37) Effect of Voluntary Exercise on Resting Blood Pressure and Heart Rate in Rats.

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In order to explore the possibility that voluntary exercise can be used as a therapeutic model for decreasing hypertension in spontaneously hypertensive rats (SHR), the rats were exercised in a running wheel.

MATERIALS AND METHODS:

Three-month old naive, male SHR were divided into 3 groups of 6 rats each. Group in A: Exercise in the running wheel in the dark (10 p.m. - 10 a.m.) and put in the home cage in the light (10 a.m. - 10 p.m.) for 10 days. Group in B: Exercise in the dark only every other day - i.e., only five running periods in 10 days - otherwise as in Group A. Every nocturnal 12 hours exercise in running wheel and lighting day 12 hours in home cages for 10 days. Group B: every other nocturnal exercise for 10 day, i.e. five times run in night, and other time in home cages. Group in C: home cage all the time for 10 days.

Blood pressure and heart rate were measured at the end of each 12-hour period. Both the blood pressure and the heart rate were measured by the tail cuff method after the rats had warmed up to 37 C.

Brain catecholamine contents of the three groups were measured by high performance liquid chromatography electrochemical detector after the running experiment. The regions of the brain were the diencephalon and pons plus medulla oblongata (P + MO) which contain the nucleus tractus solitarius, which is considered to regulate the blood pressure and the heart rate.

RESULTS:

Group A: the blood pressure was 200 mm Hg at the pre-exercise stage. After running, the blood pressure decreased to 170 mm Hg for 5 days, and then increased again to more than 200 mm Hg at the 7th day, even during running periods. During the post-exercise period, the blood pressure increased remarkably to more than 220 mm Hg. On the other hand, the heart rate was markedly decreased during the 10-day running period, and increased again afterwards.

Group B: the blood pressure decreased as in Group A, whereas the heart rate did not decrease so remarkably.

Norepinephrine (NE) and dopamine (DA) contents were highest in the diencephalon in Group A, but there was no change in P + MO.

DISCUSSION:

Interesting was the decrease in the blood pressure and the heart rate in SHR during running. The reason for this remarkable decrease is unknown. One possible explanation reason is that some catecholaminergic changes in the central and peripheral nervous system take place.

It is possible that in SHR the activity of catecholaminergic neurons is accelerated at various points during the nocturnal running periods, and that the resulting catecholamine changes cause the observed decrease in the blood pressure and the heart rate.