October 14, 2020

Health & Physiology

Tumor Infiltrating Immune Cells Predict Patient Outcomes

by Caroline S Jansen [1] | MD/PhD Student; Haydn T Kissick [1] | Assistant Professor

[1]: Department of Urology, School of Medicine; Winship Cancer Institute; Department of Microbiology and Immunology, School of Medicine; Emory Vaccine Centre, School of Medicine; Emory University , Atlanta, GA, USA

This Break was edited by Max Caine, *Editor-in-chief* - TheScienceBreaker

ABSTRACT

Tumor infiltration of a certain immune cell, a CD8 T-cell, is known to predict patient outcomes in many cancers, and we found that this same parameter predicts disease free survival in kidney cancer patients. Our results suggest that these cells are maintained by stem-like cells that reside in densely populated immune outposts inside tumors.

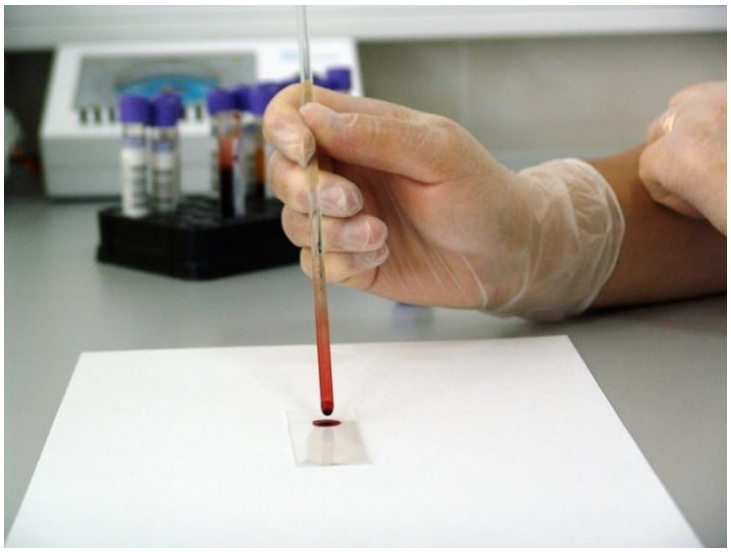

Image credits: Pixabay

There has been much investigation into the role of the body's immune system in fighting or promoting the development of cancer, and in recent years, one particular type of immune cell, the CD8 T cell, has been shown to be important for fighting cancer in many tumor types. These T cells are often described as 'killer' T cells, due to their ability to kill infected or damaged cells. Many popular immunotherapies work by boosting these T cells, but little investigation has been done to understand why some cancers or some patients' tumors may harbor many T cells, whereas others have very few. Our study sought to answer this question – why do some tumors have many T cells in them, while others do not? To answer this question, we studied the T cells in tumors from patients with kidney, bladder, or prostate cancer. With these samples, we measured the characteristics of each patient's immune system inside their tumor, such as by counting various immune cells or describing the features of these immune cells.

We first counted the number of CD8 T cells in each kidney cancer patient's tumor. When we did this, there was a wide variation in the number of T cells in patients' tumors. When we stratified patients into those with 'high' or 'low' CD8 T cell infiltration, we found that patients with high T cell infiltration had significantly improved disease free survival, so these patients with many T cells in their tumors lived cancer-free for longer after surgery than did patients with few T cells. Having made this observation, we

then investigated why these patients had more or less T cells in their tumors, and what we found was that CD8 T cells in a patient's tumor are maintained by a subgroup of these cells that have stem cell like properties. These stem-like CD8 T cells had been previously reported in mouse models, but in those studies were only found in lymphoid tissue, which is the specialized tissue that serves as home base for the immune system. Thus, our finding of these stem-like CD8 T cells in the peripheral, tumor tissue was novel and surprising, prompting further investigation into what other cells might associate with these stem-like CD8 T cells in tumors. .

By developing and employing innovative quantitative imaging analysis techniques, we found that stem-like CD8 T cells in tumors are usually found in close proximity with another type of immune cell, called an antigen presenting cell. These aggregates seemed to form a sort of immune outpost, wherein the immune system organizes a way to resupply the population of tumor fighting T cells directly within the tumor tissue. When we assessed the density of these immune outposts—aggregates of stem-like CD8 T cells and antigen presenting cells—in tumors, we found that this measurement predicted patient outcomes similarly to quantifying CD8 T cell infiltration. When patients had a high density of tumor immune outposts, they had significantly improved disease-free survival, whereas patient's with sparse tumor immune outposts had inferior disease-free survival.

In summary, our study found that measuring CD8 T cells in tumors can predict patient outcomes. We suppose that the absence or loss of these immune outposts may explain the paucity of T cells in some patients. Importantly, these findings may represent a new way of understanding how cancer can evade the immune system and could provide key context in future studies to understanding how what may govern a patient's response to immunotherapies, such as immune checkpoint blockade.