

## Human Papillomaviruses and Cancer

### Key Points

- Human papillomaviruses (HPVs) are a group of more than 150 related viruses, of which more than 40 types can be sexually transmitted. Some sexually transmitted HPVs cause genital warts, whereas others, called high-risk or oncogenic HPVs, can cause cancer (see Question 1).
- Genital HPV infections are very common, but most occur without any symptoms and go away without any treatment over the course of a few years (see Questions 1, 4, and 5).
- Sometimes, HPV infections can persist for many years. Persistent infections with high-risk HPVs are the primary cause of cervical cancer. HPV infections also cause some cancers of the anus, vulva, vagina, penis, and oropharynx (see Question 3).
- The U.S. Food and Drug Administration has approved two vaccines, Gardasil® and Cervarix®, that are highly effective in preventing infection with the two HPV types that cause most cervical cancers. Gardasil also prevents infection with the two HPV types that cause most genital warts (see Question 6).

### 1. What are human papillomaviruses, and how are they transmitted?

Human papillomaviruses (HPVs) are a group of more than 150 related viruses. They are called papillomaviruses because certain types may cause warts, or papillomas, which are benign (noncancerous) tumors.

Some HPVs, such as those that cause the common warts that grow on hands and feet, do not spread easily. However, more than 40 HPV types are sexually transmitted, and these HPVs spread very easily through genital contact. Some types of sexually transmitted HPVs cause cervical cancer and other types of cancer (1). These are called high-risk, oncogenic, or carcinogenic HPVs. Other sexually transmitted types of HPV do not appear to cause cancer and are called low-risk HPVs.

Although genital HPV infections are very common, most occur without any symptoms and go away without any treatment within a few years. However, some HPV infections can persist for many years. Persistent infections with high-risk HPV types can cause cell abnormalities. If untreated, areas of abnormal cells, called lesions, can sometimes develop into cancer.

### 2. What are genital warts?

Some types of sexually transmitted low-risk HPVs cause warts to appear on or around the genitals or anus. Most genital warts (technically known as condylomata acuminata) are caused by two HPV types, HPV-6 and HPV-11. Warts may appear within several weeks after sexual contact with a person who is infected with HPV, or they may take months or years to appear, or they may never appear.

### 3. What is the association between HPV infection and cancer?

Persistent HPV infections are now recognized as the cause of essentially all cervical cancers. It was estimated that, in 2010, about 12,000 women in the United States would be diagnosed with this type of cancer and more than 4,000 would die from it. Cervical cancer is diagnosed in nearly half a million women each year worldwide, claiming a quarter of a million lives annually.



HPVs also cause some cancers of the anus, vulva, vagina, and penis (2). In addition, oral HPV infection causes some cancers of the oropharynx (the middle part of the throat, including the soft palate, the base of the tongue, and the tonsils) (2, 3).

It has been estimated that HPV infection accounts for approximately 5 percent of all cancers worldwide (2).

#### **4. Are specific types of HPV associated with cancer?**

Both high-risk and low-risk types of HPV can cause the growth of abnormal cells, but only the high-risk types of HPV lead to cancer. About 15 high-risk HPV types have been identified, including HPV types 16 and 18, which together cause about 70 percent of cervical cancers (4, 5). It is important to note, however, that the great majority of infections with high-risk HPV types go away on their own and do not cause cancer (5).

#### **5. What are the risk factors for HPV infection and cervical cancer?**

Having many sexual partners is a risk factor for HPV infection. Nevertheless, most HPV infections go away on their own without causing any type of abnormality. However, even among women who develop abnormal cervical cell changes because of persistent infection with high-risk HPV types, the chances of developing cervical cancer are small, even if the abnormal cells are not treated. As a general rule, the more severe the abnormal cell changes, the greater the risk of cancer. In addition, whether an HPV-infected woman develops cervical cancer appears to depend on a variety of factors acting together with infection by high-risk HPV types. Factors that may increase the risk of cervical cancer in women persistently infected with high-risk HPV types include smoking and having many children (5).

#### **6. Can HPV infection be prevented?**

Anyone who is sexually active is at risk for a sexually transmitted HPV infection. Being in a long-term, mutually monogamous relationship with an uninfected partner minimizes the risk of genital HPV infection. However, it is difficult to determine whether a partner who has been sexually active in the past is currently infected.

HPV infection can occur in both male and female genital areas that are covered or protected, respectively, by a latex condom, as well as in areas that are not covered or protected. Although the degree of protection provided by condoms in preventing HPV infection is unknown, condom use has been associated with a lower rate of cervical cancer.

Two vaccines approved by the U.S. Food and Drug Administration (FDA), Gardasil® and Cervarix®, are highly effective in preventing persistent infections with some HPV types. Gardasil prevents infection with HPV types 16 and 18, the two high-risk HPVs that cause most (70 percent) cervical cancers (4), as well as types 6 and 11, which cause most (90 percent) genital warts (5). Cervarix also prevents persistent infections with HPV types 16 and 18.

#### **7. How are HPV infections detected?**

Cervical cells can be tested to identify high-risk types of HPV that may be present. HPV DNA tests look for viral DNA from multiple high-risk HPV types and can detect the presence of a viral infection before any cell abnormalities become visible. The FDA has approved HPV DNA tests for follow-up testing of women with equivocal cell abnormalities on a Pap test (a screening test to detect cervical cell changes). HPV DNA tests are also approved for general cervical cancer screening of women over the age of 30 when done together with a Pap test. There are currently no approved tests to detect HPV infections in men.

#### **8. What are the treatment options for HPV infection?**

Although there is currently no medical treatment for HPV infections, the cervical lesions and warts that can result from such infections can be treated. Methods commonly used to treat cervical lesions include cryosurgery (freezing that destroys tissue), LEEP (loop electrosurgical excision procedure, or the removal of tissue using a hot wire loop), and conization (surgery to remove a cone-shaped piece of tissue from the cervix and cervical canal). Similar treatments may be used for external genital warts. In addition, some drugs may be used to treat external genital warts (6). More information about treatment for genital warts can be found on the Centers for Disease Control and Prevention's (CDC) Sexually Transmitted Diseases Treatment Guidelines 2006 Web page at <http://www.cdc.gov/std/treatment/2006/genital-warts.htm> on the Internet.

## 9. How can people learn more about HPV infection?

The following Federal Government agencies can provide more information about HPV infection:

- The National Institute of Allergy and Infectious Diseases (NIAID), part of the National Institutes of Health, supports research on HPV infection and offers printed materials. NIAID can be contacted at:

**Organization:** National Institute of Allergy and Infectious Diseases  
**Address:** Office of Communications and Government Relations  
6610 Rockledge Drive, MSC 6612  
Bethesda, MD 20892-6612  
**Telephone:** 301-496-5717  
1-866-284-4107 (toll-free)  
**TTY:** 1-800-877-8339  
**Web site:** <http://www.niaid.nih.gov/Pages/default.aspx>

- The CDC, part of the Department of Health and Human Services, also offers support and information about HPV.
  - The CDC-INFO Contact Center provides information about sexually transmitted infections, including HPV, and how to prevent them. The center can be reached by calling toll-free 1-800-CDC-INFO (1-800-232-4636). Both English- and Spanish-speaking specialists are available 24 hours a day, 7 days a week, 365 days a year. Staff provide information about sexually transmitted diseases and referrals to free or low-cost clinics nationwide.
  - Free educational literature about sexually transmitted infections and prevention methods is also available. More information from the CDC about sexually transmitted infections is available at <http://www.cdc.gov/std> on the Internet.
  - The CDC also makes information about HPV, including treatment guidelines and surveillance statistics, available at <http://www.cdc.gov/hpv/> on the Internet.

## Selected References

1. Division of STD Prevention. *Prevention of genital HPV infection and sequelae: Report of an external consultants' meeting*. Atlanta, GA: Centers for Disease Control and Prevention, 1999.
2. Parkin DM. The global health burden of infection-associated cancers in the year 2002. *International Journal of Cancer* 2006; 118(12):3030-3044. [[PubMed Abstract](#)]
3. D'Souza G, Kreimer AR, Viscidi R, et al. Case-control study of human papillomavirus and oropharyngeal cancer. *New England Journal of Medicine* 2007; 356(19):1944-1956. [[PubMed Abstract](#)]
4. Munoz N, Bosch FX, Castellsague X, et al. Against which human papillomavirus types shall we vaccinate and screen? The international perspective. *International Journal of Cancer* 2004; 111(2):278-285. [[PubMed Abstract](#)]
5. Schiffman M, Castle PE, Jeronimo J, Rodriguez AC, Wacholder S. Human papillomavirus and cervical cancer. *The Lancet* 2007; 370(9590):890-907. [[PubMed Abstract](#)]
6. Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines 2002. Centers for Disease Control and Prevention. *Morbidity and Mortality Weekly Report* 2002; 51(RR-6):1-78.

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## Related NCI materials and Web pages:

- National Cancer Institute Fact Sheet 4.21, *Human Papillomavirus (HPV) Vaccines* (<http://www.cancer.gov/cancertopics/factsheet/Prevention/HPV-vaccine>)
- National Cancer Institute Fact Sheet 5.16, *Pap Test* (<http://www.cancer.gov/cancertopics/factsheet/Detection/Pap-test>)
- HPV (Human Papillomavirus) Vaccines for Cervical Cancer Digest Page (<http://www.cancer.gov/cancertopics/hpv-vaccines>)
- *Understanding Cervical Changes: A Health Guide for Women* (<http://www.cancer.gov/cancertopics/understandingcervicalchanges>)
- *What You Need To Know About™ Cervical Cancer* (<http://www.cancer.gov/cancertopics/wyntk/cervix>)

## How can we help?

We offer comprehensive research-based information for patients and their families, health professionals, cancer researchers, advocates, and the public.

- **Call** NCI's Cancer Information Service at 1-800-4-CANCER (1-800-422-6237)
- **Visit** us at <http://www.cancer.gov> or <http://www.cancer.gov/espanol>
- **Chat** using LiveHelp, NCI's instant messaging service, at <http://www.cancer.gov/livehelp>
- **E-mail** us at [cancergovstaff@mail.nih.gov](mailto:cancergovstaff@mail.nih.gov)
- **Order** publications at <http://www.cancer.gov/publications> or by calling 1-800-4-CANCER
- **Get help** with quitting smoking at 1-877-44U-QUIT (1-877-448-7848)

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