

Human papillomavirus infection: to vaccinate, or not to vaccinate

Vaccination against human papillomavirus infection heralds a significant milestone in the fight against cervical cancer. However, this prophylactic strategy has both cost and ethical implications, as Jennifer Gillett explains.

The Department of Health has agreed, in principle, to accept the Joint Committee for Vaccination and Immunisation (JCVI) recommendation that vaccination against human papillomavirus (HPV) should be introduced routinely for girls aged around 12–13 years, subject to independent peer review of the cost-benefit analysis. This has considerable social, ethical and cost implications.

Cervical cancer is one of the most common cancers diagnosed in females. Annually, almost half a million women around the world are diagnosed with the disease and there are over 270,000 deaths. It is the second most common cancer in women under the age of 35 years.

A major discovery in human cancer aetiology has been the recognition that cervical cancer is a rare consequence of an infection by some types of HPV. In public health terms, this finding is as important as the discovery of the association between cigarette smoking and lung cancer.

There are over 100 types of currently identified HPV. Approximately 30 types of HPV are spread sexually and these include high-risk strains for cervical cancer and genital warts. Approximately 90% of genital warts appear to be caused by HPV types 6 and 11, and HPV types 16 and 18 are implicated in the development of cervical cancer. There is also evidence to suggest that HPV type 16 may be involved in other forms of genital cancer and in some cancers of the mouth, throat and anus.

It is estimated that around 80% of females

will be infected with HPV at some point in their lives. In the majority of cases, the immune system fights off this infection. However, if the infection persists or if a woman is frequently re-infected with any of the high-risk HPV types, there is a higher risk for that individual of developing changes in cervical cells that can lead to cervical cancer.

The development of a vaccine against HPV is not only of major public health importance but it also has considerable ethical and cost implications. These implications include whether or not vaccination is appropriate for a sexually transmitted disease, the optimum age of vaccination, and the cost-effectiveness of vaccination.

IS VACCINATION APPROPRIATE FOR A SEXUALLY TRANSMITTED DISEASE?

As HPV is not casually transmissible, parents may feel there is a less compelling rationale for requiring protection against it than against diseases such as measles or pertussis (whooping cough). Effective prevention of

‘The development of a vaccine against HPV is not only of major public health importance but it also has considerable ethical and cost implications’

‘Almost half a million women around the world are diagnosed with cervical cancer each year, and over 270,000 die of the disease’

HPV, it is argued, is possible if sexual activity is restricted to couples in a faithful, committed relationship who have not engaged in sexual activity with others before or during their relationship. Thus, it is argued that vaccination is both an unnecessary risk in terms of adverse effects and an expensive solution to a disease that can be controlled through changes in personal sexual behaviour.

AT WHAT AGE SHOULD VACCINATION BE GIVEN?

Indications suggest that the vaccination programme will be aimed at girls aged 12–13, as this is the age at which it is best to prevent future infection and should reach girls before they become sexually active. However, there is concern among some religious groups and parents that giving young girls a vaccine against a sexually transmitted disease, which does not have an immediate impact on their lives, may encourage them to be sexually active earlier than might otherwise have been the case.

It is thought that the reduction in harm the vaccination provides will increase the risks taken, leading to other serious consequences (eg unwanted pregnancy and other STDs). However, early research carried out by Cancer Research UK showed that 75% of parents would want their daughters to receive the HPV vaccine, and only a small minority of parents were worried that the vaccination would encourage promiscuity.

COST-EFFECTIVENESS OF VACCINATION

Two major pharmaceutical companies have now developed vaccines against specific HPV types. Merck has developed Gardasil, which is effective against HPV types 6, 11, 16 and 18, and has been approved for use by the US Food and Drug Administration (FDA) and the European Commission. GlaxoSmithKline has developed Cervarix, which is effective against HPV types 16 and 18. But neither of these vaccines protects against all HPV types that have the potential to cause cervical cancer.

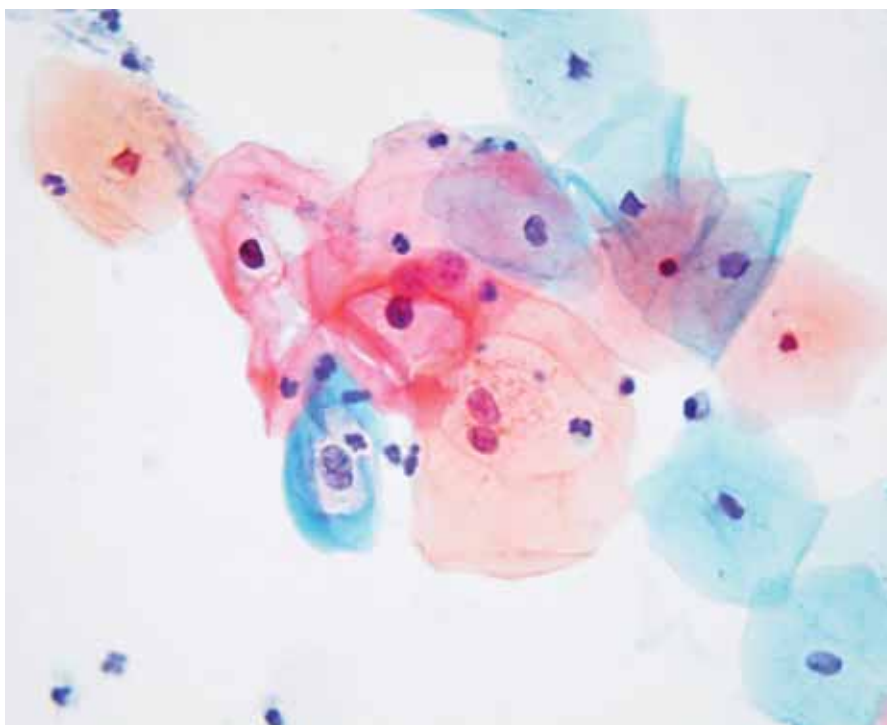
Studies have shown that each vaccine is 100% effective against the HPV types that it targets. Both the vaccines target HPV types 16 and 18, and these are responsible for around 70% of cervical cancers. Therefore, the current vaccines have the potential to prevent up to seven out of 10 cases of cervical cancer.

It has been suggested that the introduction of the vaccine will negate the need for cervical screening. This is untrue as the vaccine does not protect against all potential cancer-causing HPV types. Screening would also be needed initially for girls who are vaccinated until further research has taken place. Also, if older women are vaccinated, it is likely that they would need to be screened for a further 10–15 years until any lesions that may have started to develop prior to vaccination have been identified and treated. Therefore, the introduction of the HPV vaccine will not replace the need for screening immediately and thus overall costs will increase.

There is also the issue of whether or not boys should be vaccinated. Studies are still underway to assess the vaccine's effectiveness in boys. But should boys be offered vaccination? Both sexes can carry the virus, but it is women who carry the main burden of disease. However, boys could benefit from the vaccine as one of the vaccines developed protects against the HPV type that causes genital warts.

One model of the cost-effectiveness of the

'Early research carried out by Cancer Research UK showed that 75% of parents would want their daughters to receive the HPV vaccine'



Light micrograph of cells from a cervical smear showing the typical morphological features of human papillomavirus infection, including binucleation and koilocytosis (perinuclear haloes).

HPV vaccine for boys highlights the fact that if vaccine efficacy is high and there is high vaccine coverage in girls, then vaccinating boys provides little additional benefit. If vaccine efficacy is low and coverage is low, then the vaccination of boys will improve population impact. Therefore, the vaccination of boys increases herd immunity, which is an essential component of any successful immunisation programme. However, it is thought unlikely that boys will be offered HPV vaccination in the near future, mainly due to the cost involved.

TO VACCINATE, OR NOT TO VACCINATE

It seems that there are many factors to be considered when making a decision about the future of HPV vaccination. The success of any vaccination programme depends on factors such as vaccine uptake, which is influenced by the public perception of vaccine safety, the perceived threat of disease, and vaccine availability and supply. The government will have to put a good case forward to convince some individuals that HPV vaccination is the best solution in the fight against cervical cancer.

FURTHER READING

- Cancer Research UK. www.info.cancerresearchuk.org
- Colgrove J. The ethics and politics of compulsory HPV vaccination. *N Engl J Med* 2006; **355**: 2389–91.
- Gostin LO, DeAngelis CD. Mandatory HPV vaccination: public health vs private wealth. *JAMA* 2007; **297** (17): 1921–3. Erratum in: *JAMA*. 2007; **298** (2): 178.
- Lowndes CM, Gill N. Cervical cancer, HPV and vaccination. *BMJ* 2005; **331**: 915–6.
- Parliamentary Office of Science and Technology. *Vaccines and public health*. 2004, No 219.
- Schneider A. Pathogenesis of genital HPV infection. *Genitourin Med* 1993; **69**: 165–73.
- Steinbrook MD. The potential of human papillomavirus vaccines. *N Engl J Med* 2006; **354**: 1109–12.

Jennifer Gillett LIBMS is a biomedical scientist in the microbiology department at Kingston Hospital.