Antigen encoding in immune modulation.

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Editorial

Immune system is very important and crucial, all the time it has to be ready to respond to a variety of external threats that we are constantly exposed to, as well as internal threats, like cancer cells. Due to this the thin balance of immune-regulation becomes vital for all sort of defensive mechanism. Overactive or aberrant immunity can create problems of their own; turning it off is just as important. The immune response, and the signals and cells it uses, is very complex, as turning it on. T cells are critical players in immunity; they can move through the body depending upon the physiological need and Pathological trigger. Researchers have now learned more about measuring the strength of the T cell response. It has been difficult, until now, to see how well an antigen could activate immunity. If researchers can now determine antigen strength, then that data could potentially predict the efficacy of a vaccine or immunotherapy.

Globally, scientists have tried multiple parallel experiments that were performed with robotics, to observe how T cells reacted to different conditions or antigens. Machine learning was used to analyse the data that was generated, and mathematical models were created that revealed patterns; this showed that there are some simple rules governing what seems to a set of very complex variables. The cytokines that were triggered during the immune response appear to convey information about what type of antigen was found on the invader. The research also indicated that there are six classes of antigens that each activates distinct cellular responses, and not only three as commonly thought.

Systems immunology lacks a framework with which to derive theoretical understanding from high-dimensional datasets. So, Robotic platform with machine learning to experimentally measure and theoretically model CD8+ T cell activation was done. High-dimensional cytokine dynamics could be compressed onto a low-dimensional latent space in an antigen-specific manner (so-called “antigen encoding”). Antigen encoding to model and reconstruct patterns of T cell immune activation was done. The model delineated six classes of antigens eliciting distinct T cell responses. We generalized antigen encoding to multiple immune settings, including drug perturbations and activation of chimeric antigen receptor T cells. Such universal antigen encoding for T cell activation may enable further modelling of immune responses and their rational manipulation to optimize immunotherapies.

These experiments are hope of coming healthcare therapeutics which supports the idea that immune responses exist along a spectrum rather than as a binary “on-off” switch, there may be different levels of immune response that can be tuned to the right level of alert depending on the complexity of the situation."

This research could lead to more effective immunotherapies in future that use T- cells that specifically target an individual's tumors.

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