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Preventive Vaccines: Triggering an Immune Response

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Last winter, it surprised and frustrated some older Americans that they were last in line for the H1N1 flu vaccination. But most people over 60 weren't getting as sick from the H1N1 virus as children and young adults. One reason involved the immune system and its long-term memory: The bodies of many older people had apparently "seen" similar viruses decades before, and had built up some defenses against H1N1. It is almost as if they had been vaccinated decades ago.

Vaccination (or immunization) generally starts with the introduction of something the body can recognize as a harmful foreign invader—dead or weak viruses, or even proteins that are unique to the surface of a disease-causing pathogen. Our immune system "learns" these signals and can store that information in long-lived immune cells. If infected later, a person's immune system is ready to kick into action, and can destroy the invading cells.

Knowing that certain viruses can cause cancer—cervical and liver cancer, in particular—vaccine researchers began experimenting with preventive cancer vaccines 50 years ago. The Food and Drug Administration approved the first one, against hepatitis B virus, in 1981 and has now also approved Gardasil (in 2006) and Cervarix (in 2009) for females to prevent infection by several types of human papillomavirus. (The FDA approved Gardasil for boys and young men in late 2009 to prevent genital warts.) Chronic hepatitis B infection can lead to liver cancer, and HPV causes most of the nearly 500,000 worldwide cases of cervical cancer diagnosed each year, and has also been linked to certain cancers of the anus and the head and neck.

Both vaccine types work similarly, and both are extremely effective. They stimulate our bodies to make antibodies matching the virus, so if ever infected, those antibodies are ready to help identify and fight them off.

Now, researchers at Johns Hopkins University in Baltimore and elsewhere are researching entirely new cervical cancer vaccines that fight existing viral infections, offering hope to women who have already been infected with a high-risk type of HPV. It is this technique—which engages the immune system through infection-fighting T cells that seek out and destroy cancer cells—that gets many oncologists and patients particularly excited.