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Computational modeling of the neurovascular unit to predict microglia mediated effects on blood-brain barrier formation. Zurlinden[2] TJ, Saili[2] KS, Silvin[1] A, Schwab[2] AJ, Hunter[2] ES, Spencer[3] RS, Baker[3] NC, Ginhoux[1] F, Knudsen[2] TB. [1]Singapore Immunology Network (SIgN), Agency for Science, Technology and Research (A*STAR), Singapore; [2]USEPA, ORD, RTP, NC; [3]Leidos, RTP, NC.

Development of the neurovascular unit (NVU) involves interactions between endothelial cells, pericytes, neuroprogenitor cells, and microglia. The latter, our resident brain macrophage population, couples angiogenesis-neurogenesis with the microphysiological environment. We constructed an *in silico* model of the developing neuroepithelium in CompuCell3D rendering a cNVU that recapitulated a suite of critical signaling pathways (Notch/dll4, CSF-1, VEGF-A/C) and cellular behaviors (growth, migration, proliferation, differentiation, apoptosis). Imputing ToxCast *in vitro* profiling data into the simulated neuroepithelium enabled predictions of developmental neurovascular toxicity. For example, targeting CSF-1R *in silico* yielded a quantitative effect on microvascular arborization. Cybermorphs can now be qualified against *in vivo* phenotypes from CSF-1R ablation genetically or immunologically. The *in silico* models, in combination with *in vitro* cell-level data, can guide engineering of human cell-based NVU-devices to rank or prioritize untested environmental chemicals for further action. *This abstract does not reflect US EPA policy*.