

Traces of Bacteria Inside Brain Tumors May Affect Tumor Behavior

Bacterial components appeared to be biologically active, potentially influencing tumor progression in patients with gliomas and brain metastases.

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- Researchers found bacterial genetic and cellular elements inside brain tumor cells that appear biologically active and may influence tumor progression and treatment outcomes.
- These bacterial elements were also found to be linked to specific immune and metabolic responses in brain tumors.
- Outcomes for glioma and other brain tumor patients remain poor, underscoring the need for better treatments, which these findings may help advance.

HOUSTON – Researchers at The University of Texas MD Anderson Cancer Center have uncovered unexpected traces of bacteria within [brain tumors](#). This discovery offers new insights into the environment in which brain tumors grow and sets the stage for future studies seeking to improve treatment outcomes.

Published today in [Nature Medicine](#), the data revealed that bacterial genetic and cellular elements were present inside brain tumor cells and across the tumor microenvironment. These bacterial components appeared biologically active, potentially influencing tumor behavior and progression in patients with gliomas and brain metastases.

The multi-institutional study was led by [Golnaz Morad, DDS, PhD](#), postdoctoral research fellow in [Surgical Oncology](#), and [Jennifer Wargo, MD](#), professor of Surgical Oncology and [Genomic Medicine](#) and core member of the James P. Allison Institute – working in close collaboration with MD Anderson’s [Platform for Innovative Microbiome and Translational Research \(PRIME-TR\)](#).

This collaborative effort leveraged the unique resources and expertise available at MD Anderson, including the [Cancer Neuroscience Program](#) and its Central Nervous System Tumor Analysis Stream (CATALYST) initiative, the Brain Tumor Center Tissue Bank, Translational Molecular Pathology, and the support of the MD Anderson SPORE in Brain Cancer. Together, these institutional programs enabled biospecimen collection and the generation of comprehensive datasets that shaped the study’s findings.

“This work opens a new dimension in our understanding of brain tumor biology,” Wargo said. “By mapping how microbial elements influence the brain tumor microenvironment, we may be able to identify new therapeutic strategies to improve outcomes for patients facing these devastating diseases.”

Why is it important to understand microbes present in brain tumors?

Gliomas and brain metastases are associated with poor outcomes, suggesting a deeper understanding of brain tumor biology is necessary to improve treatment responses.

Although there is solid evidence regarding the presence of intra-tumoral microbes in gastrointestinal cancers such as colorectal cancer, there is debate as to whether these microbes are genuinely present universally in all types of tumors.

This study is the largest to date to explore bacterial elements in brain tumors and provides evidence, for the first time, that bacterial elements can be detected within cells in brain tumors. This is particularly important because the brain has historically been considered a sterile environment and, as a result, brain tumors were thought to be free of bacterial elements.

“These findings highlight a previously unknown player in the brain tumor microenvironment – a new piece of the puzzle that may help explain brain tumor behavior,” Morad said. “Bacterial elements appear to interact with immune cells within the tumor in ways that could influence how tumors develop and respond to treatment.”

What are other key findings of this study?

Researchers analyzed more than 200 brain tissue samples using multiple advanced methods including detailed imaging, genetic sequencing and bacterial culture to detect and examine the nature of bacterial elements in brain tumors.

In addition to the main finding, this study further showed that these bacterial elements were associated with distinct tumor behavior, specifically certain antimicrobial and immune-metabolic pathways within tumors. Bioinformatic analyses also suggested connections between intra-tumoral bacterial elements and distinct microbial communities in the body, particularly the oral microbiome (i.e. bacteria residing in the oral cavity).

What comes next in understanding how bacterial elements influence brain tumors?

Expanding on this research, experts now are working to better understand how bacterial components might reach the brain and influence the growth or behavior of brain tumors. They also are investigating whether certain conditions, such as gum disease or side effects from cancer treatments like chemotherapy and radiotherapy, could play a role in this process. By building on these findings, scientists aim to use this knowledge to develop new and improved treatment approaches for patients with brain tumors.

What are the limitations of this study?

The correlative nature of this clinical study did not allow the researchers to say for certain whether the bacterial elements cause clinically meaningful changes in the tumors. In addition, oral, gut and tumor bacteria can vary depending on where people live, their environment and their lifestyle. As a result, the types of bacteria identified in brain tumors in this study should be confirmed in larger and more diverse groups of people.

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