What are viruses?

Viruses are very small -- most cannot even be seen with a regular microscope -- organisms. They cannot reproduce on their own. They must enter a living cell, which becomes the host cell, and "hijack" the cell's machinery to make more viruses.

Viruses can enter the body through the mucous membranes, such as the nose, mouth, the lining of the eyes, or the genitals. They can also enter through breaks in the skin. Once inside, they find their specific type of host cell to infect. For example, cold and flu viruses find and invade cells that line the respiratory tract (nose, sinuses, breathing tubes, and lungs). The human immunodeficiency virus (HIV) infects the T-cells and macrophages of the immune system. HPV infects squamous epithelial cells -- the flat cells that line the surface of the skin and mucous membranes.

What is HPV?

HPV is short for human papilloma (pap-uh-LO-muh) virus. HPVs are a group of more than 100 related viruses. Each HPV virus in the group is given a number, which is called an HPV type. HPVs are called papilloma viruses because some of the HPV types cause warts or papillomas, which are non-cancerous tumors. The papilloma viruses are attracted to and are able to live only in squamous epithelial cells in the body. Squamous epithelial cells are thin, flat cells. They are found in the surface of the skin and in moist surfaces like the vagina, anus, cervix (the base of the womb at the top of the vagina), vulva (around the outside of the vagina), head of the penis, mouth, and throat. HPVs will not grow in other parts of the body.

Of the more than 100 known strains of HPV, about 60 HPV types cause warts on skin, such as that of the arms, chest, hands, and feet. These are the common warts.
The other 40 HPV types are mucosal types of HPV. "Mucosal" refers to the body's mucous membranes, or the moist surface layers that line organs and cavities of the body that open to the outside. For example, the vagina and anus have a moist top layer. The mucosal HPV types are also called the genital (or anogenital) type HPVs because they often affect the anal and genital area. The mucosal HPVs prefer the moist squamous cells found in this area. They do not grow in the skin.

Low-risk HPV types
Some types of genital HPV can cause cauliflower-shaped warts on or around the genitals and anus of both men and women. In women, warts may also appear on the cervix and vagina. This type of "genital wart" is called a condyloma acuminatum and is most often caused by HPV-6 or HPV-11. Because these genital warts very rarely grow into cancer, HPV-6 and HPV-11 are called "low-risk" viruses. These low-risk types can also cause low-grade changes in the cells of the cervix that do not develop into cancer.

High-risk HPV types
Other types of genital HPV have been linked with cancers in both men and women. These types are called "high-risk" because they can cause cancer. They also cause low-grade and high-grade changes in the cells of the cervix and pre-cancers. Doctors worry more about the high-grade changes and pre-cancers, because they are more likely to grow into cancers over time. Common high-risk HPV types include:

- HPV-16
- HPV-18
- HPV-31
- HPV-35
- HPV-39
- HPV-45
- HPV-51
- HPV-52
- HPV-58

Warts and cancer are caused by different types of HPV
In summary, low-risk HPV types can cause genital warts and low-grade changes in the cells. High-risk HPV types can cause low-grade changes, high-grade changes, pre-cancer, and cancer.

This diagram shows the different groups of HPV types and the problems each group can cause.
More than 100 HPV types

- Mucosal or genital (About 40 types)
  - Common body warts (About 60 types)
  - Low-risk types such as 6 and 11
    - Low-grade cervical changes
    - High-grade cervical changes, pre-cancers
    - Anogenital cancers
  - High-risk types such as 16 and 18
    - Low-grade cervical changes
    - Genital warts
    - Respiratory papillomas
  - Common warts (on skin like the hands and feet)

**How do you get genital HPV?**

Genital HPV is spread mainly by direct genital contact during vaginal, oral, or anal sex. It is not spread through blood or body fluids. HPV is passed from one person to another during skin-to-skin contact.

Infection is very common soon after a woman starts having sex with one or more partners. In one study, more than half of college-aged women were found to have gotten an HPV infection within 4 years of first having sex.

Transmission by genital contact without sexual intercourse is not common, but infection has been reported in women who have never had sex. Oral-genital and hand-genital transmission of some genital HPV types is possible and has been reported. Transmission from mother to newborn during delivery is rare, but it can happen. When it occurs, it can cause warts in the infant's throat called *respiratory papillomatosis*.

**How common is HPV? Who gets it?**

Genital HPV is a very common virus. Some doctors think it is almost as common as the cold virus. In the United States, over 6 million people (men and women) get an HPV
infection every year. At least one-half of the people who have ever had sex will have HPV at some time in their life. It is especially common among young people. The CDC reported in 2009 that about 45% of women aged 20 to 24 had HPV (there are no tests for HPV in men). And among girls aged 15 to 19, about 25% had HPV.

**What are the symptoms of HPV?**

Genital HPV usually has no symptoms, unless it is a type that causes genital warts. Genital warts may appear within weeks or months after contact with a partner who has HPV. More rarely, genital warts may show up years after exposure. The warts usually look like small bumps or groups of bumps in the genital area. They can be small or large, raised or flat, or shaped like a cauliflower. If they are not treated, genital warts might go away, stay and not change, or increase in size or number. But warts very rarely turn into cancer.

Most people will never know they have HPV because they have no symptoms and their immune system inactivates the virus. In about 90% of people, the body's immune system clears the HPV infection within 2 years. This is true of both high-risk and low-risk HPV types. A small number of people with HPV will have the virus for a longer time. These people can develop cell changes that over many years may lead to cancer.

**How is HPV related to cervical cancer?**

Almost all -- more than 99% -- cervical cancers are related to HPV. Of these, about 70% are caused by HPV types 16 or 18. Low-grade changes in the cells of the cervix are caused by a number of HPV types, including 16, 18, 6, or 11. Low-grade changes most often go away without treatment, although if they grow into warts doctors may remove them. But low-grade changes may also be caused by some high-risk HPV types as well as low-risk ones, and doctors who find low-grade changes often do more testing.

Nearly all cervical cancers are related to HPV, but most genital HPV infections do not cause cervical cancer. In research studies, most people who test positive for genital HPV will later test negative, often within 6 to 12 months. Scientists are still not sure if this means that a person's immune system has completely destroyed all of the HPV or has only suppressed the infection to an extremely low level (too low to be detected by the tests). If even a few cells of the cervix still contain HPV, it's possible that the virus may become active again if your immune system becomes very weak.

Changes in the cells of the cervix may suddenly happen many years after being exposed to HPV. These changes may be low-grade or high-grade. This delay helps explain how a woman could have changes in the cells of the cervix after many years of normal Pap tests and no new sex partner.

If cells stay infected with HPV, the virus may cause the cells of the cervix to change and become pre-cancer cells. True pre-cancer cell changes are called high-grade SIL (squamous intraepithelial lesions), sometimes abbreviated as HSIL. Another term for HSIL is CIN 2 and CIN 3. CIN is an abbreviation for cervical intraepithelial neoplasia.
Pre-cancer cells are not cancer. Some pre-cancer changes may return to normal on their own. But most cases of CIN 3 that are not found and treated are likely to progress to cervical cancer over about 10 years. Still, very few HPV infections lead to cervical cancer. Pre-cancer cells can be found before they have a chance to grow into cancer by having regular Pap tests.

For more information on cervical cancer, please see our document called *Cervical Cancer*.

**What about other cancers and HPV?**

About 8 out of 10 squamous cell anal cancers are caused by either HPV-16 or HPV-18 -- the same types of genital HPV that cause cervical cancer. Nearly half of cancers of the vulva and about 7 out of 10 vaginal cancers are HPV-related. Some other genital cancers (cancers of the penis and urethra) and some head and neck cancers (mostly the throat, tongue, and tonsils) are related to the high-risk types of HPV, too. Also, many of the skin cancers in people with weak immune systems contain the HPV virus.

**What about other HPV-related diseases?**

About 1 out of every 100 sexually active adults in the US have genital warts at any one time. Most of these cases are caused by HPV-6 or HPV-11.

Recurrent respiratory papillomatosis (RRP) causes warts to grow in the throat. It is very rare, but can happen when a pregnant woman with genital HPV passes HPV to her baby during delivery. RRP occurs in less than 2,000 infants and children in the US every year. It may lead to breathing problems, a hoarse voice, or may rarely progress to cancer of the larynx. It is most often linked with HPV types 6 and 11.

**Do men have the kinds of cancers that are related to HPV?**

Yes. Genital HPV is probably as common in men as in women, since it is passed from one person to another mainly through sex. But HPV is not as easily diagnosed in men. HPV has been linked to certain kinds of head and neck cancers in both men and women. And some types of HPV have been linked to cancer of the penis and anus in men. Cancer of the penis is rare, but anal cancer is now almost as common in men and women who have anal sex as cervical cancer was in women before the Pap test was introduced. But even though anal sex greatly raises a person's risk of anal cancer, it is not the only way to get anal HPV or anal cancer.

Like women, men do not have symptoms with HPV unless they have a type that causes genital warts. In men, genital warts can appear around the anus or on the penis, scrotum, groin, or thighs.
At this time, there is no test approved to detect HPV in men. But genital warts can be found and treated.

While women have the Pap test to detect early HPV-related cervical cancers, there are no approved tests to detect early anal cancers in men or women. Anal cancer screening tests are being studied in some people at high risk for anal cancer, such as those with HIV infection. To date, no such test has proven to work well enough to recommend routine use.

**Can HPV be treated?**

No. There is no treatment for the virus itself. But most genital HPV infections go away with the help of the body’s immune system, usually within 2 years.

Even though HPV itself cannot be treated, the cell changes that come from an HPV infection can. For example, genital warts can be treated. Pre-cancer cell changes caused by HPV can be found by Pap tests and treated. And cervical, anal, and genital cancers can be treated, too.

**Can HPV be prevented?**

The only sure way to prevent HPV is to abstain from all sexual activity. Having fewer sex partners and avoiding sex with people who have had many other sex partners lowers a person's risk of exposure to HPV.

Condoms provide some, but not total, protection against HPV. But they must be used every time, from start to finish. The virus can spread during direct skin-to-skin contact before the condom is put on, and male condoms do not cover the entire genital area, especially in women. The female condom covers more of the vulva in women but has not been studied as carefully for its ability to prevent HPV. Condoms are very helpful, though, in protecting against other infections that can be spread through sexual activity.

It is usually not possible to know who has HPV, and HPV is so common that even these measures do not guarantee that a person will not get HPV. Still, these measures may help reduce the number of times a person is exposed to HPV.

For those who are young or haven't started having sex, getting the 3-shot HPV vaccine can protect them from some types of HPV.

**What are the risk factors for genital HPV?**

People with the following risk factors are more likely to have genital HPV:

- Having many sex partners
- Being younger than 25 years of age
- Starting to have sex at an early age
- Having a partner who has had many different sex partners
- Having sex with uncircumcised males (Men who have not been circumcised are more likely to be infected with HPV and pass it on to their partners. The reasons for this are unclear.)

Still, a person who has had sex with only one partner can get HPV if that partner already has the virus. HPV can be picked up from having sex with an infected person at any age.

**Is there a vaccine to help prevent HPV?**

Yes. At this time there are 2 vaccines available to help prevent certain types of HPV and some of the cancers linked to those types: Gardasil® and Cervarix®. These vaccines prevent the 2 types of HPV (HPV-16 and HPV-18) that cause 70% of all cervical cancers.

Gardasil also protects against the 2 types of HPV (HPV-6 and HPV-11) that cause 90% of all genital warts. The other types of HPV will not be prevented by use of vaccines.

**Did the American Cancer Society play a role in the development of the HPV vaccines?**

Yes. Dr. Robert Rose at the University of Rochester was a member of 1 of 4 teams that contributed to the development of a vaccine against HPV. The grant he received from the American Cancer Society in the mid-1990s enabled him to continue and confirm his important work studying the virus.

**Are the HPV vaccines safe?**

The FDA reports that both HPV vaccines, Gardasil (approved in 2006) and Cervarix (approved in 2009), are safe and effective for females ages 9 to 26 years.

Gardasil is also licensed, safe, and effective for males ages 9 through 26 years. Boys and young men may choose to get this vaccine to prevent anal cancer and genital warts.

Both vaccines were tested in thousands of people around the world before they were approved. These studies showed no serious side effects and no deaths have been linked to either vaccine. Common, mild side effects include pain where the shot was given, fever, headache, and nausea.

People may faint after getting any vaccine, including HPV vaccines. Fainting after getting a shot is more common in teens than in young children or adults. To keep people from getting hurt from fainting, a 15-minute waiting period for people of all ages is recommended after any vaccination.
Both HPV vaccines are still being monitored for any side effects, especially rare ones not seen in the study trials. CDC and FDA doctors and scientists still review all reports of serious side effects reported to the Vaccine Adverse Event Reporting System (VAERS) to watch for potential new vaccine safety concerns that may need further study. (The VAERS is a national reporting system that looks at reports of side effects after vaccinations.) The American Cancer Society will watch those reviews and report any concerns about the safety of the vaccines.

**Who should be vaccinated and when?**

To be most effective, one of the HPV vaccines should be given before any type of sexual contact with another person. Both are given as shots in a series of 3 doses within 6 months.

**The American Cancer Society's recommendations for each age group**

**Girls ages 11 to 12**

The vaccine should be given to girls ages 11 to 12 and as early as age 9.

**Girls ages 13 to 18**

Girls ages 13 to 18 who have not yet started the vaccine series or who have started but have not completed the series should be vaccinated.

**Young women ages 19 to 26**

Some authorities recommend vaccination of women ages 19 to 26, but American Cancer Society experts believe that there is not enough evidence of benefit to recommend vaccinating all women in this age group. We do recommend that women ages 19 to 26 talk to their doctors or nurses about whether to get the vaccine based on their risk of previous HPV exposure and potential benefit from the vaccine.

**Boys and young men**

The American Cancer Society has no recommendation regarding the use of HPV vaccines in males. See the question "Can boys get this vaccine?"
What about women over 26 years of age? Should they get one of the vaccines?

Women over 26 years of age were not included in the first studies that were done to test how well the HPV vaccines worked. This means the FDA could not approve the vaccines for this age group. Since that time, the use of Gardasil in women up to age 45 has been studied. One study showed that in these women, the vaccine helped protect against infection and disease from the HPV types contained in the vaccine. As was seen in other studies, it only helped the women who weren't infected with those HPV types before vaccination. It isn't clear, though, that it helped enough women to justify giving it to all women up to age 45. So far, a decision about whether to vaccinate women in this age group has not been made.

Are there some girls or women who should not get one of the HPV vaccines or who should wait?

Yes. Anyone who has ever had a life-threatening allergic reaction to yeast or anything else in the HPV vaccines, or anyone who has had a serious reaction to an earlier dose of HPV vaccine should not get the vaccine. Tell the doctor if the girl getting the vaccine has any severe allergies.

Pregnant women should not get either vaccine at this time. Even though they appear to be safe for both mother and the unborn baby, this still being studied. If a woman who is pregnant does get an HPV vaccine, this is not a reason to consider ending the pregnancy.

Any woman who finds out that she was pregnant when she got the vaccine is encouraged to call the Gardasil vaccine in pregnancy registry at 1-800-986-8999 or the Cervarix vaccine in pregnancy registry at 1-888-452-9622. Information from these registries will help doctors and scientists learn how pregnant women respond to the vaccines. Pregnant women who have started the vaccine series should complete the series after their baby is born.

Women who are breast-feeding may safely get either vaccine.

Why do the vaccines have to be given at such a young age?

These vaccines will prevent HPV only if they are given before exposure to the virus. The vaccines are recommended for girls ages 11 to 12 because most girls at this age have not become sexually active. This is also an age when girls will be seeing their doctor and getting other vaccinations.
Can boys get this vaccine?

Yes. In the past few years, the FDA approved Gardasil to protect boys from anal cancers and pre-cancers as well as to prevent anal and genital warts. This vaccine may be offered between ages 9 to 26. It is not yet known if the vaccine will keep boys from passing HPV to their partners, which would also reduce cervical cancer, or if it can prevent other HPV-linked cancers in men (such as head and neck or penile cancer).

The American Cancer Society has no recommendation about the use of either HPV vaccine in males. But the Society encourages further studies to find out whether HPV vaccines protect against other cancers, along with cervical cancer.

What are the benefits of the vaccines?

Both vaccines will prevent the 2 types of HPV that cause most cervical cancers (HPV types 16 and 18). They help prevent anal, vulvar, and vaginal cancers related to these 2 types of HPV, too. Gardasil will also protect against the 2 types of HPV that cause most genital warts (HPV types 6 and 11).

The vaccines only work in people who have not already been exposed to these types of HPV. The vaccines will not prevent HPV in those who have already had these HPV types.

It is possible that the vaccines also could prevent some other HPV-related cancers, including some cancers of the penis and head and neck areas. It will be some time before studies can prove whether they will prevent these cancers.

How long will the vaccines prevent HPV infection?

How long a new vaccine protects people is never known when the vaccine is first introduced. Research is being done to find out how long protection against HPV will last, and if booster vaccines will be needed.

How much does the HPV vaccine cost? Is it covered by health insurance plans?

The drug company price for either vaccine is about $130 per dose. This cost does not include the cost of giving the shots or the doctor's charge. Most insurance plans will likely cover the cost. But check with your insurance plan to be sure.

The vaccines are included in the federal Vaccine for Children (VFC) program. This program covers vaccine costs for children and teens who don't have insurance and for some children and teens who are underinsured. The VFC program provides free vaccines
to children and adolescents younger than 19 years of age, who are either Medicaid-eligible, American Indian or Alaska Native, or uninsured.

There are over 44,000 sites that provide VFC vaccines, including hospitals and private and public clinics. The VFC program also allows children and teens to get VFC vaccines through federally qualified health centers or rural health centers if their private health insurance does not cover vaccinations. For more information about the VFC program, visit www.cdc.gov/vaccines/programs/vfc/default.htm. Or call 1-800-CDC-INFO (1-800-232-4636).

Some states and US territories have programs that will cover the vaccine costs, too. You can find the contact information for your area at the CDC Web site given above.

**Do you need to be tested for HPV before getting the vaccine?**

No. Testing is not needed and it is not recommended. A positive HPV test result does not tell you which types of HPV are present. Even after infection with one type of HPV, the vaccine could still prevent other types of HPV infection. A negative test does not tell you if you have had HPV in the past but no longer have it.

**Do women and girls who have been vaccinated still need Pap tests?**

Yes. People who get vaccinated will still need Pap tests because the vaccine will not prevent all types of HPV that can cause cervical cancer. If your daughter or granddaughter gets the vaccine, she will still need to have Pap tests at the usual times.

**If girls who are vaccinated will still need a Pap test, why should they get vaccinated?**

The vaccine prevents about 70% of cervical cancers. And those who have had the HPV vaccine can avoid the cervix cell changes caused by the HPV types the vaccine prevents.

The Pap test does not keep the cells in the cervix from changing. But it can pick up changes in the cervix soon after they start, before they can become cervical cancer. This means that if a woman has an abnormal Pap test, she will have other tests and then treatment to keep the changed cells from becoming cancer.
Can cervical cancer be prevented without a vaccine?

In most cases, yes, cervical cancer can be prevented without a vaccine. Pap tests done according to American Cancer Society guidelines and with proper follow up will prevent most but not all cases of cervical cancer. Pap tests can find cervix cell changes early, before they become cervical cancer. These changed cervix cells can then be killed or removed to keep them from becoming cancer.

When cancer screening guidelines are followed, the Pap test also finds most but not all cervical cancers at an early, curable stage. Most cervical cancers in the United States are diagnosed in women who have never had a Pap test, or who haven't had a Pap test in 5 or more years.

Is the American Cancer Society in favor of vaccinating against HPV?

Yes. The Society has been actively involved in providing reliable and unbiased information to the public and to health care providers. The Society emphasizes the ongoing need to follow screening guidelines, such as getting regular Pap tests, and the critical need to ensure that the vaccines are available to the medically underserved.

Do you want more information?

For more information on cervical cancer, HPV, HPV testing, and the HPV vaccines, call us any time, day or night, at 1-800-227-2345 or visit our Web site at www.cancer.org.

For more information on the HPV vaccines from the Centers for Disease Control (CDC), visit www.cdc.gov/vaccines/vpd-vac/hpv/default.htm.

The US Food and Drug Administration (FDA) has more information on Gardasil and Cervarix online at: www.fda.gov/BiologicsBloodVaccines/Vaccines/ApprovedProducts/ucm172678.htm

For more information on sexually transmitted illnesses, please contact the American Social Health Association (ASHA) at www.ashastd.org. You can get information on teen sexual health in English at www.iwannaknow.org or in Spanish at www.quierosaber.org.

References


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For additional assistance please contact your American Cancer Society 1-800-ACS-2345 or www.cancer.org