With cancer-causing HPVs depleted by vaccination, research suggests it's time to reevaluate screening strategies

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This artwork depicts a Finnish community-randomized HPV vaccination trial that demonstrated the efficient eradication of human papillomaviruses with the highest cancer risks and the niche occupation of the human papillomaviruses with lower cancer risks eight years post-vaccination if a gender-neutral strategy is applied. Credit: André Demony.

The vaccine against human papillomaviruses (HPVs) works, successfully preventing infections that cause genital warts, cervical cancer, and some other cancers related to the anus, genitals, head, and neck. But what happens to the remaining HPV population when the vaccine wipes the most notorious cancer-causing HPVs out of the picture? Other types of HPVs seem to fill the vacancy, researchers report November 8 in the journal *Cell Host & Microbe*.

The findings support vaccinating boys and girls and changing the current approach to HPV-related cancer screenings.

"Till this day, epidemiologists have said that vaccine-induced viral strain replacement, an ecological pathogen-host response, is very unlikely to happen among human-infecting papillomaviruses that cause cancer because they mutate rather slowly," says evolutionary geneticist Ville Pimenoff of Karolinska Institutet, Sweden, and University of Oulu, Finland.

But it appears that, just as natural selection shaped the evolution of humans, HPVs are also subjected to new evolutionary pressures posed by vaccines.

"Based on the largest community-randomized vaccination trial data, we observe strain replacement for the first time in HPVs."

The research team drew data from a clinical trial assessing the efficacy of the HPV vaccine and cervical cancer prevention screenings. More than 60,000 young women born between 1992 and 1994 from 33 different cities in Finland participated in the trial.

Based on their cities, these women were randomly assigned to one of the three vaccination strategies: no HPV vaccination, girls-only vaccination, or gender-neutral vaccination—where boys and girls were vaccinated. To

explore the long-term changes of HPV infection patterns at community levels, researchers invited these women for a follow-up cervicovaginal sampling at four and eight years post-vaccination when they turned 18 and 22.

The results showed that the HPV vaccine markedly depleted targeted cancer-causing HPV types at four years after vaccination in the gender-neutral and girls-only vaccination communities. In communities where boys and girls were vaccinated, there was also an increase of the untargeted HPV types with lower cancer risks, "replacing" vaccine-targeted strains, between four and eight years after vaccination.

"HPV vaccine is effective to clear most cancer-causing HPVs, and what we have observed here is the subsequent new equilibrium of untargeted HPV types interacting with the host communities," says Pimenoff.

The gender-neutral vaccination communities also had a more diverse population of untargeted HPVs compared to the girls-only vaccination communities. In fact, the HPV diversity level among gender-neutral vaccination communities rebounded to similar levels as those who are not vaccinated but without the vaccine-targeted HPVs. The diversity levels imply that particular selection processes are affecting the remaining non-targeted HPV types post-vaccination.

"Importantly, the increase of vaccine-untargeted low-cancer-risk HPVs do not increase the risk of cancer," Pimenoff noted. Past studies have shown that infections from these untargeted HPV strains are unlikely to lead to cancer.

Taken together, the researchers suggest that policymakers and clinicians should redesign or stop the current HPV screening approaches for cervical cancer prevention, which include testing for HPVs with lower cancer risks. With the increase of low-cancer-risk HPV types in the

vaccinated population, "current screening is likely to result in over-diagnosing individuals who are not at risk," says Pimenoff. "That would be a huge burden for the health care system."

Understanding the newly emerging distribution of HPV population in the post-vaccinated world is important for screening, and hence, public health. The team is now analyzing data from the cohort's 16-year post-vaccination follow-up. Pimenoff is also investigating new ways to measure the cancer risk of the remaining HPVs in vaccinated communities.

"Our results are very timely and in line with WHO's goal of eradicating cervical cancer," says Pimenoff. "The data elegantly show that we should definitely vaccinate boys and girls globally to benefit from the herd effect to clear the cancer-causing HPVs and the subsequent diseases even in populations with moderate vaccine coverage."

More information: Ecological diversity profiles of non-vaccine-targeted HPVs after gender-based community vaccination efforts, *Cell Host & Microbe* (2023). DOI: 10.1016/j.chom.2023.10.001. www.cell.com/cell-host-microbe … 1931-3128(23)00399-2

Sergio Ponce-de-Leon et al, Harnessing the post-vaccination era: Do emerging HPV types represent a new threat?, *Cell Host & Microbe* (2023). DOI: 10.1016/j.chom.2023.10.013 , www.cell.com/cell-host-microbe … 1931-3128(23)00417-1

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