50) Involvement of Central Serotonergic Systems in Enhanced Startle Response in SHRSP. Tetsuo Akai, Motonori Yamaguchi, Tomoyo Tanaka*, Hiroshi Ogawa* and Sukenari Sasagawa*. Research Department, Nihon Schering K.K., Osaka 532, and *Department of Hygiene, Kinki University School of Medicine, Osaka-Sayama 589 JAPAN.

INTRODUCTION:

In the previous paper (JPN HEART J 32: in press, 1991), we reported that the locomotor activity and the startle response of stroke-prone spontaneously hypertensive rats (SHRSP) was significantly enhanced on and after 3 and 5 weeks of age, respectively, compared to those of the age-matched Kyo:Wistar rats (WKY). However, role of central nervous systems in the enhanced emotional response of SHRSP is poorly understood. In the present study, in order to clarify the functional involvement of central nervous systems in the enhanced behaviors, we examined densities of various receptor-subtypes for serotonin, adrenaline, dopamine and acetylcholine in SHRSP brains at 4 weeks of age when the enhanced locomotor activity was observed, and at 5 weeks of age when the enhanced startle response was elicited.

MATERIALS AND METHODS:

Male animals of SHRSP and WKY (twelve animals per group) were used at 3 weeks of age and housed singly in wire-meshed cages. The startle response was scored by the method of Shibata et al. (Physiol & Behav 28: 289, 1982) with slight modification. The spontaneously locomotor activity was estimated by measuring ambulation and rearing in the open field. At 4 and 5 weeks of age when the locomotor activity and the startle response significantly elevated, respectively, six animals per each group were sacrificed by decapitation. The brains were immediately removed and frozen with dry ice for autoradiographical binding studies. The bindings of specific [3 H]-ligands to 5-HT_{1A}, 5-HT₂, α_1 , α_2 , β , D₁, D₂ and mACh receptors were quantified by an image analysis system (Amersham, RAS 3000).

RESULTS:

Densities of 5-HT₂ receptors in cortex, accumbens nucleus and striatum of SHRSP were 37-55% higher than those of WKY at 4 weeks of age, and these densities of SHRSP decreased at 5 weeks of age. Subsequently, no significant difference in those densities was observed between SHRSP and WKY at 5 weeks of age. Densities of 5-HT_{1A} receptors in hippocampus of SHRSP were around 14% higher than those of WKY at both 4 and 5 weeks of age, but it was statistically significant at 5 weeks of age. Densities of α_1 receptors in septum and olfactory tubercle and those of D₁ receptors in frontal cortex of SHRSP were 32-58% higher than those of WKY at 5 weeks of age. At both 4 and 5 weeks of age, densities of D₁ receptors in striatum and those of mACh receptors in cerebellum of SHRSP were 15-27% higher than those of WKY. There was no difference in the densities of α_2 , β and D₂ receptors between SHRSP and WKY.

CONCLUSIONS:

Marked changes in densities of 5-HT₂ receptors as well as D₁ and α_1 receptors were found in the specific brain regions of SHRSP between 4 and 5 weeks of age, while densities of D₁ and mACh receptors in the other specific brain regions of SHRSP increased at both 4 and 5 weeks of age. These findings suggest that functional changes in central serotonergic as well as dopaminergic and adrenergic systems of SHRSP may be involved in the enhanced startle response. Furthermore, the enhanced locomotor activity of SHRSP may be related to the functional change in dopaminergic and cholinergic systems.