

The tumor microbiota: A new frontier in cancer biology

Recent research shows that tumors in different organs host microbial communities capable of influencing cancer biology, immune responses, and the effectiveness of therapies, highlighting the need to standardize methods for studying intratumoral microbes.

The tumor microbiota — which includes bacteria, fungi, viruses, and other microorganisms present in tumor tissue — is now considered an important component of the tumor microenvironment. An international consensus article published in *Cancer Cell* (DOI [10.1016/j.ccell.2026.02.011](https://doi.org/10.1016/j.ccell.2026.02.011)) brings together institutions from the United States, Israel, Austria, and Italy, engaged in cutting-edge studies in this specific research area. Among the co-corresponding authors is Maria Rescigno, Scientific Director of the CeMM Research Center for Molecular Medicine of the Austrian Academy of Sciences, Professor of General Pathology at Humanitas University, as well as head of the Laboratory of Mucosal Immunology and Microbiota at IRCCS Istituto Clinico Humanitas; also co-author of the work is Luca Tiraboschi, researcher at the Laboratory of Mucosal Immunology and Microbiota of Humanitas. Together with an international team, they contributed to synthesizing the available evidence, identifying the main methodological challenges, and proposing shared standards for a more reliable and reproducible detection of tumor-associated microbes.

Microbes and tumors: a complex relationship

Over the last ten years, studies on preclinical models and clinical observations have demonstrated that the gut microbiota profoundly influences cancer development and modulates the effectiveness of immunotherapy. The results of experiments conducted at the international level have shown that modifying microbial communities can alter not only intestinal tumors, but also those in distant organs such as brain, liver, pancreas, breast, bones, and skin. Microbial signals, and in many cases viable microorganisms, have been detected within tumors and can contribute to reprogramming both tumor cells and cells of the immune system. “This demonstrates that tumor-associated microbes are not mere bystanders, but active modulators of tumor biology and of the response to therapies. Studying them rigorously remains complex, due to their scarcity in tumor tissues, the risk of contamination, and methodological biases, but understanding their role will be fundamental for developing more targeted therapeutic strategies,” explains Maria Rescigno.

Toward more precise therapies

Researchers have identified several ways through which microbes can influence tumors. In particular, structural components — including cell wall fragments and nucleic acids — and metabolic products derived from microbes can reach the tumor through circulation and remodel its microenvironment, directly modulating cellular and immune programs. Moreover, in some cases, viable microorganisms can translocate from the intestine or other mucosal sites to tumors, directly interacting with tumor tissue and influencing local immunity.

This evidence has led to a more precise definition of the tumor microbiota, understood as the set of microorganisms and their molecular components — including nucleic acids, proteins, and metabolites — present in all components of the tumor and its ecological niche, distinct from superficial or luminal communities (that is, located in organ cavities and not within the tumor tissue) and capable of interacting with host cells.

To address technical difficulties and avoid misinterpretations, the consensus article recommends integrating different complementary approaches, such as genetic sequencing, imaging, microbial cultures, and functional tests, in order to confirm not only the presence of microbes, but also their viability and their causal role. The authors also propose minimum reporting standards to ensure reproducibility of results across laboratories. “The goal is to move beyond the debate on mere microbial presence and focus on clinically relevant questions: how tumor-associated microbes influence tumor biology and response to therapies, and whether they may represent useful biomarkers to guide more effective and personalized therapeutic strategies,” adds Luca Tiraboschi.

Clinical implications and future perspectives

Understanding the role of the tumor microbiota opens new perspectives for cancer therapy. As already observed for the gut microbiota, interventions targeting intratumoral microbes could improve the response to immunotherapy, chemotherapy, and other therapeutic strategies. Precisely defining causal mechanisms is therefore essential to translate these discoveries into precision oncology approaches.

The study represents an important international collaborative effort and synthesizes evidence from different types of tumors, particularly those characterized by low microbial biomass, where conclusions require particularly rigorous validation. By outlining a roadmap of experimental and analytical standards, this work provides the basis for more robust research and for future clinical applications in the emerging field of tumor microbiota

The Study “Toward a consensus on the tumor microbiota: Evidence, standards, and interpretation” was published in *Cancer Cell* on 12 March 2026. DOI: 10.1016/j.ccell.2026.02.011

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The **CeMM Research Center for Molecular Medicine of the Austrian Academy of Sciences** is an international, independent and interdisciplinary research institution for molecular medicine under the scientific direction of Maria Rescigno. CeMM is oriented towards medical needs and integrates basic research and clinical expertise to develop innovative diagnostic and therapeutic approaches for precision medicine. Research focuses on cancer, inflammation, metabolic and immune disorders, and rare diseases. The Institute's research building is located on the campus of the Medical University and the Vienna General Hospital.

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