

POSITION ARTICLE

Vaccination against human papillomavirus in childhood: the next rubella analogue?

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Summary

Direct comparisons between different vaccination programmes can reveal new targets and solve challenges that have been faced and managed in the past during similar health interventions. In the rubella vaccination programme both boys and girls were included in order to ensure that women of childbearing age are effectively protected. For human papillomavirus (HPV) vaccination, at the moment only girls have been included into the scheme. The aspect of vaccinating both

boys and girls against HPV, similarly to the rubella paradigm, would interrupt "high-risk" HPV's transmission from males to females and vice versa ensuring further elimination of HPV. The new generation of HPV vaccines is expected to cost less and this will contribute to the possible introduction of HPV vaccine in both males and females.

Key words: childhood, human papillomavirus, rubella, vaccination

Introduction

Direct comparisons of different vaccination programmes require detailed validation to ensure "like for like" evaluation. Although it is difficult to make comparisons between different vaccination programmes due to the unique characteristics of different diseases, their causative agents and their modes of transmission, the approach of their evaluation and critical analysis can be really useful when a new vaccination programme is due to be implemented into the clinical practice. In this respect, comparisons of different vaccination programmes can reveal new targets and solve challenges that have been faced and managed in the past during similar health interventions.

The rubella vaccination programme

Rubella vaccination was introduced as a monovalent rubella vaccine for all schoolgirls and susceptible women in England and Wales in 1970 [1]. This selective approach was adopted at that time primarily because

of concerns about the duration of vaccine-induced immunity. School-based vaccination for girls aged 11-13 years achieved coverage of 78-86% between 1970 and 1988, while vaccination coverage of susceptible women during antenatal screening varied from 5 to 80% [1]. In 1988, rubella vaccine was replaced by the combined measles-mumps-rubella (MMR) vaccine, with the aim to eliminate all three viral diseases. Monovalent rubella vaccine remained available to susceptible adult women. For the first 3 years of the programme a catch-up dose was also offered to children at age 4 years. Since 1996, a two-dose schedule of MMR has been routinely offered to all children. Rubella vaccination programme has been primarily designed to prevent maternal rubella infection. Rubella virus has the ability to cross the placental barrier and infect fetal tissue. Congenital rubella infection occurs especially during the first trimester of pregnancy and can cause miscarriage or congenital rubella syndrome (CRS). CRS is characterized by a pattern of congenital abnormalities including nerve deafness, cataract, cardiac abnormalities and mental retardation. The goal of immunization is to prevent CRS rather than to prevent illness in young children, which

is a mild illness. Rubella vaccine confers long-lasting, probably lifelong, immunity following a single dose at 12 months of age or later.

The HPV vaccination programme

HPV vaccine has recently been introduced into the national vaccination schemes of several European countries and in the United States [2]. In the United Kingdom (UK) vaccination against HPV was introduced in September 2008 including girls aged 12-13 years. Three doses of the HPV vaccine over a 6-month period have been recommended. HPV vaccination offers protection against cervical cancer. It has been demonstrated that HPV requires more than 10 years for the malignant transformation of HPV-infected cervical tissue [3]. For HPV vaccine, clinical trials are still in progress and at the moment protection has been proved that lasts at least 5 years [4]. Ongoing research will determine the duration of protection conferred by the vaccine, the optimal age for vaccination, as well as the cost-effectiveness of the combination of vaccination and screening programmes. On-going clinical trials will clarify the duration of HPV vaccine-induced immunity. This will enable HPV vaccine introduction in earlier age, which could assure higher participation rate.

Comparison between the two programmes

In both vaccination programmes against HPV and rubella, the benefits occur after adulthood has been reached rather than relatively quickly, as with measles or polio requiring. Rubella vaccination programme has been primarily designed to prevent maternal rubella infection, while HPV vaccination offers protection against cervical cancer. Before the introduction of rubella vaccine, immunity to rubella was obtained through acquisition of the wild-type virus during early childhood. The result of this natural immunization was that 85-95% of women were immune by the time they reached childbearing age. If a childhood rubella vaccination programme fails to achieve high coverage, this may result in a reduced transmission in childhood, which can result in an increased proportion of women

who are still susceptible when they reach childbearing age. For HPV vaccine, it is unclear at what extent low coverage can change the epidemiology of HPV infection leading to the predominance of HPV types other than HPV 16 and HPV 18.

In the rubella vaccination programme both boys and girls were included in order to ensure that women of childbearing age are effectively protected. Although this has added to the cost of the immunization, cost-benefit analyses in both developed and developing countries have shown that economic benefits from the rubella vaccine are comparable to those associated with hepatitis B and *Haemophilus influenzae* type b vaccine [5]. For HPV vaccination, only girls have been included into the scheme at the moment. The aspect of vaccinating both boys and girls against HPV remains to be elucidated. This, similarly to the rubella paradigm, would interrupt "high-risk" HPV's transmission from males to females and *vice versa*, ensuring further elimination of HPV. However, the high cost of HPV vaccine at the moment remains an essential obstacle, especially for the developing countries [6]. The present cost of the HPV vaccine ranges from US \$360 in the United States to 500 Euro in the European countries. The new generation of HPV vaccines is expected to cost less and this will contribute to the possible introduction of HPV vaccine in both males and females.

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