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Maternal Separation on Postnatal Stress in Rats Induces Long-lasting Changes on Neurochemical, Behavioural and Genome Responses

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Early stress in life results in long-lasting effects in many neurotransmitter and neuroendocrine systems of the brain. Maternal Separation (MS) is used as an early life stressor that causes profound neurochemical and behavioural changes in the pups that persist into adulthood. Manipulations such as prolonged MS of pups from the dam have been used as an animal model of early-life trauma.

Animal models are quite useful for elucidating the mechanisms underlying abnormalities toward possible treatment strategies for psychiatric, emotional or neurological diseases.

The Central Nervous System (CNS) maintains a degree of adaptive plasticity, which allows adjusting to certain circumstances and modifying innate patterns from neuronal connections. Alterations during development, such as postnatal stress, provoke changes in the stress response of the pups during their whole lives. It is believed that the effects of these events during early life are due to the great plasticity of the developing in CNS. Along the critical period of certain brain

regions, mainly, those related to adverse situations, for example frontal cortex, hippocampus, and Hypothalamic-Pituitary-Adrenal (HPA) axis can develop abnormalities sometimes irreversible and thus alter the emotional process and the stress response along the animal's life.

Early postnatal period and bond between mother and infant seem particularly important in the development and shaping of normal stress response and emotional behavior. Epigenetic modifications, such as DNA methylation, are critical regulators of persistent gene expression changes and may be related to behavioural disorders. However, the mechanisms underlying the long-term effects of environmental stress early in life are not known, they are likely to involve activation of intracellular signalling pathways, leading to modifications of the genome, resulting in changes in gene expression and neural function. The neural modifies underlying the persistent effects of early life separation and stress in rodents remain to be fully elucidated.

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