New study shows how B cells may generate antibodies after vaccination

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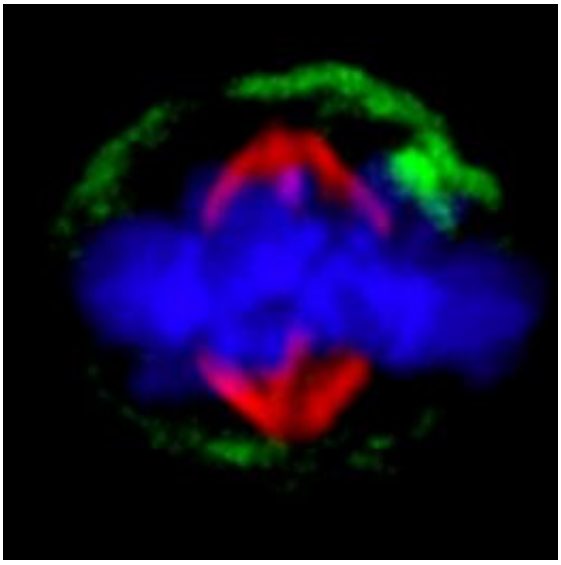

This shows a cell finishing division, with one of the linked daughter cells inheriting more of the stained green protein. Credit: Burton Barnett, Perelman School of Medicine at the University of Pennsylvania

Steve Reiner, MD, professor of Medicine, and Burton Barnett, a doctoral student in the Reiner lab at the Perelman School of Medicine at the University of Pennsylvania, have shown how immune cells, called B lymphocytes, are able to produce daughter cells that are not equal, a finding that might explain how lifelong antibodies are made after vaccination.

How do immune cells make daughter cells that are different form one another, rather than splitting into identical daughter cells? The team's paper, published this week online in *Science*, shows how one cell type can reliably produce cell diversity. Motile B cells that don't have life-long attachments with other cells, as say a layer of skin cells do, can receive cues from other immune cells, namely helper T cells, so that they attach to each other and influence the outcome of B-cell division. The researchers showed that a T cell forms a temporary attachment to a B cell, which induces the B cell to divide, resulting in daughter cells that are different on the level of the proteins they inherit. The pairing and dividing occurs in the lymphoid organs, such as the spleen, that respond to vaccination.

B cells circulate throughout the body via the bloodstream, and upon infection are recruited to fight the offending germ. During this fight, the recruited B cells must generate multiple types of daughter cells to be effective. One of these cells makes the antibodies that destroy the germ, and are what make vaccinations effective. The other type of cell improves the quality of the antibodies that can be made.

The Penn team found that B cells segregate a transcriptional protein called Bcl6, the protein receptor for interleukin-21, and another protein called atypical PKC to one side of the plane of division during cell replication, generating unequal inheritance of fate-altering molecules by daughter cells. These three proteins tell the B cell which type of daughter cell to become; and by making daughter cells with more or less of these proteins, B cells can give rise to cells that are antibody factories through division.

The team is interested in using this discovery to make better vaccines. They are also expecting that the ability of wandering immune cells to give birth to non-identical daughters may explain how our blood cells can also turn into cancers like leukemia.

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