

Gross motor skill development in Ts65Dn mice after perinatal neural progenitor cell implantation.

A. Rachubinski\*<sup>1</sup>, S.K. Cornelius<sup>1</sup>, K.N. Maclean<sup>1</sup>, K.B. Bjugstad<sup>1</sup>

1. Department Pediatrics, University of Colorado Denver, Aurora, CO.

Infants with Down syndrome (DS) experience early developmental delays prior to their emerging cognitive impairments. Motor skills such as rolling over, crawling, and walking develop at a slower rate than that of their peers without DS. Currently, treatments for DS are directed at treating already impaired neurological functions in children and adults with DS. However, a treatment which could be used earlier in development might postpone or prevent the later cognitive delays. Neural progenitor cells (NPC) have been used in a wide range of adult neurodegenerative disorders with promising behavioral and neuroanatomical results. The present study sought to determine if NPC could be used as a life long treatment for DS when implanted shortly after birth. The current study used the Ts65Dn mouse model of DS, which has a delayed postnatal development, low birth weight, and age-associated cognitive impairment. Trisomic and disomic Ts65Dn littermates were bilaterally implanted in the rostral hippocampus with 100,000 C17.2 murine NPC or saline on postnatal day 2 (PND 2). Weights were taken daily from PND 2 to PND 15. Developmental milestones including date of eye opening, ear opening, righting response, cliff avoidance, and negative geotaxis were assessed daily from PND 2 until the animal could perform each task for three consecutive days. The first of the three days the animal could complete the milestone was taken as date of acquisition. Overall, trisomic mice reached the developmental milestones of ear opening, eye opening, righting, and cliff avoidance 1 to 1 ½ days later than their disomic littermates, which is consistent with previously reported results. No differences between the groups were found in their achievement of negative geotaxis. NPC did shorten the time to ear opening by about ½ day for both groups. At present, no other NPC-induced changes have been detected. However, as developmental milestones were reached by PND14, with some as early as PND5 NPC may not have been present long enough to induce a measurable effect. Subtle differences, like the time for the ears to open, suggest that the NPC could be causing changes in the brain that may not be evident until additional testing of the mice is done at a later age. Future studies will concentrate on NPC effects at these later ages, thus allowing the NPC more time to exert potential effects.

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