Abstract Submitted
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Cilia induced cerebrospinal fluid flow in the third ventricle of brain YONG WANG, CHRISTIAN WESTENDORF, MPI for Dynamics and Self-Organization, REGINA FAUBEL, GREGOR EICHELE, MPI for Biophysical Chemistry, EBERHARD BODENSCHATZ, MPI for Dynamics and Self-Organization — Cerebrospinal fluid (CSF) conveys many physiologically important signaling factors through the ventricles of the mammalian brain. The walls of the ventricles are covered with motile cilia that were thought to generate a laminar flow purely following the curvature of walls. However, we recently discovered that cilia of the ventral third ventricle (v3V) generate a complex flow network along the wall, leading to subdivision of the v3V. The contribution of such cilia induced flow to the overall three dimensional volume flow remains to be investigated by using numerical simulation, arguably the best approach for such investigations. The lattice Boltzmann method is used to study the CFS flow in a reconstructed geometry of the v3V. Simulation of CSF flow neglecting cilia in this geometry confirmed that the previous idea about pure confined flow does not reflect the reality observed in experiment. The experimentally recorded ciliary flow network along the wall was refined with the smoothed particle hydrodynamics and then adapted as boundary condition in simulation. We study the contribution of the ciliary network to overall CSF flow and identify site-specific delivery of CSF constituents with respect to the temporal changes.

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