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Early postnatal stress and the serotonergic system

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The aim of the present study was to assess whether traumatic events during the early postnatal period would affect the rat brain development of the serotonergic system underlying regulation of emotional expressions. Rats that had received aversive stimuli foot shock (FS) at the postnatal period of the second week (2W-FS), but not the third week (3W-FS), markedly reduced fear-related freezing behavior during exposure to contextual fear conditioning (CFC), at the post-adolescent period (10-12 week old). This anxiolytic behavior observed in 2W-FS was mimicked by electrolytic lesion of the median raphe nuclei, from which the major serotonergic projections to the hippocampus arise. In 3W-FS, as well as non-FS controls, synaptic transmission in the hippocampal CA1 field was suppressed by the serotonin $(5\text{-HT})_{1A}$ receptor agonist. This synaptic inhibition was not found in 2W-FS. These findings suggest that aversive stress exposed at the early postnatal period might affect the serotonergic development, thereby emotional responses to the post-adolescent fear stimuli. In other words, the "critical developmental period" appears to exist for the serotonergic system involved in emotional expressions, which is attributable to the lifelong susceptibility to emotional stimuli.