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Neurochemical Effects Following Chronic Mild Stress, Chronic Severe Stress and Acute Stress in Male Rats

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Prolonged exposure to stressors (mild or severe) has been considered as a model that "simulates" endogenous depression. A number of neurochemical changes may be involved in the above mentioned models, which however is not thoroughly examined. On the other hand, it is well known that the character and sequence of stressors play an important role on the subsequent neurochemical effects in the rat. In the present study a chronic mild unpredictable stress model and a chronic severe stress was employed in the rats and the dopaminergic and serotonergic activity in different rat brain regions were respectively examined. For purposes of comparison the respective neurochemical changes were studied following acute stress employment in the rats. Neurotransmitter and their metabolites, in different rat brain regions were measured by High Performance Liquid chromatography (HPLC) assay with electrochemical detector (EC).

Chronic mild stress induced an increase in Dopaminergic (DA) activity and a decrease in Serotonergic (5-HT) activity in the Prefrontal Cortex (Pfc), while a decrease in 5-HT and DA activity in the Striatum (Str) and an increase in 5-HT activity in the Hippocampus (Hipp). The above results were similar between Wistar and Sprague Dawley rats.

Severe chronic stress in Wistar rats induced a decrease in striatal DA and 5-HT activity and a decrease in 5-HT activity in the Hipp. It is worth noting that a differential neurochemical profile was observed in Sprague Dawley rats. Thus, a decrease in 5-HT activity in Pfc, an increase in DA and 5-HT activity in Str and a hippocampal decrease in 5-HT activity were observed.

Acute stress in Wistar rats induced an increase in 5-HT activity in Pfc and a decrease in striatal DA activity while in Sprague Dawley rats a differential response was observed. In fact, a decrease in DA activity in Pfc, a decrease in striatal DA and 5-HT activity and a decrease in 5-HT activity in Hipp were identified.

The results showed differential neurochemical effects following the certain types of stress models employed in different animal strains. The above mentioned differentiation concerns regional changes of different neurotransmitter systems. Thus it could be suggested that specific neurochemical factors are related to the respective stress animal models and animal strain.