20) Brown Adipose Tissue in SHRSP. Masahiro Ito*, Yosihisa kawase*, Kazuko Shichijo*, Ichiro Sekine*, Sinji Uchida**, Masayori Ozaki**, Katuhiko Tuchiya***. *Department of Pathology, Atomic Disease Institute, **Second Department of Pharmacology, ***Department of Environmental Physiology, Institute of Tropical Medicine, Nagasaki University School of Medicine, Nagasaki 852.

Brown adipose tissue(BAT) plays an important role of regulation of body temperature by nonshivering thermogenesis and is involved in lipid metabolism. This metabolically active tissue is innervated dominantly with sympathetic nerves. In some mammals BAT is well developed in early stage of life. Previously we reported the high concentration of catecholamine in BAT of young aged SHR showing high body temperature. The rectal temperature of SHRSP shows an intermediate value between SHR and WKY under the semi-restraint state (Tuchiya et al.: Jpn Heart J 30, 1989). In this study we examined the morphological changes of BAT in SHRSP, and preliminarily reported about the effects of β_1 blocker on BAT of SHRSP.

Materials and methods: Male SHRSP, SHR, and WKY, 4 to 36 weeks old, were used in this study. An interscapular BAT was resected from these animals. Histologically BAT was observed by light microscopy and electron microscopy. Distribution of sympathetic innervation was examined by the glyoxalic acid method with the fluorescence microscope. Contents of noradrenaline in BAT, which reflects sympathetic nerve function, was measured by the HPLC-ECD method. Effects of β_1 blocker was evaluated by changes of body weight, rectal temperature, and BAT in SHRSP after a long term oral administration.

Results: In young aged rats BAT was well developed, especially in SHR and SHRSP. With aging, white adipose tissue transformation occurred. Changes into white adipose tissue from BAT were conspicuous in WKY and SHR, however BAT of SHRSP remains brown colour till high ages. Microscopically BAT of SHRSP, even at 36 weeks old, showed an acidphilic granular cytoplasm and ultrastructurally abundant of mitochondria and fine lipid droplets were observed. A case of recent apoplexied SHRSP showed red coloured BAT suggesting depletion of lipid vacuoles. Mast cells were occasionally encountered in BAT especially around the blood vessels. The population of mast cells were highest in SHRSP compared with WKY and SHR. Distribution and extent of fluorescence of adrenergic fibers were diffuse and strong in SHRSP, in contrast, weak in WKY. Catecholamine content of BAT was also highest in SHRSP at 24 weeks and 36 weeks old. The mean values of noradrenalin in BAT were 3.82, 1.07, 0.97 $\mu\text{g/g}$ tissue in 36-week-old SHRSP, SHR, and WKY respectively. β_1 blocker induced white adipose transformation in BAT of SHRSP and body weight increase and drop of rectal temperature(0.3°C) in SHRSP.

Discussion: In general BAT is transformed into white adipose tissue with aging, however, BAT of SHRSP is well sustained in a developed form since prehypertensive stage till high ages. This study showed the dense innervation of noradrenergic neurons in BAT of SHRSP morphologically and biochemically. These facts indicate the sympathetic nervous system might be persistently facilitated in SHRSP. And the activated BAT might be largely contributed to weight reduction in SHRSP.