Accepted Manuscript

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PII: S0142-9612(17)30774-3

DOI: 10.1016/j.biomaterials.2017.11.042

Reference: JBMT 18380

To appear in: *Biomaterials*

Received Date: 27 August 2017

Revised Date: 24 November 2017

Accepted Date: 27 November 2017

Please cite this article as: Zhao S, Fan W, Guo X, Xue L, Berninger B, Salierno MJ, del Campo Ará, Microenvironments to study migration and somal translocation in cortical neurons, *Biomaterials* (2017), doi: 10.1016/j.biomaterials.2017.11.042.

Microenvironments to study migration and somal translocation in cortical neurons

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Abstract

Migrating post-mitotic neurons of the developing cerebral cortex undergo terminal somal translocation (ST) when they reach their final destination in the cortical plate. This process is crucial for proper cortical layering and its perturbation can lead to brain dysfunction. Here we present a reductionist biomaterials platform that faithfully supports and controls the distinct phases of terminal ST *in vitro.* We developed microenvironments with different adhesive molecules to support neuronal attachment, neurite extension, and migration in distinct manners. Efficient ST occurred when the leading process of migratory neurons crossed from low- to high-adhesive areas on a substrate, promoting spreading of the leading growth cone. Our results indicate that elementary adhesive cell-substrate interactions strongly influence migratory behavior and the final positioning of neurons during their developmental journey. This *in vitro* model allows advanced experimentation to reveal the microenvironmental requirements underlying cortical layer development and disorders.