Combination in prenatal nicotine exposure with juvenile isolation rearing induces depressive behavior and change of tryptophan metabolism

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Background: L-Tryptophan (TRP) is metabolized via the serotonin pathway and kynurenine pathway (KP). Several studies have demonstrated that the abnormality of both pathways is related to the development of the pathogenesis of depression. Smoking during the prenatal period influences postnatal maturation and behavioral patterns in adulthood. Juvenile stress-induced molecular and functional changes in neurons are the key clinical features of psychiatric disorders including depression. In this study, we examined the effect of combination in prenatal nicotine exposure (PNE) with juvenile isolation rearing on the emotional and cognitive behaviors and TRP metabolism.

Methods: Pregnant dams of C57BL/6J mouse were given 0.2mg/ml (NIC) in 2% saccharin sweetened tap water from E14 to P0, then offspring were reared in social isolation (SI) during adolescence (4 weeks old). Four weeks after SI rearing, mice were subjected to the sequential behavioral tests. TRP metabolites in serum were analyzed by high pressure liquid chromatography (HPLC).

Result: We found that SI during adolescence induced hyperactivity in open field test and increase of social behavior to the unknown mouse. But, PNE did not affect these behavioral changes. The combination PNE and SI prolonged immobility in the forced swimming test. Neither PNE and/or SI did not impair objective recognition memory in the novel object recognition test. The combination PNE and SI increased serum levels of kynurenine and kynurenic acid.

Conclusion: Our results suggest that PNE specifically affected stress-induced depression-like behavior, and TRP metabolites. Therefore, it is possible that abnormal TRP metabolites may play an important role in the pathophysiology of depression.