47) Tail Vasodilation of Spontaneously Hypertensive Rat (SHR) and Stroke-prone SHR (SHR-SP) during Heat Stress. Katsuhiko Tsuchiya, Mitsuo Kosaka, *Masami Niwa, and *Masayori Ozaki. Department of Environmental Physiology, Institute for Tropical Medicine, Nagasaki University and *Department of Pharmacology, Nagasaki University Medical School, Nagasaki 852.

Introduction: It is known that the core temperature of SHR is maintained at a higher level than in the normotensive rat and that SHR is susceptible to the environmental heat stress. The interactions between the vasomotor mechanism and the temperature regulation are interesting, but it is not fully clarified. And there is little information about the temperature regulation in SHR-SP. We compared the thermoregulatory mechanisms in three groups of rats; Wistar-Kyoto (WKY), spontaneously hypertensive rat (SHR) and stroke-prone (SHR-SP). Each of them have distinctly different blood pressure.

Method: Thirty male rats of 10 months old were used, which had been reared with ad libitum food and water in the room of 25°C. Mean values ($M \pm S.E.$, $N=9$) of blood pressure measured by the tail-cuff method were 149 ± 5 mmHg, 185 ± 6 mmHg and 237 ± 8 mmHg, heart rate were 419 ± 14 beats/min, 421 ± 13 beats/min and 376 ± 12 beats/min, body weight were 393 ± 21 g, 363 ± 12 g and 317 ± 10 g in WKY, SHR and SHR-SP, respectively. For recording of rectal and tail skin temperatures by means of thermistor probes in conscious condition, rat was individually put into a wire-meshed small cage (5 cm X 6 cm X 15 cm) in the cabinet of which temperature was controlled.

Results: A) Measurement during heat stress by increasing air temperature. Air temperature was raised from 23°C to 33°C at the constant rate of 0.3°C/min. During heat stress, rectal temperature gradually increased and then a sudden increase of the tail skin temperature occurred due to the tail vasodilation, followed by a slight decrease of rectal temperature. These vasodilations occurred stepwise and the tail skin temperature finally reached at the maximal level. It is well known that the tail is an important organ for heat loss in the rat. And this heat loss response by tail vasodilation is triggered by both peripheral and central thermal inputs. If these rats of three groups have different threshold temperatures for the tail vasodilation, different rectal temperatures should be obtained at the onset of it. For this reason during heat stress, rectal and air temperatures were evaluated at the several distinct onsets of vasodilation in the three groups. Mean values of rectal temperature at onsets of tail vasodilation ($N=7$) were $38.0 \pm 0.1^\circ\text{C}$, $38.8 \pm 0.1^\circ\text{C}$ and $38.2 \pm 0.1^\circ\text{C}$, respectively. This rectal temperature in SHR is higher than that in WKY. This difference is statistically significant ($p < 0.05$). Mean values of air temperature at onset of the vasodilation were $29.0 \pm 0.4^\circ\text{C}$, $31.9 \pm 0.8^\circ\text{C}$ and $32.0 \pm 0.5^\circ\text{C}$ in WKY, SHR and SHR-SP, respectively. Air temperature for the vasodilation in SHR and SHR-SP were significantly higher than that in WKY.

B) Measurement in the constant ambient air temperature. Rats of three groups were exposed to the constant air temperature of the following three steps; 24°C, 27°C and 30°C. At 30°C, continuous tail skin vasodilation was observed in all three groups, while the tail vasodilation was observed only in WKY in 27°C and it was not observed in any group at 24°C. Mean rectal temperatures of each group ($N=4$) evaluated at every 10 min for 60 min in three steps of air temperature were $38.1 \pm 0.1^\circ\text{C}$, $38.8 \pm 0.1^\circ\text{C}$ and $38.0 \pm 0.1^\circ\text{C}$ in WKY, SHR and SHR-SP, respectively.

Summary: 1. In three groups of rats; WKY, SHR and SHR-SP of 10 months old, rectal temperatures in conscious condition were evaluated at onsets of tail vasodilation during heat stress and at constant air temperatures. 2. The tail vasodilation in SHR and SHR-SP were triggered at higher air temperature than in WKY. 3. Rectal temperature of SHR measured both onsets of the tail vasodilation and at constant temperatures were higher than those in WKY and SHR-SP.