National Cancer Institute

FactSheet

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
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HPV and Cancer

Key Points

- Some types of sexually transmitted human papillomaviruses (HPVs) can cause genital warts. Other types, called high-risk or oncogenic HPVs, can cause cancer.
- High-risk HPVs cause virtually all cervical cancers. They also cause most anal cancers and some vaginal, vulvar, penile, and oropharyngeal cancers.
- Most infections with high-risk HPVs do not cause cancer. Many HPV infections go away on their own within 1 to 2 years. However, infections that last for many years increase a person's risk of developing cancer.

1. What are HPVs?

HPVs, also called human papillomaviruses, are a group of more than 150 related viruses. More than 40 of these viruses can be easily spread through direct skin-to-skin contact during vaginal, anal, and oral sex (1).

HPV infections are the most common sexually transmitted infections in the United States. In fact, more than half of sexually active people are infected with one or more HPV types at some point in their lives. Recent research indicates that, at any point in time, 42.5 percent of women have genital HPV infections, whereas less than 7 percent of adults have oral HPV infections (2, 3).

Sexually transmitted HPVs fall into two categories:

- Low-risk HPVs, which do not cause cancer but can cause skin warts (technically known as condylomata acuminata) on or around the genitals or anus. For example, HPV types 6 and 11 cause 90 percent of all genital warts.
- High-risk or oncogenic HPVs, which can cause cancer. At least a dozen high-risk HPV types have been identified. Two of these, HPV types 16 and 18, are responsible for the majority of HPV-caused cancers.

2. What is the association between HPV infection and cancer?

High-risk HPV infection accounts for approximately 5 percent of all cancers worldwide (4). However, most high-risk HPV infections occur without any symptoms, go away within 1 to 2 years, and do not cause cancer. These transient infections may cause cytologic abnormalities, or abnormal cell changes, that go away on their own.

Some HPV infections, however, can persist for many years. Persistent infections with high-risk HPV types can lead to more serious cytologic abnormalities or lesions that, if untreated, may progress to cancer.

3. Which cancers are caused by HPVs?

Virtually all cervical cancers are caused by HPV infections, with just two HPV types, 16 and 18, responsible for about 70 percent of all cases (5, 6). HPV also causes anal cancer, with about 85 percent of all cases caused by HPV-16. HPV types 16 and 18 have also been found to cause close to half of vaginal, vulvar, and penile cancers (7).

Most recently, HPV infections have been found to cause cancer of the oropharynx, which is the middle part of the throat including the soft palate, the base of the tongue, and the tonsils. In the United States, more than half of the cancers diagnosed in the oropharynx are linked to HPV-16 (8).

The incidence of HPV-associated oropharyngeal cancer has increased during the past 20 years, especially among men. It has been estimated that, by 2020, HPV will cause more oropharyngeal cancers than cervical cancers in the United States (9).

Other factors may increase the risk of developing cancer following a high-risk HPV infection (5). These other factors include the following:

- Smoking
- Having a weakened immune system
- Having many children (for increased risk of cervical cancer)
- Long-term oral contraceptive use (for increased risk of cervical cancer)
- Poor oral hygiene (for increased risk of oropharyngeal cancer)
- Chronic inflammation

4. Can HPV infection be prevented?

The most reliable way to prevent infection with either a high-risk or a low-risk HPV is to avoid any skin-to-skin oral, anal, or genital contact with another person (1). For those who are sexually active, a long-term, mutually monogamous relationship with an uninfected partner is the strategy most likely to prevent HPV infection (1). However, because of the lack of symptoms it is hard to know whether a partner who has been sexually active in the past is currently infected with HPV.

Research has shown that correct and consistent use of condoms can reduce the transmission of HPVs between sexual partners (10). Areas not covered by a condom can be infected with the virus, though (1), so condoms are unlikely to provide complete protection against virus spread.

The Food and Drug Administration (FDA) has approved two HPV vaccines: Gardasil® for the prevention of cervical, anal, vulvar, and vaginal cancer, as well as precancerous lesions in these tissues and genital warts caused by HPV infection; and Cervarix® for the prevention of cervical cancer and precancerous cervical lesions caused by HPV infection. Both vaccines are highly effective in preventing infections with HPV types 16 and 18. Gardasil also prevents infection with HPV types 6 and 11. These vaccines have not been approved for prevention of penile or oropharyngeal cancer.

More information about HPV vaccines is available in the NCI fact sheet *Human Papillomavirus (HPV) Vaccines* at http://www.cancer.gov/cancertopics/factsheet/Prevention/HPV-vaccine.

5. How are HPV infections detected?

HPV infections can be detected by testing a sample of cells to see if they contain viral DNA or RNA.

The most common test detects DNA from several high-risk HPV types, but it cannot identify the type(s) that are present. Another test is specific for DNA from HPV types 16 and 18, the two types that cause most HPV-associated cancers. A third test can detect DNA from several high-risk HPV types and can indicate whether HPV-16 or HPV-18 is present. A fourth test detects RNA from the most common high-risk HPV types. These tests can detect HPV infections before cell abnormalities are evident.

Theoretically, the HPV DNA and RNA tests could be used to identify HPV infections in cells taken from any part of the body. However, the tests are approved by the FDA for only two indications: for follow-up testing of women who seem to have abnormal Pap test results and for cervical cancer screening in combination with a Pap test among women over age 30.

There are no FDA-approved tests to detect HPV infections in men. There are also no currently recommended screening methods similar to a Pap test for detecting cell changes caused by HPV infection in anal, vulvar, vaginal, penile, or oropharyngeal tissues. However, this is an area of ongoing research.

6. What are treatment options for HPV-infected individuals?

There is currently no medical treatment for HPV infections. However, the genital warts and precancerous lesions resulting from HPV infections can be treated.

Methods commonly used to treat precancerous cervical lesions include cryosurgery (freezing that destroys tissue), LEEP (loop electrosurgical excision procedure, or the removal of cervical tissue using a hot wire loop), surgical conization (surgery with a scalpel, a laser, or both to remove a cone-shaped piece of tissue from the cervix and cervical canal), and laser vaporization conization (use of a laser to destroy cervical tissue).

Treatments for other types of precancerous lesions caused by HPV (vaginal, vulvar, penile, and anal lesions) and genital warts include topical chemicals or drugs, excisional surgery, cryosurgery, electrosurgery, and laser surgery. More information about the treatment of genital warts can be found in the Centers for Disease Control and Prevention (CDC) *Sexually Transmitted Diseases Treatment Guidelines, 2010*, at http://www.cdc.gov/std/treatment/2010/genital-warts.htm.

HPV-infected individuals who develop cancer generally receive the same treatment as patients whose tumors do not harbor HPV infections, according to the type and stage of their tumors. However, people who are diagnosed with HPV-positive oropharyngeal cancer may be treated differently than people with oropharyngeal cancers that are HPV-negative. Recent research has shown that patients with HPV-positive oropharyngeal tumors have a better prognosis and may do just as well on less intense treatment. An ongoing clinical trial is investigating this question.

7. How do high-risk HPVs cause cancer?

HPVs infect epithelial cells. These cells, which are organized in layers, cover the inside and outside surfaces of the body, including the skin, the throat, the genital tract, and the anus. Because HPVs are not thought to enter the blood stream, having an HPV infection in one part of the body should not cause an infection in another part of the body.

Once an HPV enters an epithelial cell, the virus begins to make proteins. Two of the proteins made by high-risk HPVs interfere with normal functions in the cell, enabling the cell to grow in an uncontrolled manner and to avoid cell death.

Many times these infected cells are recognized by the immune system and eliminated. Sometimes, however, these infected cells are not destroyed, and a persistent infection results. As the persistently infected cells continue to grow, they may develop mutations that promote even more cell growth, leading to the formation of a high-grade lesion and, ultimately, a tumor.

Researchers believe that it can take between 10 and 20 years from the time of an initial HPV infection until a tumor forms. However, even high-grade lesions do not always lead to cancer. The percentage of high-grade cervical lesions that progress to invasive cervical cancer has been estimated to be 50 percent or less (11).

8. How can people learn more about HPVs and HPV infections?

The following federal agencies can provide more information about HPV infection:

National Institute of Allergy and Infectious Diseases
1–866–284–4107
1–800–877–8339 (TTY)
ocpostoffice@niaid.nih.gov
http://www.niaid.nih.gov/Pages/default.aspx

Centers for Disease Control and Prevention
1–800–CDC–INFO (1–800–232–4636)
1–800–877–8339 (TTY)
English- and Spanish-speaking specialists are available from 8:00 a.m. to 8:00 p.m., Eastern Time, Monday through Friday.
cdcinfo@cdc.gov
http://www.cdc.gov/std or http://www.cdc.gov/hpv

Selected References

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11. American Society for Colposcopy and Cervical Pathology. *Colposcopy: Colposcopic Appearance of High-Grade Lesions*. Hagerstown, MD: American Society for Colposcopy and Cervical Pathology. Retrieved January 4, 2012, from http://www.asccp.org/PracticeManagement/Cervix/Colposcopy/ColposcopicAppearanceofHighGradeLesions/tabid/7512/Default.aspx.

Related Resources

- *Human Papillomavirus (HPV) Vaccines* (http://www.cancer.gov/cancertopics/factsheet/Prevention/HPV-vaccine)
- *Pap Test* (http://www.cancer.gov/cancertopics/factsheet/Detection/Pap-test)
- *Understanding Cervical Changes: A Health Guide for Women* (http://www.cancer.gov/cancertopics/understandingcervicalchanges)
- *What You Need To Know About™ Cancer of the Cervix* (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
- ***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)