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New findings on B cells may improve vaccine design

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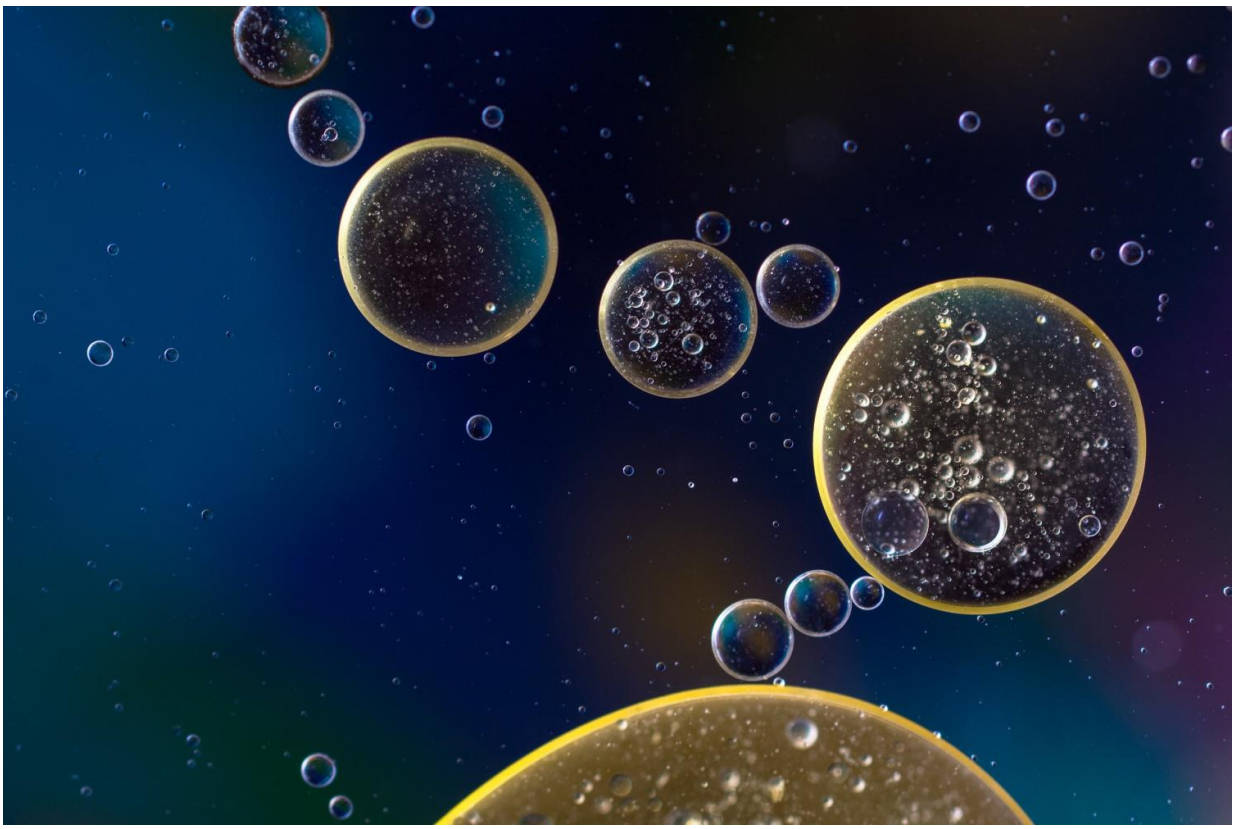

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Our bodies can fine-tune the immune response to an infection and make it proportional to the threat at hand. New research from Karolinska Institutet in Sweden describes how B lymphocytes, the immune cells that

make antibodies, choose between different cell fates to balance the magnitude of the acute immune response and the memory response that protects against future threats. The study, published in *Immunity*, may contribute to the optimisation of vaccines to fight viruses or other pathogens.

An efficient immune response to infections and vaccines requires antibodies, which are produced by specialized effector B cells of the immune system. Effector B cells produce large amounts of antibodies that fight off the acute threat, while memory B cells protect us from future threats by quickly generating new effector B cells producing antibodies if the intruder returns. To date, our understanding of how the immune system controls the balance between effector and memory B cells has been limited.

An early wave of memory cells

In a new study, researchers at Karolinska Institutet have studied the generation of B cells early after infection and vaccination in animal models. They found that B cells early on make cell fate decisions that have consequences for the balance between the effector and memory response.

"We show that there is an extensive early wave of memory cells that seems to be a 'default' fate for many activated B cells, and that these early memory cells seem to be equally long-lived as the traditional late wave of memory cells," says Taras Kreslavsky, assistant professor at the Department of Medicine, Solna, Karolinska Institutet, who led the study. "The early memory cells are kept as a reserve and can rapidly be re-activated and transformed into effector B cells if the threat increases. This way, our bodies can fine-tune the antibody response proportionally to the threat level."

Could improve vaccine design

The research team also shows that the early memory response is evolutionarily conserved, which opens the possibility of influencing the B cell response in humans through vaccination.

"We believe that rational vaccine design may enable manipulation of the type of B cells that are formed and thus make the body's defense more effective," says the study's first author, Vassilis Glaros, a doctoral student in Taras Kreslavsky's research team.

The researchers plan to further study how the early B cell response can be modulated and the consequences of skewing the response between effector and memory cell fates.

Crucial to our body's defense

"The memory B cells are crucial to our body's defense against evolving pathogens, such as SARS-CoV-2 virus variants which cause COVID-19," says co-author Sebastian Ols, a doctoral student in Karin Loré's research group at the Department of Medicine, Solna, Karolinska Institutet. "Our memory cells are better equipped at adapting and parrying new variants than our effector cells are, and it is therefore critical for vaccines to elicit diverse memory B cell responses."

More information: Vassilis Glaros et al, "Limited access to antigen drives generation of early B cell memory while restraining the plasmablast response", *Immunity* (2021). DOI: 10.1016/j.immuni.2021.08.017

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