

# Preventing and Treating Cancer with Vaccines

## Key Points

- Cancer vaccines try to prevent cancer from forming (**prophylactic vaccines**) or treat cancer that already exists (**therapeutic vaccines**).
- Two prophylactic vaccines have been approved by the U.S. Food and Drug Administration (FDA) to prevent viruses that can lead to cancer: 1) hepatitis B vaccine; and 2) Gardasil™, the human papillomavirus (HPV) vaccine.
- To date, no therapeutic vaccines have been approved by the FDA, but scientists are currently testing many types of vaccines in large scale clinical trials.

### 1. What is a vaccine?

A vaccine is a substance that teaches the immune system to recognize and defend the body against a disease. Vaccines use weakened or killed viruses, bacteria, or other substances (including those on cancer cells) that can be recognized by the immune system and trigger an immune response in the body. Putting the immune system on alert against viruses prevents people from being infected with the viruses.

### 2. What are cancer vaccines?

Cancer vaccines try to prevent cancer from forming (**prophylactic vaccines**) or treat cancer that already exists (**therapeutic vaccines**). Prophylactic vaccines are given to healthy people and are designed to protect our bodies from viruses and diseases that cause cancer. Therapeutic vaccines are given to cancer patients and are designed to strengthen the body's natural defenses against an existing cancer.

### 3. Why does the immune system need a vaccine to help fight cancer?

The **immune system**, which is made up of special cells, tissues, and organs, is the body's natural defense against disease. The immune system attacks organisms and other substances that invade our bodies and cause illness. In most cases, the immune system does a great job of keeping people healthy and preventing infections.

Cancer cells can sometimes form and spread throughout the body without being “seen” by the immune system. One reason is that cancer cells look a lot like normal cells. As a result, cancer cells sometimes escape recognition by the immune system and are not attacked. Another reason is that cancer cells may release certain types of molecules that slow down the immune system's attack against them. Scientists hope that knowing more about the immune system's response to cancer can be used to design the most useful cancer vaccines.

#### **4. What cancer vaccines are ready for use in the United States right now?**

At this time, two cancer preventive vaccines have been licensed by the U.S. Food and Drug Administration (FDA): 1) hepatitis B vaccine; and 2) Gardasil™, the human papillomavirus (HPV) vaccine. The hepatitis B vaccine prevents infection with the hepatitis B virus, which may cause some forms of liver cancer. Gardasil™ prevents infection with HPV types 16 and 18, which cause 70 percent of cervical cancers. Gardasil™ also protects against infection with HPV types 6 and 11, which cause 90 percent of genital wart cases.

Currently, no cancer treatment vaccines exist. However, scientists are currently testing many types of vaccines in large scale clinical trials. More information about these trials may be found on the National Cancer Institute clinical trials web site (<http://cancer.gov/clinicaltrials/search>), and the National Institutes of Health clinical trials web site (<http://clinicaltrials.gov>).

#### **5. Who should get a cancer vaccine and when?**

The hepatitis B vaccine is usually given as a series of 3 or 4 shots. All children should get their first doses of the hepatitis B vaccine at birth and should have completed the vaccine series by 6-18 months of age. Additionally, children and adolescents through 18 years of age who did not get the vaccine when they are younger should be vaccinated. Adults at risk for hepatitis B infections are also encouraged to get vaccinated if they have not done so already.

The Gardasil™ vaccine for the prevention of some types of HPV is given as a series of 3 shots within a 6 month period. Gardasil™ is proven to be effective only if given before infection with HPV, so it is recommended that it be given before an individual is sexually active. The FDA has approved Gardasil™ for use in females 9 to 26 years of age.

Talk to your doctor and family members before making any choices about cancer vaccines. You may be able to try a cancer vaccine being tested in a clinical trial for an advanced cancer once all other treatments have been tried, when your regular treatment no longer works, or in combination with other treatments. Remember, only you and your doctor can decide what is best for you.

#### **6. What is the future of cancer vaccines?**

There are hopeful results from early-stage clinical trials, which are testing therapeutic vaccines against a few types of cancers. Researchers still have a lot of work to do to clearly show that therapeutic vaccines work. It is possible that these vaccines will be more useful when combined with other treatments or that a series of vaccinations may be needed for a patient to benefit from treatment.

Much work also remains to create prophylactic vaccines that protect our bodies from viruses and other germs that cause cancer. There also appears to be much potential for utilizing therapeutic cancer vaccines for preventing premalignant conditions into life-threatening cancer.

Current cancer vaccine research is creating new ways of preventing and treating cancer. Scientists hope their efforts will make vaccines that target many cancers are safe, easy to use, and far lower in cost than treating cancer.

#### **Sources:**

American Cancer Society  
[http://www.cancer.org/docroot/ETO/content/ETO\\_1\\_4X\\_Cancer\\_Vaccines\\_Active\\_Specific\\_Immunotherapies.asp?sitearea=ETO](http://www.cancer.org/docroot/ETO/content/ETO_1_4X_Cancer_Vaccines_Active_Specific_Immunotherapies.asp?sitearea=ETO)

Centers for Disease Control and Prevention  
[www.cdc.gov/vaccines/pubs/vis/downloads/vis-hep-b.pdf](http://www.cdc.gov/vaccines/pubs/vis/downloads/vis-hep-b.pdf)  
[www.cdc.gov/vaccines/pubs/vis/downloads/vis-hpv.rtf](http://www.cdc.gov/vaccines/pubs/vis/downloads/vis-hpv.rtf)

National Cancer Institute  
<http://www.cancer.gov/clinicaltrials/learning/cancervaccines/page1>  
<http://www.cancer.gov/newscenter/pressreleases/cancervaccines>

National Institute of Allergy and Infectious Diseases  
[http://www3.niaid.nih.gov/research/topics/HIV/vaccines/reports/forum\\_slides/slide02.htm](http://www3.niaid.nih.gov/research/topics/HIV/vaccines/reports/forum_slides/slide02.htm)

**Related Resources:**

National Cancer Institute  
Telephone: 1-800-4-CANCER  
Web site: <http://www.cancer.gov>

American Cancer Society  
Telephone: 1-800-ACS-2345  
Web site: <http://www.cancer.org>