1. No.
   2020G027

2. Title
   To Better Understand the Mechanism how Low-birthweight Leads to Attention-deficit/ Hyperactivity Syndrome (ADHD) and to Develop a Novel Prophylaxis for ADHD

3. Period
   2020-2022

4. Summary
   [Background] Children born with low birthweight (LBW) have higher risks of neurodevelopmental disorders such as attention-deficit/hyperactivity disorder (ADHD). Human umbilical cord-derived mesenchymal stromal cells (UC-MSCs) have potential of modulating inflammation and are expected to ameliorate the brain pathophysiology. The aim of this study was to examine the effects of intravenous injection of UC-MSCs on a rat model of LBW.
   [Methods] Pregnant Sprague-Dawley rats were subjected to mild intrauterine hypoperfusion by artery stenosis using metal microcoils on embryonic day 17. UC-MSCs (1×10^5 cells) or vehicle were administered intravenously on postnatal day 1.
   [Results] LBW pups showed delayed neurodevelopment, hyperactivity/impulsivity, and social impairment. UC-MSCs treatment partially prevented the emergence of these behavioral problems. Post-activation depression of the spinal H-reflex was weakened in LBW pups and was improved by UC-MSC administration. Serotonin was significantly decreased, and GABA and norepinephrine tended to decrease in the brain of LBW pups. Gut microbiota exhibited decreases in the relative abundance of the genera Proteus and Lactococcus in LBW pups. Cytokines in cerebrospinal fluid and serum and the number of hippocampal neurons did not change by LBW. UC-MSC administration did not improve the evaluations mentioned above.
   [Conclusions] UC-MSC administration had a partial effect on behavior and a marked improvement on spinal cord excitability.