63) β -Adrenergic Receptors in the Lower Brainstem of Spontaneously Hypertensive Rats. Akihiko Himeno, Masami Niwa, and Yoshibumi Nakane. Departments of Psychiatry and Pharmacology 2, Nagasaki University School of Medicine, Nagasaki 852.

Recent study provided evidence for the significant role of nucleus tractus solitarius in central-neuronal circuit which are involved in regulation of blood pressure. It is widely accepted that catecholaminergic neurons located in the lower brainstem including nucleus tractus solitarius participate to the central control of blood pressure, by interacting with β -adrenergic receptors. Using the quantitative receptor autoradiographic method with ^{125}I -pindolol and β -adrenergic ligands, we carried out investigation on β_1 and β_2 -adrenergic receptors in the nucleus tractus solitarius of spontaneously hypertensive rats (SHR).

Male SHR and Wistar Kyoto rats (WKY) were decapitated at the age of 4 and 14 weeks. The lower brainstem were immediately removed, and immersed in isopentane at -30°C . Frozen, $16\ \mu\text{m}$ -thick sections were cut in a cryostat at -16°C and thaw-mounted onto subbed glass slides. Sections were dried under vacuum at 4°C overnight. The β_1 - and β_2 -adrenergic receptors were analyzed, according to the receptor autoradiographic method of Rainbow et al. (1984). β_1 - and β_2 -adrenergic receptors densities were calculated from the binding amounts obtained at the incubation with $150\ \text{pM}$ ^{125}I -pindolol in the presence of $50\ \text{nM}$ ICI-118,551 and $70\ \text{nM}$ ICI-89,406, respectively. Non-specific binding was determined in the presence of $100\ \mu\text{M}$ 1-isoproterenol. In the equilibrium binding study, tissue sections were incubated in the presence of increasing concentrations of ^{125}I -pindolol, ranging from $30\ \text{pM}$ to $310\ \text{pM}$.

At 14 weeks of age, the systolic blood pressure of SHR, $185 \pm 4\ \text{mmHg}$, was significantly higher than that of WKY, $126 \pm 2\ \text{mmHg}$. High densities of β_1 - and β_2 -adrenergic receptors were present in the area postrema, nucleus tractus solitarius. The highest densities of β_1 - and β_2 -adrenergic receptors were found to be in the area postrema. Alterations in β_1 - and β_2 -adrenergic receptors densities were observed in the area postrema. The β_2 -adrenergic receptors density in the nucleus tractus solitarius of 4-week- and 14-week-old SHR was significantly higher than those of age-matched WKY, whereas no differences in the β_1 -adrenergic receptors density between all groups studied was observed. The SHR had higher densities of β_1 - and β_2 -adrenergic receptors in the area postrema than WKY did at the age of 4 and 14 weeks. The equilibrium binding study revealed a significant increase in the maximum binding capacity (B_{max}) of ^{125}I -pindolol binding to the nucleus tractus solitarius of 14-week-old SHR with no changes apparent in the binding affinity, as compared to age-matched WKY.

The present results of alterations in β -adrenergic receptors in the area postrema and nucleus tractus solitarius in SHR support a role of central catecholaminergic system in genetic hypertension in rats. Among the results presented, of particular interest is the observation that SHR had higher density of β_2 -adrenergic receptors in the nucleus tractus solitarius of 4-week-old SHR, since the nucleus plays a significant role in the central inhibitory control of blood pressure. Increased adrenaline synthesis in the nucleus tractus solitarius observed in young, prehypertensive SHR has been thought to be linked and related to the pathophysiology of hypertension in SHR. As the β_2 -adrenergic receptors on the presynaptic sites regulates re-uptake of adrenaline into the nerve endings, it seems likely that the increase in the number of β_2 -adrenergic receptors is related to the initiation of hypertension in SHR.