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