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**Nature's rheologists: Lymphatic endothelial cells control migration in response to shear stress** GERALD FULLER, ALEX DUNN, VINAY SURYA, Stanford University — Endothelial cells (ECs) line the inner surface of blood and lymphatic vessels and are sensitive to fluid flow as part of their physiological function. EC organization, migration and vessel development are profoundly influenced by shear stresses, with important implications in cardiovascular disease and tumor metastasis. How ECs sense fluid flow is a central and unanswered question in cardiovascular biology. We developed a high-throughput live-cell flow chamber that models the gradients in wall shear stress experienced by ECs in vivo. Live-cell imaging allows us to probe cellular responses to flow, most notably EC migration, which has a key role in vessel remodeling. We find that most EC subtypes, including ECs from the venous, arterial, and microvascular systems, migrate in the flow direction. In contrast, human lymphatic microvascular ECs (hLMVECs) migrate against flow and up spatial gradients in wall shear stress. Further experiments reveal that hLMVECs are sensitive to the magnitude, direction, and the local spatial gradients in wall shear stress. Lastly, recent efforts have aimed to link this directional migration to spatial gradients in cell-mediated small molecule emission that may be linked to the gradient in wall shear stress.

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