

# Neuroimmunology

Neuroimmunology is a field combining neuroscience, the study of the nervous system, and immunology, the study of the immune system. Neuroimmunologists seek to better understand the interactions of these two complex systems during development, homeostasis, and response to injuries.

Neuroimmunology plays a critical role in our understanding of the pathophysiological processes that underlie a variety of diseases treated by neurosurgeons, including [degenerative disc disease](#) (DDD), [glioblastoma](#) (Glioblastoma), [aneurysmal subarachnoid hemorrhage](#) (aSAH), and others. Compared with traditional methods in neuroimmunology, which study one pathway or gene at a time, emerging multiomics methodologies allow for holistic interrogation of multiple immune-signaling pathways to test hypotheses and the effects of therapeutics at a systems level. In a review, Zamanian et al. summarized key concepts for gathering and analyzing multiomics data so that neurosurgeons can contribute to the emerging field of systems neuroimmunology. Additionally, they describe 3 use cases, based on original research published by their group and others, that utilize [transcriptomics](#), [metabolomics](#), and [proteomics](#) analyses to study immune-signaling pathways in DDD, aSAH, and Glioblastoma. Through these use cases, techniques for performing machine learning and network-based analyses to generate new clinical insights from multiomics data are shared. They hoped that neurosurgeons might use this review as a summary of common tools and principles in systems immunology to better engage in creating the immunotherapies of tomorrow <sup>1)</sup>.

<sup>1)</sup>

Zamanian C, Bhandarkar AR, Monie DD, Moinuddin FM, Vile RG, Quiñones-Hinojosa A, Bydon M. Systems neuroimmunology: a review of multiomics methodologies to characterize neuroimmunological interactions in spinal and cranial diseases. *Neurosurg Focus*. 2022 Feb;52(2):E9. doi: 10.3171/2021.11.FOCUS21571. PMID: 35104798.

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