Q&A: Researchers discuss identifying potential new protein targets for melanoma therapeutics

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Yu-Hwa Huang, Ph.D. and Charles Yoon, MD, of the Department of Medicine and Department of Surgery at Brigham and Women's Hospital respectively, are co-lead authors of a paper titled "High-dimensional mapping of human CEACAM1 expression on immune cells and association with melanoma drug resistance," published in Communications Medicine. In this article, they discuss their findings.

**How would you summarize your study for a lay audience?**

Some proteins, such as programmed cell death protein 1 (PD1), can stop the immune system from attacking cancer cells and, therefore, support the growth of cancer. Therapies targeting these proteins can be highly effective, but tumors can become resistant.

We applied a method to detect proteins at a single-cell level to uncover human carcinoembryonic antigen cell adhesion molecule 1 (CEACAM1) patterns in melanoma. We found that increased CEACAM1 expression levels on multiple different immune cell types was associated with tumors resistant to cancer therapy. This points us to a new potential target for therapy for patients with melanoma resistant to treatment.

**What knowledge gaps does your study help to fill?**
It is important for researchers to identify factors involved in anti-tumor resistance to develop effective cancer therapies. Previous research has revealed that CEACAM1 inhibits an immune response and its levels have been associated with poor patient outcomes.

**How did you conduct your study, and what did you find?**

By using mass cytometry, we created and used a human CEACAM1-specific antibody to provide global insights into the potential cellular basis for CEACAM1's immune role in melanoma, its association with the state of treatment and its expression relative to PD1 and PD-L1. We discovered that CEACAM1 is found on specific groups of immune cells (including subsets of B cells, monocytic cells, dendritic cells and T cells) in the tumor microenvironment and its presence is associated with treatment-resistant cancer.

**What are the implications?**

We now understand how CEACAM1 is connected to the immune system's response to melanoma and how it compares to other proteins involved in immune regulation. Our work highlights CEACAM1 as a potential therapeutic target for melanoma patients whose tumors are resistant to other therapies, such as immune checkpoint inhibitors.

**What are the next steps?**

We are eager to understand the immune cell-type specific mechanisms by which CEACAM1 operates in the tumor microenvironment.

**More information:** Yu-Hwa Huang et al, High-dimensional mapping of human CEACAM1 expression on immune cells and association with
Provided by Brigham and Women’s Hospital

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