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# Cancer Neuroscience of Brain Tumors: From Multicellular Networks to Neuroscience-Instructed Cancer Therapies

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## Abstract

Deepening our understanding of neuro-cancer interactions can innovate brain tumor treatment. This mini review unfolds the most relevant and recent insights into the neural mechanisms contributing to brain tumor initiation, progression, and resistance, including synaptic connections between neurons and cancer cells, paracrine neuro-cancer signaling, and cancer cells' intrinsic neural properties. We explain the basic and clinical-translational relevance of these findings, identify unresolved questions and particularly interesting future research avenues, such as central nervous system neuro-immuno-oncology, and discuss the potential transferability to extracranial cancers. Lastly, we conceptualize ways toward clinical trials and develop a roadmap toward neuroscience-instructed brain tumor therapies. Significance: Neural influences on brain tumors drive their growth and invasion. Herein, we develop a roadmap to use these fundamentally new insights into brain tumor biology for improved outcomes.

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