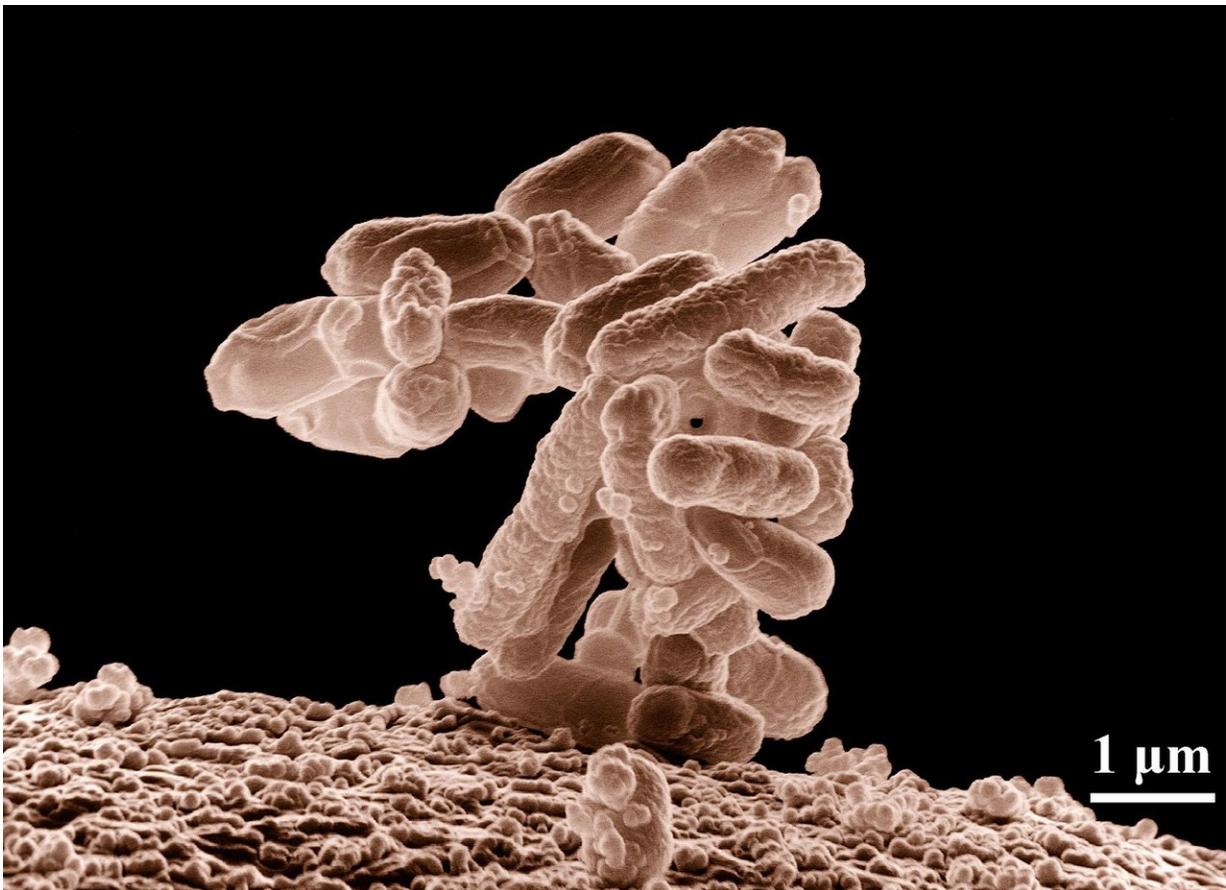


# Cancer under pressure: Visualizing the activity of the immune system on tumor development

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As tumors develop, they evolve genetically. How does the immune system act when faced with tumor cells? How does it exert pressure on the genetic diversity of cancer cells? Scientists from the Institut Pasteur and Inserm used in vivo video techniques and cell-specific staining to visualize the action of immune cells in response to the proliferation of cancer cells. The findings have been published in the journal *Science Immunology* on November 23, 2018.

Over time, the uncontrolled proliferation of [tumor](#) cells results in the accumulation of new mutations and changes to their genome. This gradual process creates significant genetic diversity among [cancer](#) cells in any given patient. And although the cells in the immune system, especially T cells, are potentially able to eliminate these abnormal cells, tumor diversity can have a harmful effect, complicating the action of the immune system and rendering some therapies ineffective. Understanding this frantic race between tumor development and the [immune response](#) is key to the success of future immunotherapy techniques.

Scientists in the Dynamics of Immune Responses Unit (Institut Pasteur/Inserm), directed by Philippe Bousso, in collaboration with Ludovic Deriano, Head of the Genome Integrity, Immunity and Cancer Unit (Institut Pasteur), investigated how spontaneous immune responses to tumors influence this tumor heterogeneity. They demonstrated that the immune system can employ mechanisms to significantly reduce tumor diversity, favoring the emergence of more genetically homogeneous tumor cells.

In their study, the scientists marked each cancer cell subclone with a separate color in a mouse model. By monitoring these colors, they were therefore able to characterize the evolution of tumor heterogeneity in time and space. They were also able to observe the contacts between T cells and [cancer cells](#) and determine how some tumor cells are destroyed. Their research highlights the drastic impact the immune system can have

on tumors by reducing their heterogeneity.

The same impact on the heterogeneity of [tumor cells](#) has also been observed in response to immunotherapies that release the brakes on the [immune system](#), an approach which was awarded the Nobel Prize in Physiology or Medicine this year.

This research shows that taking into account the interaction between immunotherapies and tumor heterogeneity could contribute to the development of optimum therapeutic combinations and sequences.

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**More information:** Idan Milo et al, The immune system profoundly restricts intratumor genetic heterogeneity, *Science Immunology* (2018). [DOI: 10.1126/sciimmunol.aat1435](https://doi.org/10.1126/sciimmunol.aat1435)

Provided by Pasteur Institute

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