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The effect of lymphatic valve morphology on fluid transport[1] ALEXANDER ALEXEEV, MATTHEW BALLARD, ZHANNA NEPIYUSHCHIKH, BRANDON DIXON, Georgia Institute of Technology — The lymphatic vasculature is present in nearly all invertebrate tissue, and is essential in the transport of fluid and particles such as immune cells, antigens, proteins and lipids from the tissue to lymph nodes and to the venous circulation. Lymphatic vessels are made of up a series of contractile units that work together in harmony as "micro hearts" to pump fluid against a pressure gradient. Lymphatic valves are critical to this functionality, as they open and close with the oscillating pressure gradients from contractions, thus allowing flow in only one direction and leading to a net pumping effect. We use a hybrid lattice-Boltzmann lattice spring model which captures fluid-solid interactions through two-way coupling between a viscous fluid and lymphatic valves in a section of a lymphatic vessel to study the dynamics of lymphatic valves and their effect on fluid transport. Further, we investigate the effect of variations in valve geometry and material properties on fluid pumping. This work helps to increase our understanding of the mechanisms of lymphatic fluid transport, which has implications in a variety of pathologies, including cancer metastasis, autoimmunity, atherosclerosis and obesity.

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