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MODULATING NEURONAL CELL MIGRATION UNDER CURVED CONFINEMENTS

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Abstract:

During brain development in the cortical plate, neuronal cells exhibit distinct tangential and radial migration strategies. In case of complications, e.g., inadequate or disordered migration, developmental disorders such as lissencephaly, subcortical band heterotopia, and polymicrogyria can occur. Under healthy conditions, excitatory pyramidal neurons migrate radially from the ventricular zone into the cortical plate before switching to tangential routes. Radial migration has been extensively studied, but the mechanical cues of the tangential phase have been less scrutinized. Furthermore, additional cortical folding may superimpose critical mechanical cues to the tangential migration process. Using multi-curvature micropatterns, we studied synergistic physical and chemical cues that act upon neurons during curved tangential migration. First, PC12 cells (rat, P8) were cultured on polystyrene Petri dishes coated with poly-L-lysine (PLL) for control and with 3% (w/v) agarose micro curvatures on PLL, with media containing DMEM (97%), FBS (1%), HS (1%), and PenStrep (1%). These curvatures consisted of multiple concentric circles of increasing radii, with agarose barriers between each circle, and were created by stamping agarose with a 10:1 PDMS mold. Cell motility was imaged for 24 h *in vitro* (Dino-Lite microscope, 15 min interval) and tracked in Fiji ImageJ Manual Tracking software. Preliminary results indicate that neurons in the multi-curvatures migrated on average 45 times faster than under control conditions. These initial findings may be a starting point for better understanding physical cues during tangential migration strategies in the developing brain.

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