

## Towards an eradication of cervical cancer?

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*An analysis of thousands of clinical studies carried out on the effectiveness of vaccines against the virus responsible for cervical cancer (HPV) showed a drastic decrease in the incidence of infections and of precancerous lesions since the establishment of vaccination programs.*

### A VIRAL CANCER

Cervical cancer is characteristically caused by a class of viruses named human papillomavirus (HPV). Several hundreds of different HPV exist, the most dangerous being HPV16 and HPV18 which are responsible for about 70% of all cervical cancers worldwide. The majority of HPV infections occur shortly after the first sexual relations and become generally more common as the number of sexual partners increases.

Most women will be infected by one or another of these viruses over the course of their lives, but the immune system generally succeeds in neutralizing them and preventing the development of a cancer. When this defense fails, however, the virus produces two proteins (called E6 and E7) which subdue the functions of important tumor suppressors (p53 and Rb) and thus promote the uncontrolled growth of cells.

### ANTICANCER VACCINES

Until very recently, the only approach to fighting cervical cancer was to screen for it as early as possible by use of Papanicolaou tests (Pap tests), followed by colposcopy or biopsy for patients who presented precancerous lesions. This early detection allowed a substantial reduction in the mortality linked to this cancer, particularly in the industrialized countries, but it did nothing to prevent the cancer at its origin by blocking the virus from infecting the cervical cells.

It was the arrival on the market, about a dozen years ago, of vaccines that block infection by HPV16 and HPV18 which completely revolutionized our approach towards cervical cancer.

In clinical studies, these vaccines were shown to have a remarkable effectiveness, showing a success at preventing precancerous lesions or genital warts (condylomas) caused by HPV16 or 18 which approached 100%.

Consequently, the majority of public health agencies now recommend administration of vaccines before the exposure of young women to the virus, ideally at the beginning of adolescence.

### DECREASING INFECTIONS

Currently, about a hundred countries have established programs for anti-HPV vaccination, which means that millions of young women have been vaccinated and thus providing a very large number of people with whom we can determine the effectiveness of these vaccines. In a recent article which appeared in the *Lancet*, a group of researchers from the



University of Laval analyzed the results from 40 studies (comprising a total of over 60 million subjects) on the effects of vaccination vs the incidence of HPV infections as well as on the presence of cervical intraepithelial neoplasias rated grade 2 or 3 (CIN2+), i.e. precancerous lesions at very high risk of progressing to cancer.

The results were extremely encouraging: at 5-8 years after vaccination, the incidence of HPV16 and HPV18 was diminished by 83% in women aged 13-19 and by 66% in those aged 20-24<sup>1</sup>. Decreases of the same order were also observed in diagnoses of anogenital warts in the same two populations of women, as well as in young men aged 15-24.

This serves as a good example of the herd effect phenomenon in immunity, in which the vaccination of a sufficiently high percentage of the population suffices to decrease the propagation of an infectious diseases, even amongst those who have not received the vaccine.

Even more importantly, vaccination is associated with a marked decrease (51%) in the incidence of CIN2+ precancerous lesions in young women between the ages of 15 and 19, and by 31% in women aged 20-24. Even if it is still too early to quantify the effect of these vaccines on the incidence of cervical cancer, the simultaneous decrease in the causes of these cancers (infection by HPV) and of a key step in the development of this disease (CIN2+ neoplasias) strongly suggests that we are moving towards a drastic decrease in new cases of cervical cancer over the coming years.

One can even envision that, with vaccination extended to all young women, it will be possible to completely eliminate this disease in the near future.

These observations serve as another example of the absurdity of the anti-vaccination position, which has unfortunately spread over the past decades.

In actual fact, vaccines are among the key factors largely responsible for the phenomenal increase in life expectancy which has occurred over the past century and, without these extraordinary means of prevention, smallpox, polio, measles and other infectious diseases would continue to reap many human lives.

The eradication of a common cancer, such as cervical cancer, thanks to vaccination represents another example of the immense potential that vaccination holds for our health.

<sup>(1)</sup> Drolet M et al. Population-level impact and herd effects following the introduction of human papillomavirus vaccination programmes: updated systematic review and meta-analysis. *Lancet*, published online June 26 2019.