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MEETING ABSTRACT

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Effects of risk-factor clustering on baroreflex sensitivity and blood pressure variability in borderline hypertensive rats

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Background: Primary hypertension is a common disease of unknown etiology, which strikes over a billion people worldwide. Numerous factors have been established to increase the risk of developing this condition. The aim of this study was to investigate the effects of stress, salt loading and genetic predisposition on neurogenic cardiovascular control, implicated in the pathogenesis of hypertension. For this purpose, experiments were conducted in borderline hypertensive rats (BHR) with family history of hypertension.

Methods: Experiments were performed in twelve-weeks old BHRs equipped with a radiotelemetry device for direct blood pressure (BP) recording. Animals were randomized in three experimental groups and monitored for 15 weeks: the first group (control) included BHRs recorded under baseline physiological conditions (genetic predisposition; risk factor 1); the second group of animals was salt-loaded with 0.9 % saline solution (risk factors 1+2); the third group of BHRs was salt-loaded and exposed to combined environmental stress models in two time blocks: shaker stress plus crowding stress, then isolation stress plus air-jet stress plus tilt stress (risk factors 1+2+3). Arterial BP was digitalized at 1000 Hz and analyzed in Dataquest A.R.T. 4.0 software (Transoma Medical, Data Science International, USA). Autonomic cardiovascular control was assessed by spectral analysis of systolic BP (SBP), diastolic BP (DBP) and heart rate (HR). Evaluation of spontaneous baroreflex sensitivity (BRS) was done by the sequence method.

Results: Control BHRs displayed higher values of BP, but still in the normotensive range, and no change in BP variability. In these rats HR was lower than in other groups, no alternation in HR variability was noted, while BRS sporadically increased. Salt-loaded BHRs exhibited BP levels comparable to the control BHRs, and lower SBP variability. HR also decreased over time and maintained low for 15 weeks. No change in HR variability was found. BRS was increased and the increase persisted during the follow-up period. Salt-loaded plus stressed BHRs exhibited overt hypertension. However, changes in BP variability were inconsistent. Both HR (decrease) and BRS (increase) were altered, with no change in HR variability.

Discussion: The present results show that rats genetically predisposed to hypertension exhibit periodical increases in BRS suggesting that the baroreflex responds to slight elevation of BP, through the engagement of the vagus nerve, which leads to lower HR values. Addition of salt loading to BRS unveiled that it is stimulus enough to trigger long-term changes of BRS in genetically predisposed animals. At this point, the baroreflex can still maintain BP in the normal range. Decrease in BP variability in these rats confirms a buffering effect of the baroreflex on BP. Adding environmental stress to salt loading in BHRs leads to overload of autonomic mechanisms which results in a notable BP increase. Occasional changes in BRS and of the HR observed in these rats suggest that the baroreflex is still trying to overcome the disruption of homeostasis.

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