

# Immunotherapy for pediatric intracranial tumor treatment

Immunotherapy has emerged as a promising treatment approach for pediatric intracranial tumors in recent years. Here are some key points about the use of immunotherapy in this context:

## Overview of Pediatric Intracranial Tumors:

Pediatric intracranial tumors are a diverse group of brain and central nervous system neoplasms that occur in children and adolescents. Common types include gliomas, medulloblastomas, ependymomas, and atypical teratoid/rhabdoid tumors (AT/RT). These tumors present unique challenges due to the delicate and developing nature of the pediatric brain.

## Rationale for Immunotherapy:

Immunotherapy aims to harness the body's own immune system to recognize and attack tumor cells. Pediatric intracranial tumors can be immunogenic, meaning they express antigens that can be targeted by the immune system. Immunotherapy has the potential to improve treatment outcomes and reduce the long-term side effects associated with conventional therapies like chemotherapy and radiation.

## Immunotherapy Approaches:

Checkpoint inhibitors: These drugs, such as anti-PD-1 and anti-CTLA-4 antibodies, block immune checkpoints that tumor cells use to evade the immune system. Adoptive cell therapies: This involves the ex vivo expansion and infusion of the patient's own T cells or other immune cells that have been engineered to target tumor-specific antigens. Vaccines: Cancer vaccines aim to stimulate the patient's immune system to recognize and attack tumor-associated antigens. Combination therapies: Immunotherapy is often combined with other treatments, such as chemotherapy or radiation, to enhance the anti-tumor immune response.

## Clinical Trials and Research:

Several clinical trials are ongoing to evaluate the safety and efficacy of various immunotherapy approaches in pediatric intracranial tumors. Areas of research include the identification of optimal immunotherapeutic targets, the use of combination therapies, and the optimization of delivery methods to the brain. Challenges include the unique tumor microenvironment of the central nervous system and the potential for neurological side effects.

## Promising Results and Future Directions:

Early clinical trials have shown encouraging results, with some patients experiencing durable responses and improved outcomes. Continued research and clinical development are needed to further optimize and refine immunotherapy strategies for pediatric intracranial tumors. Personalized approaches that consider the individual patient's tumor characteristics and immune profile may be key to improving the efficacy of immunotherapy in this patient population.

Overall, immunotherapy holds significant promise as a novel and targeted treatment approach for pediatric intracranial tumors, with the potential to improve outcomes and reduce long-term side effects. Ongoing research and clinical trials will continue to shape the future of this rapidly evolving

field.

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A critical step in advancing immunotherapy for these patients is to uncover targets that can be effectively translated into therapeutic interventions.

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A team performed a transcriptomic analysis across pediatric brain tumor types to identify potential targets for immunotherapy. Additionally, they assessed components that may impact patient response to immunotherapy, including the expression of genes essential for antigen processing and presentation, inhibitory ligands and receptors, interferon signature, and overall predicted T cell infiltration.

They observed distinct expression patterns across tumor types. These included elevated expression of antigen genes and antigen processing machinery in some tumor types while other tumors had elevated inhibitory checkpoint receptors, known to be associated with response to checkpoint inhibitor immunotherapy.

These findings suggest that pediatric brain tumors exhibit distinct potential for specific immunotherapies <sup>1)</sup>

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Frederico SC, Raphael I, Nisnboym M, Huq S, Shlegel BT, Sneiderman CT, Jackson SA, Jain A, Olin MR, Rood BR, Pollack IF, Hwang EI, Rajasundaram D, Kohanbash G. Transcriptomic observations of Intra and extracellular immunotherapy targets for pediatric brain tumors. Expert Rev Clin Immunol. 2024 Aug 8. doi: 10.1080/1744666X.2024.2390023. Epub ahead of print. PMID: 39114885.

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Last update: **2024/08/08 11:54**

