The Comparison of Oxidative Enzyme Activity in Skeletal Muscle from Stroke-Prone Spontaneously Hypertensive and Normotensive Rats. Shigehiko Ogoh, Sakiya Yamasaki, Hiroshi Okamoto, Satoshi Fukuda*, and Sadayoshi Taguchi. Graduate School of Human and Environmental Studies, Kyoto University, Kyoto-fu 606. *National Institute of Radiological Sciences, Chiba-ken 263.

Recent studies suggested that skeletal muscle characteristics are changed in hypertension, insulin resistance, and android obesity which frequently coexist.

A slow-to-fast fiber type transition was investigated in the SHR rat before and after the development of hypertension (Bachir-Lamrini, L. B. et al. 1990). Juhlin-Danfelt et al. (1979) pointed out that there were negative correlations between the percentage of type I fibers and mean arterial blood pressure. The structural and histochemical properties of selected muscles were examined in stroke-prone spontaneously hypertensive (SHRSP) and compared with their normotensive Wistar-Kyoto (WKY) counterparts.

[Methods] Twenty four week old, female WKY (n=20, B.W., 238.7 ± 12.3 g) and SHRSP (n=20, B.W., 199.7 ± 9.3 g) were used in this experiment. After pentobarbital anaesthesia (50mg/kg), the soleus muscle of the left hindlimb was dissected out and frozen for subsequent histochemical analysis. Serial transverse sections (10μ m) were cut with a cryostat at -20°C and stained with myofibrillar ATPase (Padykula et al.1955) and for SDH activity (Nachlas et al. 1957). The fiber type distribution and cross-sectional areas of each fiber type were calculated using a digitizer on ATPase-stained sections. Mean SDH activity of a single muscle fiber was determined using computer-assisted image analysis techniques.

[Results and Discussion] Soleus muscle of SHRSP displayed a significant difference in fiber type distribution with a decrease of slow-twitch fibers (SO) and a concomitant increase of fast twitch fibers (FOG) as compared with WKY. This agrees with previously reported data on SHR rats (Bachir-Lamrini et al. 1990). One possible explanation for the fiber transition could be linked to capillarization of the skeletal muscle. It has shown that skeletal muscle can be affected in hypertensive subjects with a capillary rarefaction (Henrich et al. 1988, Prewitt et al. 1982). SO fibers tend to be more highly vascularized than FOG fibers. Zeman et al. (1988) suggested that chronic administration of adrenergic β 2- receptor agonist causes slow-to-fast transition in skeletal muscle fibers. The effects of thyroid hormone on muscle properties have been indicated to be very similar to those reported in SHR rat, increasing the number of fast fibers (Kubista et al. 1971, Nicol et al. 1981). Bachir-Lamrini et al. (1990) suggested that the increased level of plasma catecholamines can be involved as potentially responsible for the histochemical and biochemical alterations observed in SHR. It is likely that the fiber type transition could be partly hormonally induced. In SDH activity, it was displayed that the value of single fiber in SHRSP was lower as compared with WKY. Bassett, Jr. (1994) showed that type I fibers had much greater capillarizations on blood flow for oxidative metabolism. These histochemical differences in muscle fiber type are important in understanding the evidence relating skeletal muscle characteristics to cardiovascular risk factors.