effect on the metabolic processes by way of the enzymatic reactions, similarly to the effect exerted upon the carbohydrate metabolism (Pansky, 1965). The differences established in the changes of the enzymic activity of the various groups of thymectomized and splenectomized animals are indicative of the substantially weaker effect exerted by splenectomy over the same processes. It is presumable that the latter finding might be accounted for by thymus cellular elements or factors present in the spleen (Miller, 1963).

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## ВОЗДЕЙСТВИЕ ТИМЭКТОМИИ И СПЛЕНЭКТОМИИ НА АКТИВНОСТЬ НЕКОТОРЫХ ЭНЗИМОВ В АОРТЕ БЕЛЫХ КРЫС

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### РЕЗЮМЕ

Прослежены изменения в активности 5'-нуклеотидазы и аденилпирофосфатазы в стенке аорты у белых крыс, которые были тимэктомированы в возрасте 15 дней. Полученные при биохимическом исследовании результаты, сравнены с данными, полученными на спленэктомированных, в возрасте в 15 дней, крысах и таковыми — на интактных животных. В целях прослеживания динамики изменений, животные из всех трех групп убивались на 30-ый, 50-ый и 70-ый день после оперативного вмешательства (в возрасте 45, 65 и 85 дней).

Аденилпирофосфатазная активность интактных животных не изменяется в зависимости от возраста. У тимэктомированных животных активность этого энзима в возрасте в 45 дней такая же как у контрольных животных, однако с увеличением возраста — нарастает, причем в 85-дневном возрасте является в 3 раза более высокой, в сравнении с таковой у контрольных животных того же возраста. У спленэктомированных в возрасте в 45 дней, активность гораздо ниже, а в возрасте в 85 дней увеличена, однако значительно меньше, чем у тимэктомированных.

В активности 5'-нуклеотидазы наблюдаются различия только в результатах 85-дневного возраста — у тимэктомированных крыс активность является самой высокой, а у контрольных — самой низкой.

Из полученных результатов видно, что тимэктомия и спленэктомия, произведенные в 15-дневном возрасте, оказывают длительное воздействие на организм и изменяют активность исследованных энзимов. При этом воздействие спленэктомии является значительно более слабым, чем воздействие тимэктомии.