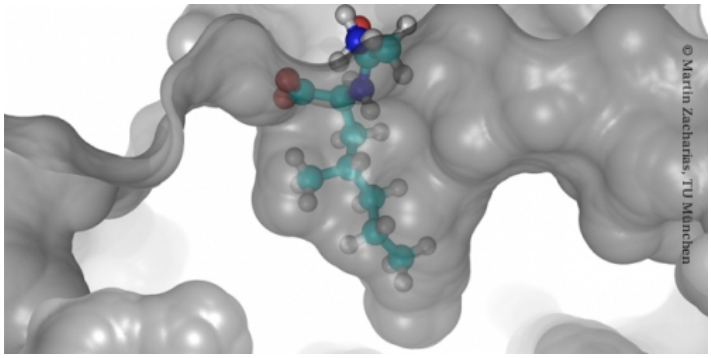
Discovery by Jacobs University researchers facilitates detection of immune cells that fight tumors and viruses



Computer simulation of a dipeptide bound to an MHC multimer. The function of these chemical compounds to facilitate the production of MHC multimers for the detection of T cells was discovered by the Springer group at Jacobs University

In its fight against tumors, the human immune system uses so-called T cells that can recognize and kill cancer cells. To detect and follow such anticancer immune responses, doctors and researchers make use of so-called MHC multimers. These are proteins that specifically bind to the surface of the T cells and tag them with a fluorescent label so that they can be seen through the microscope or by other means, allowing researchers to calculate how many T cells that react with the tumor are present in the patient.

January 20, 2015

Such MHC multimers have to be designed and produced specifically for each patient. Currently this process takes weeks or even months. The research group led by **Sebastian Springer**, Professor of Biochemistry and Cell Biology at Jacobs University, has now found a novel way of producing MHC multimers much faster (within minutes) and cheaper than before, expanding the possibilities for T cell research. Their work was published in the ***Proceedings of the National Academy of Sciences of the USA*** at the beginning of January.*

"Imagine that the MHC multimers are made of two things: an MHC protein and a small ligand, which is basically a piece of the tumor", explains Prof. Springer. "The complex of MHC protein and ligand binds to the T cell, but the type of ligand is what distinguishes different MHC multimers from each other. Up to now, the MHC protein and the ligand had to be put together in a test tube and subjected to a very long procedure, at the end of which you got the multimer. Now, with the method that we discovered, you simply take a finished multimer and exchange the ligand for the one that you need, in a matter of minutes."

The exchange reaction is driven by chemical compounds known as dipeptides, and this is what the researchers in Prof. Springer's group have discovered.

"We have studied MHC proteins for fifteen years, and looked very hard at their structure and ligand binding", adds Prof. Springer. "Out of our basic research, this very significant application came naturally. It's actually applicable not just to immune responses against cancer but researchers can also use it to follow immune responses against viruses, such as HIV, in order to understand them better and to design improved vaccines."

Following the award of a patent, Jacobs University has now signed a licence contract with a German company that will produce the MHC multimers according to the novel method.

The work of Prof. Springer's group was done in collaboration with the groups of **Prof. Hans-Georg Rammensee** and **Prof. Stefan Stevanović** in Tübingen, Germany, where the binding of ligands to MHC proteins was discovered almost thirty years ago. A Jacobs PhD student and a Master student from the MoLife program at Jacobs contributed to the discovery.

**Publication: Sunil Kumar Saini, Heiko Schuster, Venkat Raman Ramnarayan, Hans-Georg Rammensee, Stefan Stevanović, and Sebastian Springer: Dipeptides catalyze rapid peptide exchange on MHC class I molecules. Proceedings of the National Academy of Sciences of the United States of America 112 (2015), p. 202-207.*
More info: www.pnas.org/content/112/1/202.abstract

Contact:
Sebastian Springer | Professor of Biochemistry and Cell Biology
s.springer@jacobs-university.de
www.jacobs-university.de/springerlab