

Fluid

A fluid is a [substance](#) that continually deforms (flows) under an applied [shear stress](#), or external force. Fluids are a phase of matter and include liquids, gases and plasmas. They are substances with zero shear modulus, or, in simpler terms, substances which cannot resist any shear force applied to them.

see [Fluid balance](#)

see [Fluid imbalance](#)

The movement of fluid into, through, and out of the brain plays an important role in clearing metabolic waste. However, there is controversy regarding the mechanisms driving fluid movement in the fluid-filled paravascular spaces (PVS), and whether the movement of metabolic waste in the brain extracellular space (ECS) is primarily driven by diffusion or convection. The dilation of penetrating arterioles in the brain in response to increases in neural activity (neurovascular coupling) is an attractive candidate for driving fluid circulation. It drives deformation of the brain tissue and of the PVS around arteries, resulting in fluid movement. We simulated the effects of vasodilation on fluid movement into and out of the brain ECS using a novel poroelastic model of brain tissue. Kedarasetti et al. found that arteriolar dilations could drive convective flow through the ECS radially outward from the arteriole and that this flow is sensitive to the dilation dynamics. Simulations of sleep-like conditions, with larger vasodilations and increased extracellular volume in the brain, showed the enhanced movement of fluid from the PVS into the ECS. Our simulations suggest that both sensory-evoked and sleep-related arteriolar dilations can drive the convective flow of [cerebrospinal fluid](#) not just in the PVS, but also into the ECS through the PVS around arterioles ¹⁾.

Cerebrospinal fluid

[Cerebrospinal fluid](#)

¹⁾

Kedarasetti RT, Drew PJ, Costanzo F. Arterial vasodilation drives convective fluid flow in the brain: a poroelastic model. *Fluids Barriers CNS*. 2022 May 15;19(1):34. doi: 10.1186/s12987-022-00326-y. PMID: 35570287.

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Last update: **2024/08/13 06:50**

