The role of prostaglandin E_2 in environmental factors of psychiatric disorders

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We investigated the possibility of prostaglandin E_2 (PGE_2) as one of common molecules associated with vulnerability to neurodevelopmental disruptions induced by environmental factors. PGE_2 levels in whole brain were significantly increased after exposure to viral infection [injection of polyinosinic-polycytidylic acid (polyI:C)], hypoxia (exposure to CO_2), and neglect (separation from the dams) in postnatal day (PD) 2, compared to those after non-exposure. The mice administered polyI:C during PD 2-6 exhibited the impairment of sociality, object recognition memory, and pre-pulse inhibition (PPI) in adult at PD 70, and further, significant decreased spine density of the mPFC in adult mice. Exposure to CO_2 at PD 2 and separation from dams during PD 2-21 exhibited the impairment of PPI and decrease of spine density in adult mice. These behavioral impairments induced by administration of polyI:C were recovered by an inhibition of PGE_2-EP1 (PGE_2 receptor subtype) and of cyclooxygenase (COX). Our findings suggest that PGE_2 is one of potential common molecules associated with vulnerability to neurodevelopmental disruptions induced by environmental factors, and PGE_2 plays a crucial role in the development of behavioral and neuronal impairments, which are associated with activation of PGE_2-EP1.