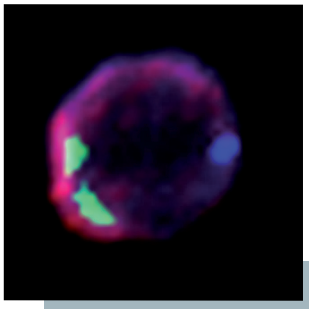

salk
Where cures begin.

Susan Kaech

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The Problem

Every time we encounter a new virus or bacteria, our immune system preserves a memory of the invader so that it can protect us faster the next time we're exposed to it. In the case of viruses, immune cells called T cells are activated by that first encounter and begin to divide and develop into subtypes, some of which (known as memory T cells) are responsible for remembering that specific virus. In fact, vaccines take advantage of this mechanism to help us develop long-term immunity to viral diseases like polio or measles. But how exactly this process works—and why it sometimes fails—isn't fully understood.

The Approach

Susan Kaech aims to understand how memory T cells are produced during infection and vaccination, how they function and why they can fail to induce long-term immunity during immunization. Her lab has been a leader in using genetic and molecular tools to identify the genes and signaling molecules involved in generating two specific types of memory T cells, CD4 and CD8, from precursor cells during both acute and chronic viral infections. She and her team discovered more than half a dozen important regulatory genes, as well as several types of key molecules called cytokines, which influence memory T cell development. Kaech is also interested in how T cells are metabolically regulated, and how their differentiation and function can be altered by nutrient availability during infection and in tumors. In particular, she seeks to learn how T cell behavior is suppressed by tumors, in order to create better therapies for cancer using the body's own immune system—an innovative and rapidly moving field called cancer immunotherapy.

The Innovations and Discoveries

- Kaech discovered the cellular precursors of long-lived memory CD8 T cells that form following viral infection in mice, based on increased expression of a gene called *IL-7*, which is required both for T cell development into mature memory cells and for their long-term survival.
- Kaech used a technique called gene expression profiling to compile a database of clusters of genes that are associated with different T cell types, which her lab made available for use by other researchers.
- Kaech, in the course of investigating models of melanoma and lung cancer in mice, found that stimulating a receptor on T cells called CD40 suppressed tumor growth.

For more information, please visit:
www.salk.edu/scientist/susan-kaech

Aging, Cancer, Cellular Biology, Immunology