23) Catecholamine content of the brain in SHR and SHRSP under the immobilized stress.

Kunihiro OKAMURA and Masahiko NOMURA. Dept. of Physiology, School of Medicine, Fujita-Gakuen Health Univ. Toyoake, Aichi 470-11, JAPAN.

INTRODUCTION The spontaneously hypertensive rat (SHR) has been identified as an important animal model of essential hypertension in man. We have suggested that there is some disagreement about the catecholamine content in the rat brain. It is already known that the SHR and stroke prone SHR (SHRSP) are more sensitive at stress compared with WKY. In order to clarify the difference of the catecholamine content reported in these hypertensive rats, we took measurements of amine content in young 4 week and mature 12 week rats under immobilized stress.

MATERIAL AND METHODS Four and 12 week rats (WKY, SHR and SHRSP) were immobilized in a prone position for 3 hrs by fixing their heads with wire mesh. The animals were killed by decapitation. The handling group was held in hand for 5 min daily in 4 and 12 week rats of WKY, SHR and SHRSP. The animals were killed by decapitation after the seventh 5 min interval of handling. The brains were quickly removed, and the brain regions were dissected using a modification of the Glowinski and Iversen (1966) method. The tissues were homogenized in ice-cold 0.1N perchloric acid and the homogenates were centrifuged at 30,000 x g for 15 min. The supernatant was stored at -60 C and used for the direct injection into the high-pressure liquid chromatograph with electrochemical detection. The chromatograph was a Bioanalytical system JC-14 and the detector was a model LC-4B electrochemical one. Separation of monoamine was performed through a column.

RESULTS Noradrenalin (NA) concentration was measured in the immobilized rat brain. The NA concentration decreased in the medulla oblongata, diencephalon of both 4 week and 12 week SHR compared with the normotensive WKY control rats. Furthermore, NA concentration in the immobilized rat brain was decreased in the medulla oblongata of 4 week and the medulla oblongata, diencephalon of 12 week SHRSP. The level of NA, Adrenalin (AD) concentration increased in the medulla oblongata, diencephalon of young SHR and SHRSP after treatment of handling, but in mature 12 week SHR and SHRSP were not statistically significant. However, in 4 week SHR, NA concentration of midbrain had increased compared with WKY after treatment of handling. NA level was found to have decreased in the medulla oblongata of mature SHR and SHRSP after treatment without handling.

DISCUSSION Previous studies in various genetic hypertensive rats have presented conflicting views concerning the relationship of NA metabolism to blood pressure. Immobilized stress induced significant decrease have been observed in NA contents of the medulla oblongata and diencephalon of young and mature hypertensive rats compared with WKY. Thus, there were changes in NA content in the medulla oblongata and diencephalon of young, mature SHR and SHRSP after 1hr of immobilization stress. We suggested that young rats as well as mature SHR and SHRSP were highly sensitive to stress compared with WKY. It is interesting that prior to hypertension, in young rats NA and AD concentrations in the medulla oblongata and diencephalon had increased after treatment of handling. As described by Golaskin (1977), there is an increased activity of phenylethylamine-N-methyltransferase (PNMT) in the A1 and A2 of the medulla oblongata in young 4 week SHR. This increase of AD content in the medulla oblongata and diencephalon in young hypertensive rats might be the cause of the risen blood pressure rather than consequence of the gradually rising blood pressure. The high sensitivity and increase in NA and AD concentration in young hypertensive rats is very interesting. Since changes in endogenous content of NA do not provide a good index of change in noradrenergic nerve activity, we must study the turnover rate of endogenous NA and the release of NA to electric and chemical stimulation in the medulla oblongata and diencephalon of both young and mature SHR and SHRSP.