NCIRS National Centre for Immunisation Research and Surveillance

FactSheet

# HPV vaccines – Frequently Asked Questions

This fact sheet provides responses to common patient questions and concerns about human papillomavirus (HPV) and the HPV vaccines and vaccination. There is misleading information about HPV vaccines on the Internet and social media. Immunisation providers and the public should be cautioned to check that they obtain information from reliable and trusted sources. More detailed information about HPV and HPV vaccines can be found in the NCIRS fact sheet Human papillomavirus vaccine for Australians.

**Questions about human papillomavirus (HPV) and HPV vaccines in general**



**Questions about HPV vaccine efficacy and impact**



**Questions about HPV vaccine safety**

## Questions about HPV and HPV vaccines in general

### Q1. Which HPV vaccines are available in Australia, and how are they different from other HPV vaccines?

There are two human papillomavirus (HPV) vaccines available for use in Australia: bivalent (2vHPV) vaccine Cervarixand nonavalent (9vHPV) vaccine Gardasil9. Each vaccine protects against infection from its target HPV types. The 9vHPV vaccine protects against 6, 11, 16, 18 31, 33, 45, 52 and 58. The 2vHPV vaccine protects against types 16 and 18.

The 9vHPV vaccine is used in Australia's National Immunisation Program and given routinely to adolescents aged 11–13 years through the school-based program. The 2vHPV vaccine is available on the private market.

While HPV vaccines do not prevent all types of HPV, they provide strong protection against cancer-causing HPV types. The 9vHPV vaccine can prevent up to 90% of cervical cancers and 96% of anal cancers in Australia.[1] The 2vHPV vaccine is also highly effective and protect against HPV types 16 and 18, which cause the majority of HPV-associated cancers in Australia.[1,2] Both 9vHPV and 4vHPV vaccines also protect against types 6 and 11 that cause genital warts.

### Q2. How many doses of HPV vaccine are needed?

The vaccination schedule for the National HPV Vaccination Program's target age cohort, adolescents aged 12–13 years, is one dose. Several studies have shown the antibody response to a one-dose HPV vaccination schedule in younger adolescents (i.e. <15 years of age) generates a strong immune response and lasts for several years after vaccination.[3-7] People who are immunocompromised are recommended to receive three doses of HPV vaccine.

The optimal age for HPV vaccination is around 12–13 years, prior to HPV exposure. People who have not received HPV vaccine by age 13 years can still receive a single dose of the vaccine up to age 25 years.

### Q3. Why has the HPV vaccine recommendation changed to one dose?

Vaccination recommendations can change as more evidence becomes available. In 2023, one dose of 9vHPV vaccine is recommended for adolescents aged 12–13 years through the routine national school program. People who have not received HPV vaccine by 13 years of age can still receive a single dose up to 25 years of age.

Previously, two doses were given through the school program and three doses were recommended for people aged 15 years and older. This recommendation changed based on a

large body of robust evidence that shows a single dose of HPV vaccine is comparable to two or three doses in providing protection against HPV infections.

In 2022, the World Health Organization and the UK also recommended a single HPV vaccine dose after reviewing the evidence.

**Q4. I was vaccinated with the 4vHPV vaccine, Gardasil. Do I need to be revaccinated with the 9vHPV vaccine, Gardasil9?**

No, revaccination with the 9vHPV vaccine is not needed. While the 9vHPV vaccine does protect against five additional HPV types, both 4vHPV and 9vHPV vaccines protect against HPV types 16 and 18 that cause most of the HPV-associated cancers. Cancers caused by the other five HPV types are extremely rare. It is important to stay up-to-date with cervical screening, as it will detect some of these infections in their pre-cancerous stage.

For those who started HPV vaccination aged 26 years or older, three doses of HPV vaccine are required. If any scheduled doses have been missed, earlier doses should not be repeated. While there are no upper limits on the receipt of the second dose for those who commenced vaccination before the age of 26 years, timely completion of vaccination should be prioritised.

**Q5. Is the vaccine really needed if only a small proportion of HPV infections lead to cancer?**

Although only a small *proportion* of HPV infections result in disease, a large number of people still develop cellular abnormalities and cancers because HPV infections are common in the population.

Prior to HPV vaccination, every year Pap screening in Australia detected low-grade cervical abnormalities in about 90,000 women and high-grade cervical abnormalities in a further 15,000 women. In 2020, 795 people aged 25 to 74 years were diagnosed with cervical cancer, a rate of 9.7 per 100,000 women.[8] In 2019, 179 women died due to cervical cancer,[8] a rate of 2.3 per 100,000 women.

Apart from the cervix, HPV is also associated with cancers of several other body sites in both women and men, such as the anus, vulva, vagina, penis, and head and neck.[9-11] There are no screening programs in place to detect cancers at these sites. In 2017, 289 Australian women and 190 Australian men were diagnosed with anal cancer,[12,13] of which HPV caused about 85% of cases.[10] In addition, 767 new cases of the oropharynx were detected in 2017 in Australia,[13] the majority (650/767) in men, of which HPV caused about 60% of cases. It is important to note that most of these cancers would have arisen from HPV infections that were acquired before the availability of vaccination.

HPV vaccine can prevent HPV infection, the development of pre-cancerous lesions and cancers caused by vaccine-type HPV infection. Since the introduction of the HPV vaccination program in Australia in 2007, reductions in lesions caused by HPV have already been recorded (see Q12 and Q13).[14]

In addition to reducing the risk of cervical cancer, HPV vaccination protects against HPV infections and associated disease in other sites.

**Q6. I've heard there are many HPV types that can infect people, but the vaccine used in Australia only protects against nine. Can I still get cancer caused by HPV even if I am vaccinated?**

There are 40 known HPV types that can infect the mucosal surfaces of humans and potentially cause disease. Although the 9vHPV vaccine protects against the HPV types that most commonly

cause serious disease, some of the HPV types not included in the vaccine can still cause cancer (see also Q7).

**Q7. If I am vaccinated, do I still need to undertake cervical screening?**

Yes, it is important that women aged >18 years undergo regular cervical screening, as per national guidelines under the National Cervical Screening Program. Screening for women aged 25–74 years is recommended every 5 years (or 2 years after the last Pap test). HPV vaccination is a preventive healthcare measure to be used in conjunction with the cervical screening program. Although vaccination reduces pre-cancerous lesions, it does not protect against all HPV types.

More information about the changes to the National Cervical Screening Program can be found at www.cancerscreening.gov.au.

**Q8. I thought HPV vaccine prevents against cervical cancer. Why is it offered to males too?**

Cervical cancer is the most common HPV-associated cancer worldwide, so the majority of HPV research, especially early studies of HPV and HPV vaccine, was focused on preventing cervical cancer. However, much more is now known about other HPV-associated cancers that affect men, like anal, penile, head and neck cancers, and genital warts[10] (see Q5). HPV vaccine can prevent HPV infections in males that lead to these cancers. A major clinical trial of the 4vHPV vaccine in males 16–26 years of age showed the vaccine prevented more than 85% of persistent anogenital infections and external genital lesions (primarily genital warts) due to vaccine HPV types among participants not already infected by those types.[15]

Vaccinating males also increases protection against HPV due to 'community (herd) immunity'.[16]

**Q9. Will other HPV types replace those we vaccinate against?**

Virological studies of HPV indicate that there is very little, if any, interaction between virus types, that is, they don't compete with each other.[17] HPV16 appears to be unique in terms of its tendency to cause disease. Therefore, it is unlikely that other HPV types will replace the cancer-causing types 16, 18, 31, 33, 45, 52 and 58 if infection with these types is prevented through vaccination. The types of HPV infection occurring over time in Australia are being closely monitored.

**Q10. Can the HPV vaccine be co-administered with other vaccines such as influenza and COVID-19?**

Yes, HPV vaccines can be given at the same time as other vaccines, including COVID-19, influenza, meningococcal, hepatitis B and pertussis, if required.[18-24]

When co-administering HPV vaccine and another vaccine, it is recommended to administer the vaccines in different limbs, if possible.

## Questions about HPV vaccine efficacy and impact

**Q11. Isn't leading a healthy lifestyle enough to prevent cancer?**

Although there is evidence that a healthy diet and exercise can help protect against certain other cancers, such as bowel cancer, there is no definitive evidence that these factors will protect against cancers associated with HPV. The only way to ensure protection from infection with HPV (which is the necessary first step in the cancer development process) is to abstain from sex

completely. Although the risk of acquiring HPV infection increases with the number of sexual contacts, even having only one partner who is infected can result in getting an HPV infection and HPV-related cancer.[25,26] Most people with a current HPV infection do not display any symptoms or signs – that is, you can't tell if you or your partner has the virus. Similarly, if infected, there is no way to ensure or know if the body's immune system will be able to clear the virus on its own or if that infection is silently progressing to cancerous changes.

Factors that have been shown to increase a person's risk of persistent HPV infection, and thus of developing related cancers, include:

- genetic factors[27,28]
- smoking[29,30]
- the presence of a co-infection with other sexually transmitted infections, such as herpes or chlamydia
- whether there is severe immune suppression, such as HIV infection.[31]

Other factors that increase the risk for cervical cancer in particular include having had a very large number of births (seven or more) and long-term oral contraceptive use.[32]

A person may be able to reduce their risk of HPV infection somewhat by consistent condom use, but HPV can be transferred via contact between genital and mucosal surfaces that are not covered by the condom.

### Q12. I've heard the vaccine doesn't work if you get it after you've become sexually active. Is that true?

For HPV vaccine to work, it *must* be given before a person comes in contact with HPV viruses. As HPV infection is commonly transmitted during sexual activity, HPV infection rates are highest in young people[33,34]. Because of this, the best time to vaccinate is in early adolescence before exposure to HPV. In addition, younger adolescents respond better to the vaccine: those who receive their first HPV vaccine dose when aged 9–14 years develop higher levels of HPV antibodies than older adolescents.[35]

If the vaccine is given to people who are already sexually active, there is a higher chance they would have already been exposed to one or more of the vaccine HPV types and, in turn, the benefit of the vaccine will be reduced. This has been shown in clinical trials of HPV vaccines. In women aged 16–26 years who had not yet been infected with any vaccine HPV types, vaccination prevented more than 98% of high-grade cervical lesions (CIN2 or worse) associated with those types. However, when all women enrolled in these trials were considered (including those who were already infected with any HPV type), protection for the whole group was lower at only 52%.[36]

People who have already had an HPV infection but are still recommended to receive HPV vaccine should still get vaccinated as it can prevent a future HPV infection.

### Q13. How do we know the vaccine will prevent cancers caused by HPV when cancer takes years to develop?

HPV infection is the necessary first step for the development of cervical and other HPV-related cancers. It takes several years for an HPV infection to progress into cancer. So HPV vaccine trials needed to assess the efficacy of the HPV vaccine against the early stages of the disease process, rather than cancer as the end result.[37] HPV vaccination has been shown to prevent 90 to 100% of cervical, penile and anal infections due to the vaccine HPV types[15,38,39] and pre-cancerous lesions caused by HPV.[40] Surveillance data have shown substantial reductions in high-grade pre-cancerous cervical lesions in women eligible to receive HPV vaccination in

Australia (see Q14).[8,41] In coming decades, studies will be able to show how the vaccine reduces actual cancers.

### Q14. Are there reductions in HPV disease in Australia since vaccination was introduced in 2007?

Data are already showing that since the Australian HPV vaccination program commenced in April 2007, there has been an overall decline in HPV disease in females and males.[41-43] For example, the number of high-grade pre-cancerous lesions detected in 20–24 year old women has dropped from 18.1 per 1,000 women screened in 2007 to 13.5 per 1,000 women in 2013.[14] Cervical screening data from 2017–2018 have shown that the prevalence of HPV16 and HPV18 infection was low (2.1%) and stable across all age groups.[44] There have also been declines in rates of HPV infections in Aboriginal and Torres Strait Islander women (from 23.9% in 2007 to 1.4% in 2015).[45] Through a combination of high rates of HPV vaccination and cervical screening, Australia is on track to eliminate cervical cancer by 2035.[46,47]

HPV genital warts have almost disappeared among young women <21 years of age (eligible for vaccine) since the introduction of the vaccine.[42] New genital wart diagnoses in heterosexual males of the same age as the girls targeted by the HPV vaccination program have also declined. However, there has been no significant reduction in new cases of genital warts reported by men who have sex with men which suggests they get limited benefit from the female program.[48]

## Questions about HPV vaccine safety

### Q15. How do we know HPV vaccines are safe?

Overall, the HPV vaccines have an excellent safety profile, similar to that for other vaccines routinely used in the National Immunisation Program. Monitoring done in millions of people across many countries has found no credible evidence that there is any illness that occurs more frequently among people who have had HPV vaccine compared with those who have not.[49-52] The HPV vaccine trials for Gardasil9, Gardasil and Cervarix, which provided data for registration of these vaccines, involved tens of thousands of people worldwide. The trials have been evaluated by many expert groups, including the Food and Drug Administration (FDA) in the USA and the Therapeutic Goods Administration (TGA) in Australia, all of which have concluded that the vaccines are safe and effective. According to the World Health Organization (WHO), to date more than 270 million doses of the vaccine have been distributed worldwide, with many countries monitoring vaccine safety post-licensure (i.e. after the vaccine is in use).[53]

Studies have shown that the 9vHPV vaccine is generally well tolerated in adolescent girls and boys as well as women and men.[39,54-58] Across multiple trials of the 9vHPV vaccine in adolescents involving over 15,000 participants, the most common side effect was minor reactions at the injection site (pain, redness and swelling), which occurred in about 90% of recipients.[49] In some people, fainting or related symptoms such as dizziness can be triggered in response to painful stimuli such as vaccination; however, this can be avoided with appropriate care (see Q19).[59] The 9vHPV vaccine can be safely administered with other vaccines often given to adolescents, including meningococcal and diphtheria-tetanus-pertussis vaccines.[18,19]

Post-licensure safety monitoring is also ongoing, particularly through passive reporting systems, which allow all healthcare professionals and members of the public to report any suspected adverse events following vaccination[60] (see also Q17 and Q18). The safety of HPV vaccine is monitored through AusVaxSafety, Australia's active vaccine safety surveillance system (www.ausvaxsafety.org.au). Injection site reactions, including pain, are known to occur following

administration of HPV vaccines, and the current reported event rates are consistent with what are expected according to the existing data.

### Q16. Are there any contraindications for HPV vaccination?

The only contraindication to vaccination with Gardasil9 is known anaphylaxis (severe allergic reaction) to yeast or severe allergy to any other vaccine ingredient(s). As with any medication, there is always a small risk of an allergic reaction (anaphylaxis) following administration. Although these events are rare, all patients should be observed for 15 minutes after vaccination.

### Q17. I've read that the ingredients in the HPV vaccine cause autoimmune diseases. Is that true?

Like many other vaccines, HPV vaccines contain an adjuvant. Adjuvants are substances added to vaccines to improve the immune response to the part of the vaccine that mimics the pathogen. The adjuvant in 9vHPV vaccine is an aluminium adjuvant. Some people have raised concerns that aluminium adjuvants cause autoimmune disease. However, aluminium-containing adjuvants have been around for more than 50 years and are widely used in human vaccines. Much larger amounts of aluminium are taken into the body through other means, such as food, than through vaccines. There is no evidence that aluminium in vaccines results in any serious or long-term adverse events, including autoimmune diseases.[61,62] Similarly, no association has been found between the adjuvant used in the 2vHPV vaccine (Cervarix), ASO4 (which contains aluminium hydroxide) and autoimmune conditions.[63,64]

Evidence from clinical trials and post-licensure studies of the 4vHPV vaccine shows no link between the vaccine and autoimmune diseases.[54,58,65] An analysis of several clinical trials, involving more than 20,000 participants, found that the overall proportion of participants who reported new onset autoimmune conditions was similar among those who got the vaccine and those who got a placebo (2.4% of people in each group). Post-licensure epidemiological studies have not identified any association between HPV vaccination and autoimmune conditions, including multiple sclerosis and type 1 diabetes. Although one large study from France suggested a possible very small risk (approximately 1 in 100,000 girls vaccinated) of Guillain-Barré syndrome (GBS),[66] a disease that causes inflammation of nerves and results in generalised muscle weakness, other large studies that collectively included more than 10 million vaccine recipients showed that GBS is very rare and the evidence for this association is weak.[67-70]

### Q18. I've heard that the HPV vaccine triggers a range of rare but serious conditions, such as POF, POTS and CRPS. Is that true?

There have been case reports hypothesising that a range of rare and poorly understood conditions, such as premature ovarian failure (POF), postural orthostatic tachycardia syndrome (POTS) and complex regional pain syndrome (CRPS), could be induced by HPV vaccines. These reports lack scientific and epidemiological credibility and do not provide sufficient evidence to suggest a causal link between the vaccine and these illnesses.

POF, also known as premature menopause, occurs when the menstruation cycle ceases before the age of 40, and in up to 90% of cases, the cause is unknown. It has been suggested that the HPV vaccine may be a cause, based on some reports of teenage girls in Australia and America presenting with POF-like symptoms after receiving the HPV vaccine.[71] However, because many girls have received HPV vaccine and POF has long been known to occur in females who have not been vaccinated, these few cases do not show an increase in POF or prove a link to the vaccine. Complex regional pain syndrome (CRPS) and postural orthostatic tachycardia syndrome (POTS) are conditions that have been detailed in multiple case reports on HPV vaccination. CRPS involves chronic pain typically following often minor trauma or injury,[72] and POTS involves substantial, sustained increase in heart rate when moving from lying to sitting.[50] Both conditions are thought to be caused by a variety of known and unknown factors and are diagnostically

challenging, with onset difficult to determine and symptoms often overlapping with other conditions. There is no evidence to support HPV vaccine is a particular trigger of CRPS more than that rarely seen for any other painful stimuli. Similarly, POTS occurs irrespective of vaccination, and pre-clinical and clinical studies have found no evidence or basis to suggest a causative relationship between POTS and HPV vaccination.[73]

Overall, there is no strong scientific or epidemiological evidence to suggest that the HPV vaccines can induce POF, POTS or CRPS. These diseases of unclear aetiology, unfortunately, do occur in adolescents and young people, whether they are vaccinated or unvaccinated, and there is no evidence that they occur more frequently in HPV-vaccinated populations.[49,57,73-78]

### Q19. Does the HPV vaccine cause fainting?

Although rare, fainting was more commonly reported when HPV vaccine was first introduced (reported at a rate of 29.6 per 100,000), but is now very rarely reported (7.1 per 100,000 doses[51]). Fainting can be caused by many things, but is usually triggered by pain or anxiety. These reactions are more common in adolescents and young people, independent of whether a vaccine is being given. Although sometimes distressing, these symptoms usually resolve with simple treatment such as lying down, adequate food and drink intake, and reassurance. When administering the vaccine, it is important to make sure patients have eaten properly before vaccination and are observed for 15 minutes afterwards.[79]

### Q20. How do we know the vaccine won't cause cancer?

None of the HPV vaccines registered in Australia can cause cancer. The viral proteins which can disrupt normal cell growth and repair mechanisms and ultimately result in cancer are well described in the scientific literature.[80-82] They are not contained in the HPV vaccines.

HPV vaccines are made using recombinant DNA technology and contain only 'virus-like particles' (see Q23). The vaccines contain only proteins from the outer coat of the virus, with no viral DNA. It is not a live virus, and is not infectious.

### Q21. I've heard the vaccine could cause infertility. Is that true?

No. There is no biologically plausible way in which the vaccine could cause infertility in either women or men. HPV infection, unlike some other sexually transmitted infections such as chlamydia, is not a cause of infertility. Studies of high doses of the vaccine in female and male rats showed no effect on fertility,[83,84] and ongoing review of vaccine use in humans has shown no evidence that HPV vaccination is linked to infertility.[53,85]

Some websites report disturbing claims that one ingredient of the vaccine, polysorbate 80, causes infertility in rats. This is based on one study of newborn rats (weighing 10–17 grams) given extremely large doses (20–200 times the amount in Gardasil) injected into the abdomen.[86] The TGA has reviewed available data and concluded that there is no evidence that the amount of polysorbate 80 in HPV vaccines (50 µg per 0.5 mL dose of Gardasil) poses a risk to human reproduction or fertility. Polysorbate 80 is used as an emulsifier and is found in numerous medications, including other vaccines, and is used as a food additive and in cosmetics.

### Q22. Is it safe to get the vaccine when pregnant?

Although it is recommended that HPV vaccination be avoided during pregnancy, there is no indication that inadvertent administration of the vaccine to a pregnant woman will result in an increased risk of adverse pregnancy outcomes. The rate of adverse pregnancy outcomes has been shown to be similar in 4vHPV vaccine and placebo recipients. In particular, there was no evidence of an impact on spontaneous abortion rates, foetal deaths or number of live births. Congenital anomalies were rare, and the types of anomalies that occurred in both groups were

consistent with those generally observed in pregnancies in women aged 16–26 years.[87] Data from post-licensure surveillance do not indicate any issues or new safety signals.[88,89]

Women who wish to conceive following a course of HPV vaccine can commence trying to fall pregnant immediately after their last dose, as the vaccine is not a live virus.

For women who fall pregnant before completing the vaccine schedule, the schedule can safely be resumed following pregnancy. As with other vaccines, there is no need to recommence the vaccine schedule from the first dose.

**Q23. I've heard that it is a genetically modified vaccine. Is that true?**

No, none of the HPV vaccines contain viral DNA and they cannot 'interact' with your DNA. HPV vaccines are made using recombinant DNA technology, which means they contain very pure protein rather than killed or live viruses. Hepatitis B vaccine is made using similar technology.

## Other issues

**Q24. Why is there information on the Internet and social media saying the vaccine is dangerous if it isn't?**

There are many competing interests and a wide range of views available on the Internet and it is often difficult to determine what is credible information, and what is misrepresentation or opinion.

Some people may reject mainstream medicine, including vaccinations. While this position should be respected as their choice, it is important for others who are considering vaccination to be aware that some information on the Internet comes from organisations or people who are philosophically opposed to vaccination.[90-92] These people or organisations may use a range of compelling strategies to make their case, including selectively referring to small, isolated studies that challenge scientific consensus, misrepresenting facts, and using false logic.[93]

You may come across information from organisations that you might expect to support vaccination. One such organisation is the American College of Pediatricians, which released a statement in January 2016 raising concerns around the HPV vaccine. It is important to be aware that this is a highly conservative, small group of approximately 200 members that does not represent the views and recommendations of the main medical or scientific bodies in the USA, Australia or many other countries. The highly respected American Academy of Pediatrics, which represents over 64,000 paediatricians in the USA, recommends routine HPV vaccination for all adolescents as a safe and effective measure to protect against HPV infections. Similarly, the Royal Australian and New Zealand College of Obstetricians and Gynaecologists and the Australian Medical Association both support and recommend HPV vaccination for adolescents.

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