Team studies T cell activation with nanoparticles

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A University of Alberta-led research team has taken a major step forward in understanding how T cells are activated in the course of an immune response by combining nanotechnology and cell biology. T cells are the all important trigger that starts the human body's response to infection.

Christopher Cairo and his team are studying how one critical trigger for the body's T cell response is switched on. Cairo looked at the molecule known as CD45 and its function in T cells. The activation of CD45 is part of a chain of events that allows the body to produce T cells that target an infection and, just as importantly, shut down overactive T cells that could lead to damage.

Cairo and his team are using nanotechnology to study how individual molecules interact in live cells. The method allows them to view the movement of these molecules at nanometre scale, so they can "see" the molecular interaction. To see the movement of a protein, researchers labeled the molecules with nanoparticles and then observed the particles using a microscope. This study is the first to analyze CD45 this way, but the most important advance is their observation of how CD45 interacts with other molecules in the cell to carry out its function.

The team found that CD45 is tethered to the cell cytoskeleton, a meshwork of proteins that gives the cell its shape and structure. They also observed how particular proteins hold CD45 onto the cytoskeleton.

"It's one thing to observe molecular binding in a test tube," said Cairo. "It's quite another to see how the process happens in a live cell." Cairo says a better understanding of the immune regulator CD45 could eventually lead researchers to a point where they can use it as a way to control T cells.

"You could imagine that if you knew when CD45 was turned on or how each molecular partner helps it work, you might be able to take advantage of that and design an inhibitor," said Cairo. "Of course, that's a long way off; at this point, we're trying to understand the molecular mechanisms involved."

The work of Cairo and co-authors is in the April edition of *The Journal of Biological Chemistry.*

Provided by University of Alberta