39) Hemodynamic Changes to Acute Stress with Pulsed Doppler Flowmetry in Conscious Rat Kenkin Suzuki, Hiroshi Kawamura, Masahiro Maki, Hideaki Higashi, Kazuyoshi Tsukamoto, Kazutoshi Komatsu, Keiji Hara, Hiromi Mitsubayashi, Hiroaki Tomori, Satoru Itoh, Mizuo Miyagawa, Takashi Miyawaki, Yuji Naruse and Michinobu Hatano. 2nd Department of Internal Medicine, Nihon University School of Medicine, Itabashi-ku, Tokyo 173, Japan.

Previously the microsphere method and electromagnetic flowmetry have been extensively used for measurement of cardiac output and vascular resistance in conscious freely moving rats. However, it's technical difficulties and bulky size of flow probes have sometimes impeded normal blood flow and easy flowmetry. Recently, a pulsed Doppler flow meter has been developed which enables us to implant the miniaturized probes in rats. With this probe, the present experiment was performed to study changes in hemodynamics and plasma catecholamines to acute stress in conscious rats.

Female spontaneously hypertensive rats (SHR) (20 weeks old) and age sex matched Wistar-Kyoto rats (WKY) were intubated, anesthetized with mixed gas (halothane and N_2O) and artificially ventilated. Subsequently, the chest was opened at the second right intercostal space and flow probe was implanted around ascending aorta. A polyethylene catheter filled with saline was placed in the right femoral artery and stimulating electrode was attached to the muscle of hind limb. After 4 days of post operative recovery, electrical foot-shocks (50 Hz, 2.5 mA, 10 sec) were given to conscious rats and hemodynamic changes were monitored. Simultaneously, blood samples were obtained from rats at rest and during foot-shock periods, and plasma catecholamines were assayed using high performance liquid chromatography (HPLC). Pressor threshold (systolic pressure increase of 10 mmHg) current was also determined.

Prestimulatory mean arterial pressure (MAP) and total peripheral resistance (TPR) were significantly greater in SHR than in WKY (MAP: 140 ± 5 vs. 110 ± 3 mmHg, TPR: 22.3 ± 5.7 Hz vs. 14.6 ± 1.0 mmHg/kHz; $p < 0.01$, respectively). However, heart rate (HR), cardiac output (CO) and stroke volume (SV) were not different between both strains (HR: SHR, 370 ± 19 vs. WKY, 401 ± 14 beats/min, CO: SHR, 6.6 ± 0.6 vs. WKY, 7.7 ± 0.5 kHz, SV: SHR, 0.018 ± 0.002 vs. WKY, 0.019 ± 0.001 kHz; n.s., respectively). During the foot-shock periods, MAP, HR and TPR increased significantly from the base-line in both strains ($p < 0.01$). The increments in MAP and HR were tended to be greater for SHR compared with WKY. However, SV decrease significantly from the base-line in both strains ($p < 0.05$). This decremental response of SV was tended to be greater for WKY compared with SHR. CO in SHR gradually increased from the base-line, whereas CO in WKY decreased at the early period of foot-shock, and then increased. Pressor threshold current was greater in SHR than in WKY (0.88 ± 0.08 vs. 0.61 ± 0.10 mA; $p < 0.05$). Although plasma norepinephrine concentrations were not different between SHR and WKY during resting period (SHR: 583 ± 67 vs. WKY: 455 ± 29 pg/ml; n.s.), The increment of plasma norepinephrine concentration in responses to foot-shock was significantly greater in SHR than in WKY (SHR: 2411 ± 333 vs. WKY: 1153 ± 222 pg/ml; $p < 0.02$).

These data suggest that the cardiovascular responses to electrical foot-shock evoked sympathoadrenal stimulation was greater in SHR than in WKY, and that the decreases in CO and SV for WKY at the early phase of the foot-shock may indicate the different response pattern of preload between both strain.