Neural NO-mediated Super-suppression of Sympathetic Outflow in Dahl Salt Hypertensive Rats.

Yasuhiro Nishida[1], Megumi Tandai-Hiruma[1], Chen Qing Hui[2]

[1]National Defense Medical College, Department of Physiology,
[2]University of Texas Health Science Center at San Antonio, Department of Physiology.

Summary

Histochemical studies have shown a widespread distribution of nitric oxide synthase (NOS) in the brain. Systemic inhibition of NOS activity stimulates sympathetic outflow in baroreceptor-denervated animals, which is counteracted with pressor effect-elicited baroreflex in intact animals. On the other hand, Dahl salt-sensitive rats have been reported to have dysfunction in the L-arginine-nitric oxide (NO) system. We then investigated the effects of 7-nitroindazole, an inhibitor of neural NOS, on sympathetic outflow in Dahl rats.

Methods: Dahl salt-sensitive (DS) and -resistant (DR) rats were fed a regular salt (0.4% NaCl) or a high salt (8% NaCl) diet for 4 weeks. Using conscious rats instrumented chronically, renal sympathetic nerve activity (RSNA) was measured in both baroreceptor (BR)-loaded and -unloaded states. The BR unload was performed by decreasing arterial pressure with occlusion of the inferior vena cava.

Results: The neural NOS inhibitor increased resting RSNA from 24 ± 3 % to 38 ± 6 % with an increase of mean arterial pressure by 15 ± 3 mmHg and BR-unloaded RSNA from 100 % to 278 ± 16 % in high salt-DS rats (n=9). However, the inhibitor did not increase resting RSNA in other rat-groups but increased BR-unloaded RSNA from 100 % to 179 ± 15 %, 177 ± 15 %, or 133 ± 4 % in regular salt-DS (n=8), high salt-DR (n=8), or regular salt-DR rats (n=9), respectively. High salt diet significantly furthermore increased the BR-unloaded RSNA than regular salt diet did in Dahl rats. A vehicle of the inhibitor did not show any effect in each group of rats. After vehicle, L-arginine (100 μmole/kg/min for 10 min) decreased both resting and unloaded RSNA in just high salt-DS rats. After the inhibitor, the L-arginine did not show any effect on resting or unloaded RSNA in each rat-goup.

Conclusion: Neural NO may suppress sympathetic outflow even in normal diet or salt-resistant rats. This neural NO-medicated regulation of sympathetic outflow may markedly enhanced by salt load in Dahl rats. These findings suggest that neural NO may super-suppress sympathetic outflow in Dahl salt hypertensive rats.