Medical Xpress

Immune system fighters speak in patterns of proteins, prefer squishy partners

October 26 2012

When talking to the key immune system fighters known as T-cells, it helps to speak their language. Now researchers from Columbia University in New York, N.Y., and the University of Pennsylvania in Philadelphia have discovered two new conditions for communication that may help scientists one day harness the power of T-cells to fight diseases such as cancer. The team will present its findings at the AVS 59th International Symposium and Exhibition, held Oct. 28 – Nov. 2 in Tampa, Fla.

T-cells flow freely throughout the body and communicate with their partner T-cells, in part, through signals expressed in proteins on their surfaces. But unlike other freely circulating cells, T-cells are a bit more touchy-feely. "They stick to each other; they kind of crawl on each other," says lead researcher Lance Kam, a biomedical engineer at Columbia University. The cells spread onto each other; they put new proteins into the interface between them. And these proteins at the interface, Kam continues, "organize into some really beautiful patterns." One arrangement is shaped like a bulls-eye.

Kam's team wanted to find out whether the spacing of the proteins in these cellular tete-a-tetes plays a part in the communication process, and whether the squishiness or rigidity of the cells has any effect on the conversation. Using a custom-made artificial cell, they tested whether the real T-cells "liked" certain configurations of proteins on its surface. Not only did the team find that the spacing of the signaling proteins mattered for the proper activation of T-cells, but the rigidity of the surface mattered as well. Mouse cells – like most cells – preferred a more rigid surface, but human T-cells liked squishier partners.

Knowing that these two conditions figure into T-cell activation may help drug researchers design optimal T-cell habitats in which to grow huge T-cell armies to fight cancers and other diseases. While this reality is several years away, the two new findings that the team presents will help advance the harnessing of T-cells for immunotherapy. This type of cancer treatment involves removing a patient's T-cells, expanding their numbers, training them to recognize cancer cells, and re-injecting this fortified army back into the patient. Understanding what kind of partner the T-cells prefer could help to make this process more effective.

"We think that by learning more about the natural interface, the natural signals that activate the cells, we can get better control over the cell expansion process," Kam says, resulting in larger production of high-quality T-cells that can fight cancer.

Provided by American Institute of Physics