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Elucidation of Mechanisms Involved in Acquisition of Salt Sensitivity and Baroreflex Failure in Pressure Overload Via Heart-Brain Communication

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Summary

Hypertensive heart disease leads to heart failure associated with sympathetic activation. We have previously shown that pressure overload acquires salt sensitivity and that cardiac sympathetic afferent reflex is enhanced via brain inflammation. In the present study, to determine the mechanism involved in the heart and brain communication, we examined expression levels of transient receptor potential vanilloid 1 (TRPV1) in the heart and brain derived neurotrophic factor (BDNF) in the nucleus tractus (NTS) within the brain in mice with pressure overload. In C57BL/6J mice, we performed aortic banding at upper portion of the abdominal aorta. Western blot analysis was performed to examine protein expression levels of TRPV1 and BDNF. At 8 weeks after aortic banding, we found that expression levels of TRPV1 in the heart and BDNF in the NTS of the brain were increased in mice with aortic banding (AB) compared with mice with sham treatment (Sham). Epicardial application of capsaicin was used to stimulate the cardiac afferents, which caused enhanced the pressor response in AB mice compared with Sham mice. In addition, epicardial application of resinferatoxin (RTX) attenuated the progression of cardiac hypertrophy in AB mice. Furthermore, in TRPV1 knockout mice, the progression of cardiac hypertrophy was markedly attenuated compared with wild type mice associated with the decreased expression level of BDNF in the NTS of the brain. These results suggest that in mice with pressure overload, cardiac TRPV1 stimulation that causes cardiac sympathetic afferent reflex was closely linked with the BDNF expression in the NTS of the brain which plays a key role in the baroreceptor reflex function.