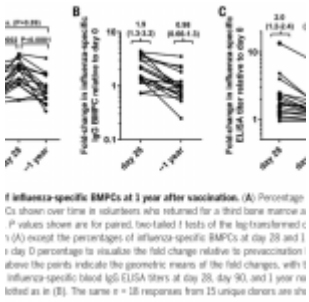
Why is flu vaccine induced immunity short-lived?



Viral strains that cause influenza (flu) change annually, as a result, a new flu vaccine that aims to induce immunity to new influenza strains is provided annually. One of the strategies of the flu vaccine pipeline is to develop a universal flu vaccine that could generate protective immunity to multiple influenza strains, without the need for annual vaccination. However, vaccine-induced influenza immunity declines rapidly presenting a challenge for long-term vaccine induce immunity. Bone marrow plasma cells (BMPCs) play an important role in maintaining serological IgG antibody (Ab) titres and have been shown to correlate with antigen-specific antibodies. Researchers (Davis et al.,) thus aimed to track BMPCs and Ab titres induced by flu vaccination in 53 volunteers.

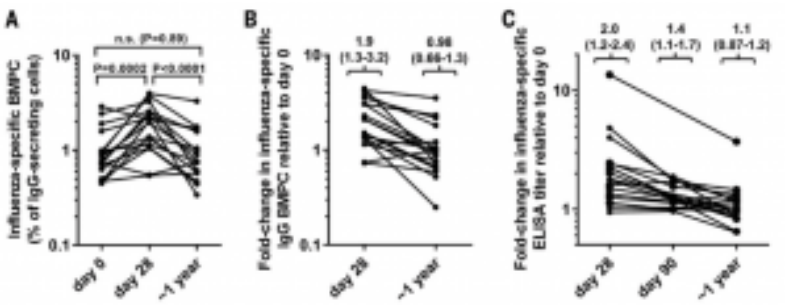


Fig. 3. Decline of influenza-specific BMPCs at 1 year after vaccination. (**A**) Percentage of influenza-specific IgG BMPCs shown over time in volunteers who returned for a third bone marrow aspiration ~1 year after vaccination. *P* values shown are for paired, two-tailed *t* tests of the log-transformed data. (**B**) Same data plotted as in (A) except the percentages of influenza-specific BMPCs at day 28 and 1 year are normalized to the day 0 percentage to visualize the fold change relative to prevaccination levels in each donor. Numbers above the points indicate the geometric means of the fold changes, with the IQRs in parentheses. (**C**) Influenza-specific blood IgG ELISA titers at day 28, day 90, and 1 year normalized to the day 0 titer and plotted as in (B). The same *n* = 18 responses from 15 unique donors are shown in all panels.

Davis et al., detected influenza-specific BMPCs and IgG/IgA Abs in volunteers before vaccination. This immunity was due to previous flu vaccination and flu episodes. New seasonal flu vaccination significantly increases influenza-specific BMPCs and IgG/IgA Ab titres, however, 1-year post-vaccination vaccine-induced immunity declined to similar levels as

baseline. Using clonotype-tracking researchers attributed this contraction of humoral immunity to loss of newly-generated vaccine-specific cells. These results present a potential challenge for a universal flu vaccination strategy as vaccine-induced immunity declines rapidly. Detection of robust immunity before recent vaccination suggests that there is hope for inducing life-long Ab immunity. Thus future vaccine strategies should aim to induce long-lived BMPCs that have *undergone gene expression and metabolic changes required to promote longevity.*

Journal Article: Davis et al., 2020. Influenza vaccine–induced human bone marrow plasma cells decline within a year after vaccination. Science

Summary by Cheleka AM Mpande