

Dr. Jennifer Munson

Professor of Biomedical Engineering at Virginia Tech

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Interstitial fluid flow in the brain: Contributions to cancer and cognition

Abstract:

Fluid flow in the brain is an emerging area of research with implications in Alzheimer's, aging, brain homeostasis, development, and cancer. In cancers, interstitial fluid flow is increased as pressure builds as tumors grow, and during aging and Alzheimer's disease, we see decreases in flow. In my laboratory, we study the role of interstitial fluid flow, or the fluid flow within the spaces of tissues, on cellular behaviors, with an eye towards how we can leverage flow and its effects to treat disease. In glioblastoma, the deadliest form of brain cancer, cellular invasion is a defining factor of its resistance to therapeutic intervention and poor patient prognosis. Using tissue engineered models of the brain, we see that interstitial flow can induce invasion through a number of mechanisms which can be inhibited in vivo. Using MRI to map flows, we can find invading cells based on specific attributes of tumor originating fluid flow. Translating our tools, we have found that flows slow in Alzheimer's and chemotherapy-related cognitive disruption. In these scenarios, we see that changes to brain-draining lymphatics can drive these decreases, and in some cases, their targeting can reverse the adverse effects. In this talk, I will explore and show data from these neurological disorders and highlight how we develop the tools needed to measure, model, and manipulate fluid flow.

Biography:

Dr. Munson is a Professor of Biomedical Engineering and Director of the Cancer Research Center Roanoke at the Fralin Biomedical Research Institute at Virginia Tech-Carilion at Virginia Tech. She received her B.S. in Chemical Engineering and Neuroscience from Tulane University. She received her Ph.D. in Bioengineering from Georgia Institute of Technology and completed her postdoctoral training at the Swiss Federal Institute of Technology in Lausanne (EPFL). During her training, she was supported by the National Science Foundation, the Fulbright Program, and the Whitaker Foundation. Her laboratory studies the role of fluid flow in tissue homeostasis and disease with a specific focus on cancer and neurological disorders. Dr. Munson has received funding from the NCI, NINDS, NIA, NCATS, Lipedema Foundation, and the Sebastian Strong Foundation. Dr. Munson has been awarded the Rita Schaffer Young Investigator Award from the Biomedical Engineering Society, the Cellular and Molecular Bioengineering Young Innovator Award, and the Emerging Leader Award by the Ivy Foundation. She was recently conferred the distinction of Fellow by the Biomedical Engineering Society and the American Institute of Medical and Biological Engineering.

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