



REALIZING THE PROMISE

by **Kristen L. Mueller**

For cancer treatment, 2011 marked the beginning of a new era. Fifteen years after *Science* published a paper showing that antibodies blocking an inhibitory receptor on the T cell surface unleash these T cells to kill tumors in mice, the U.S. Food and Drug Administration approved such an antibody for use in treating melanoma. The idea of harnessing immune cells to fight cancer isn't new, but only recently have scientists amassed enough clinical data to demonstrate what a game-changer cancer immunotherapy can be.

The underlying basis of cancer immunotherapy is to activate a patient's own T cells so that they can kill their tumors. Reports of amazing recoveries abound, where patients remain cancer-free many years after receiving the therapy.

Given this success, what is the best pathway forward? Currently, only a fraction of patients respond to immunotherapy, and immunotherapy only works in a subset of cancers. Understanding why is essential. This will require a multifaceted approach that involves designing innovative clinical trials to access important patient samples and determining which cancer therapies can be combined to give the best efficacy. Basic science is also critical: Unraveling the complex interplay of cells in the tumor microenvironment, understanding how tumor mutational load influences therapeutic efficacy, and dissecting how our resident microbes shape the development and treatment of cancer will also provide important insights that will forge the way toward improving existing therapies and developing new ones. This field is no stranger to obstacles, so the future looks very promising indeed.

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