Meningeal Immunity and Lymphatics in Brain Diseases

Abstract: Immune cells and their derived molecules have major impact on brain function. We have shown that a proper T cell compartment is critical for higher brain function. Mice deficient in adaptive immunity have impaired cognitive function compared to that of wild-type mice. Importantly, replenishment of the T cell compartment in immune deficient mice restored proper cognition. Our recent works also demonstrate the effect of the immune system on social behavior. Despite the robust influence on brain function, T cells are not found within the brain parenchyma, a fact that only adds more mystery into these enigmatic interactions between T cells and the brain. Our results suggest that meningeal space, surrounding the brain, is the site where CNS-associated immune activity takes place. We have recently discovered a presence of meningeal lymphatic vessels that drain CNS molecules and immune cells to the deep cervical lymph nodes. This communication between the CNS and the peripheral immunity is playing a key role in several neurological and psychiatric disorders and, therefore, may serve as a novel therapeutic target that is worth in-depth mechanistic exploration.

Biography: Dr. Jonathan (Jony) Kipnis’s research group focuses on the complex interactions between the immune system and the central nervous system (CNS). The goal is to elucidate the cellular and molecular mechanisms underlying the beneficial effects of immune system in brain function in neurodegenerative, neurodevelopmental, and mental disorders as well as in healthy aging. Dr. Kipnis’s research team showed that the brain function is dependent, in part, on the function and integrity of the immune system. The fascination with immunity and its role in healthy and diseased brain is what brought the team to a breakthrough discovery of lymphatic vessels that drain the CNS into the peripheral lymph nodes and thus serve as a physical connection between the brain and the immune system. The implications of this work are broad and range from Autism to Alzheimer's disease through neuroinflammatory conditions, such as Multiple Sclerosis. Dr. Kipnis graduated from the Weizmann Institute of Science in Israel, where he was a Sir Charles Clore scholar and a recipient of distinguished prize for scientific achievements awarded by the Israeli Parliament, The Knesset. Jony joined UVA faculty in 2007. He is now a Harrison Distinguished Professor and Chair of the Neuroscience. Since 2015 he is also a Gutenberg Research College Fellow at the Johannes Gutenberg University Mainz Medical Center, Germany.