The Prenatal Bisphenol A Exposure Effects on Neural Signalling Activity in Male Rat Hippocampus and its Neurobehavioral Outcomes

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Bisphenol A (BPA) is an organic synthetic compound that most publicized as endocrine-disrupting chemicals (EDCs) due to its remarkable effects on signalling activity via multiple steroid hormone receptors. The environmental perturbations on signalling networks such as BPA during the prenatal period may be involved in developmental disorders by anti-androgenic effects, especially on neurodevelopment leading to memory and behaviour deficits when reaching adulthood. The objective of the present study is to determine the effects of prenatal BPA exposure on the relationship of synaptic plasticity markers (Synapsin I and PSD 95) with N-Methyl-D-Aspartate receptor (NMDAR) subunits (GRIN2A and GRIN2B) in neural communication networks and its neurobehavioral outcomes. The pregnant Sprague Dawley rats were orally dosed at 5 mg/kg/day and 50 mg/kg/day with 0.5% Tween 80 in reverse osmosis water from gestational day 2 until 21 or until spontaneous delivery. The control group were exposed to the same treatment except without BPA. The male litters were raised until postnatal day 35 (PND35). At PND35, the competency of rats in learning and memory tasks were evaluated by open field, step down passive avoidance and Morris water maze tests for six consecutive days and followed by quantification of GRIN2A, GRIN2B, PSD95 and Synapsin I using ELISA. The data obtained from respective days showed prenatal BPA exposure significantly induced anxiety-related behaviour and impairment in spatial memory at dosage BPA treated group compared to the control group. Additionally, utero BPA exposure also significantly downregulated the expression of GRIN2A ($p=0.000$), GRIN2B ($p=0.001$) and PSD95 ($p=0.004$) in adult male rat hippocampus. These data suggest that the impairment in neurobehavioral performance might be involved with the inhibition of signalling pathway between synaptic plasticity markers and NMDAR subunits in adult male rat hippocampus leading to learning and memory deficits when reaching adulthood.

Keywords: Bisphenol A; Signalling activity; Synaptic plasticity markers; NMDAR subunits; Neurobehaviour