Comparison of the Direct and Indirect Measurements for Blood Pressure and Heart Rate in Relation to the External Temperature in 12-month-old SHRSP and WKY. Hideaki Higashino, Katerina Simeonova*, Ivan Lambey* and Aritomo Suzuki. Department of Pharmacology, Kinki University School of Medicine, Osaka 589, Japan, and *Faculty of Medicine, 1431 Sofia, Bulgaria.

The improvement of the equipment to measure the blood pressure in the rat indirectly resulted in the development of SHR, and the study for hypertension using this animal was generalized in the world. Since an indirect method detect the blood pressure using tail artery which works as a radiative vessel, however, the inner pressure and blood flow in the tail artery were markedly influenced by the external and/or body temperature. Recently, the equipments to measure the blood pressure indirectly were improved positively, especially in the photo-detector with a higher sensitivity and the change of determination from a photoplethysmographic method to a volume-oscillometric method. As the results, it has become to be advertised that some instruments possible to detect the pulse and blood pressure without a requirement of heating were produced. We must consider these circumstances once again from the basis, because tail artery is not a trunk vessel but a radiative vessel.

Experiments were carried out on 12-month-old male SHRSP and WKY (n=6-8). The body weights were 330 ± 10 g in SHRSP and 389 ± 11 g in WKY, and the basal rectal temperature were $37.3 \pm 0.2^\circ\text{C}$ in SHRSP and $37.1 \pm 0.2^\circ\text{C}$ in WKY, respectively. Under short pentobarbital/ketamin anesthesia, the rats were chronically instrumented for the direct blood pressure measurement. The animals were kept in Bollman-type restrainer which was readily influenced by the external temperature in a box with a thermostat during the experiment. The blood pressure and the heart rate were measured by the two different methods simultaneously, a direct and an indirect method, with a polygraph (142-8, Sanei) and an indirect blood pressure monitor (TK-370A, UNICOM), respectively. The external temperature regulated in the box was elevated at the rate of 2°C in 3 min from 24°C up to 40°C . Rectal temperature was measured with a thermister, and regional blood flow (RBF) and regional resistance (RR) in the tissue were detected by the microsphere method.

In SHRSP, the heart rates at any external temperature from 24°C to 40°C were measured with a significant correlation between the direct and indirect methods, and the blood pressure was detected in the range of 26°C to 38°C with a significant correlation between the two methods. On the hand, the heart rate and the blood pressure in WKY were measured in the ranges of 28°C to 38°C and 34°C to 38°C , respectively, with a significant correlation between the two methods. Although the heart rate was decreased with the increase of external temperature, the almost stable rates were obtained only in the range of 34°C to 38°C in the both rat groups. The values of blood pressure measured by the direct method were not affected by the external temperature besides the slightly elevated values at 40°C in the both rat groups. However, the values measured below 32°C by the indirect method were significantly lower compared with the values measured by the direct method in WKY. The rectal temperature elevated at the external temperature above 34°C by 0.8 - 1.5°C , and the higher rectal temperature was maintained for the duration of 20-30 min in the both rat groups. The microsphere method clarified the decrease and the increase of RR and RBF of the tail by 45-47% and 52-69%, respectively, in the both rat groups without any change in cardiac output index (CI) and total peripheral resistant index (TPRI), when external temperature elevated by 10°C from 25°C to 35°C .

From these experimental data, it was concluded and recommended that the best way to measure the blood pressure and the heart rate accurately in SHRSP and WKY by the indirect volume-oscillometric method was to warm the rats at 34 - 36°C for 5 min, otherwise we will obtain the wrong data regarding the blood pressure and the heart rate.