Virus infection sheds light on memory T cells living in our skin

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Very recently, researchers discovered an important population of immune cells called memory T cells living in parts of the body that are in contact with the environment (e.g., skin, lung, GI tract). How these "resident" memory T cells are generated was unknown, and their importance with regard to how our immune system remembers infection and how it prevents against re-infection is being studied intensively.

Now, a study by a Brigham and Women's Hospital (BWH) research team led by Xiaodong Jiang, PhD, research scientist and Thomas S. Kupper, MD, Chair of the BWH Department of Dermatology, and the Thomas B. Fitzpatrick Professor of Dermatology at Harvard, has used a model involving a vaccinia virus infection of the skin to answer important questions about how these newly discovered cells protect us.

The study will be electronically published on February 29, 2012 in *Nature*.

Jiang and Kupper used skin infection with vaccinia virus to study the relative roles of central memory T cells (T cells that circulate in the bloodstream) and resident memory T cells in protective immunity. What they found was that after infection, disease-specific T cells were rapidly recruited not only to the infected site, but also to all areas of skin.

They further showed that multiple additional infections at future time points led to an accumulation of even more of these resident memory T cells in the skin, and that these cells remained in the skin for long

periods of time.

Finally, Jiang and Kupper showed, for the first time, that resident memory T cells were the most important protective immune cells in fighting infection—much more important than central memory T cells, which were ineffective at rapid immune protection by themselves.

"Finding that resident memory T cells were so much more important than central memory T cells in protective immunity was surprising, and makes us re-think current immunologic dogma," said Kupper.

While skin was used as a model system in this study, the results can be extrapolated to the lungs, GI tract, and other epithelial tissues that contact the outside world.

The findings suggest that the most important elements of T cell memory to infectious diseases may reside in tissues, rather than in the blood.

"The immune system provides the right T cells, at the right place and time, to protect us from an environment that is full of potentially harmful pathogens." said Kupper.

Also, the findings imply that vaccines should be optimized to create precisely this kind of long lasting tissue-resident T cell immunity, and that the current focus on antibody production may not be as important.

"This work suggests a fundamental reassessment of how vaccines are both constructed and delivered," said Kupper. "These results have altered the way we think about the immune system and vaccination for infectious diseases."

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