Effect of Thymectomy on Lipoprotein Lipase Activity in the Serum and the Heart of Rats

The long-standing clinical observation that thrombotic episodes and atherosclerosis are more frequent in the aged than in the young is now supported by experimental evidence of a lower serum heparin level in the former than in the latter[1,2], and of a decline with age in the lipoprotein lipase activity in rat tissue[3]. Heparin is known to increase the activity of the lipoprotein lipase present in the circulation and to produce changes in the lipolytic activity in the individual organs[4–8]. On these grounds it appears reasonable to assume the existence of a correlation between the decrease with age in the heparin-lipoprotein-lipase system and age-dependent involution of the thymus gland.

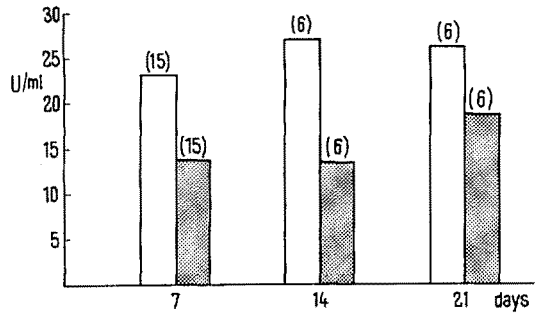
In one half of a group of 54 female Wistar strain rats weighing 100 ± 10 g, the thymus gland was removed, and in the other half sham-thymectomy performed. After they had been starved for 20 h, the animals in both groups were killed by decapitation in three lots on the 7th, 14th, and 21st day following operation. Each blood was defibrinated by stirring and the serum separated by centrifugation. Each heart was promptly removed, washed with saline, homogenized in acetone cooled to −10°C, and dried at −10°C. In both the serum and the ammoniated heart muscle extract obtained by KORN's method[7], lipoprotein lipase activity was determined on coconut substrate (Ediol) activated with fresh human serum[9]. As unity (U) was taken the amount of enzyme which released 1 *M* glycerin in 60 min at pH 8.2 and 37°C.

Enzyme activity was determined separately in each serum, and in the pooled acetone powders of four hearts each. The activity measured in the heart was referred to 50 mg of acetone powder, for the quantity of powder obtained from the individual hearts varied between 40 and 60 mg.

The Figure illustrates the effect of thymectomy on serum lipoprotein lipase activity. It shows this activity to decrease as early as the 7th day after operation: against 22.2 ± 1.3 in the sham-thymectomized rats stand 13.6 ± 1.4 U/ml; the difference is statistically significant ($p < 0.01$). On the 14th day 26.2 ± 0.8 stand against 13.4 ± 1.3 U/ml; the difference is still more significant ($p < 0.01$). Even on the 21st day a serum enzyme activity of 18.0 ± 0.6 U/ml in the thymectomized rats contrasted considerably with 25.6 ± 0.7 U/ml in the sham-thymectomized control animals ($p < 0.01$).

In the hearts of these animals the lipoprotein lipase activity showed a decrease in the operated rats as compared with the sham-operated animals: the overall average activity was 14.2 ± 1.6 U/50 mg in the former and 21.4 ± 2.1 U/50 mg in the latter. The difference is statistically significant ($p < 0.01$). Overall average values only are stated because no appreciable differences were found to have occurred with time.

In evaluating these findings it seems safe to claim that thymus gland is capable of influencing the activity of the lipoprotein lipase present in the circulation as well as that bound to the organ (heart). The decrease in activity, observed to occur in the absence of the thymus, suggests a role for the gland in the changes of the enzyme with age. A suggestion of this kind accord well with the recent finding that compared with a variety of animal species the serum lipoprotein lipase activity is highest in the rat[10], which possesses a relatively large-sized and persistent thymus gland.



Effect of thymectomy on serum lipoprotein lipase in the rat.
☐ sham-thymectomized ▨ thymectomized
Number in brackets on top of column indicates number of determinations.

Zusammenfassung. Entfernung der Thymusdrüse führt zu einer Abnahme des Gehaltes an Lipoprotein-Lipase in Serum und Herzmuskel der Ratte. Die Veränderung wird im Verlaufe der ersten 3 postoperativen Wochen als signifikant betrachtet.

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