# An update on immunization in UK

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## Abstract

The immunization schedule changes frequently and it is important that healthcare professionals keep up to date. Parents often look to specialists for advice about vaccinating their children and place more trust in them, than government bodies. This article describes the introduction of meningococcal B and ACWY vaccines and the extension of influenza vaccine to some older children. The success of the rotavirus and maternal pertussis programmes is noted. Possible changes to the HPV and hepatitis B programmes are discussed as are vaccines for the future such as varicella, RSV and Group B streptococcus. Extra vaccines/doses for children with chronic disorders are briefly described.

**Keywords** hepatitis B; HPV; immunization; influenza; meningococcal ACWY; meningococcal B; pertussis; rotavirus; vaccine

## Introduction

The UK vaccine programme is highly successful, with overall high vaccination rates and low incidence of disease. However, it changes frequently, both in the terms of numbers of vaccines used, their timing and dosage. It is very important that practitioners are up to date with these changes so that they can advise parents appropriately. This is all the more important for paediatricians who may be looking after children with chronic disorders. These children are often in more need of vaccination than the general population and yet they are more likely to be underimmunized. A well informed paediatrician will be trusted by parents and is in a position to ensure that all indicated vaccines are offered. This article aims to provide updates on the current programme and looks at some potential additions (Table 1).

## Recent changes

### Rotavirus vaccine in infants

Rotavirus vaccine was introduced in the UK infant immunization schedule in 2013. Although rotavirus infection rarely results in death in the UK it has been estimated that in England and Wales, it costs the NHS about £15 million per annum. The two doses of attenuated live vaccine are administered orally with other vaccines at 8 and 12 weeks and, unlike most other vaccines, there are strict limits on the age that it should be given, with the first dose given no later than 15 weeks of age. This is because of the small increased risk of intussusception associated with the vaccine and by ensuring the first dose is given by 15 weeks, the peak period for naturally occurring intussusception (5 months) is avoided. The vaccine has been well received with uptakes of 93.3% for one dose and 88.3% for two doses. However, uptake in ethnic groups is lower notably among white Irish and among ethnic groups describing themselves as 'other' (PHE 2015). In 2014 and the first 4 months of 2015 the number of reported cases of rotavirus fell by almost 70% compared to previous years (PHE 2015).

### Influenza vaccines in childhood

Influenza vaccine has long been a part of the immunization programme in many countries including UK, for those of all ages who are at particular risk from the disease as well as for the elderly. It is recognized that children, particularly young children have a relatively high morbidity from the disease, but the inactivated vaccines are poorly effective in this age group and so only at-risk children tended to be immunized. The advent of a live attenuated influenza vaccine (LAIV) has changed this. A number of studies have shown it to have superior efficacy to inactivated vaccines in children. The vaccine is administered by nasal spray and is well tolerated, the commonest side effects being nasal congestion and fever.

LAIV has been used for many years in Russia and was approved by FDA in USA in 2003. In 2012, the JCVI in UK recommended the routine use of the vaccine in children aged two to less than 17 years. This will provide protection to individual children but also stop them acting as a reservoir of infection for the rest of the population, particularly at-risk and elderly people. Recognizing that the programme has significant resource implications, it will be rolled out over a number of years and closely monitored, to ensure that it is, in practice, cost effective. In the 2015–16 'flu season', the quadrivalent LAIV will be offered routinely to all 2, 3 and 4 year old children, as well as those in years 1 and 2 at school. It is the vaccine of choice for at-risk children aged 2–17 years inclusive.

In 2014/15, uptake of the vaccine was 38.5%, 41.3% and 32.9% in children not at-risk aged 2, 3 and 4 years respectively. The uptake was even lower in at-risk children 16.8%, 53.1% and 42.0% in those aged 6 months to under 2 years, 2 years to under 5 years and 5 years to under 16 years old, respectively.

Because of the frequent change in antigenic nature of the circulating virus strains, the vaccine has to be modified on an almost yearly basis. Some seasons the match between the vaccine and the predominant circulating wild viruses may be poor and so the influenza vaccines have a relatively low effectiveness. 2014/15 was such a season. Overall the effectiveness of the vaccines was estimated to be 34.3% (95% CI 17.8–47.5%). LAIV had an effectiveness of 35% (95% CI 29.9–67.5%) against A(H3N2) and 100% (95% CI 17.0–100.0) against influenza B.

### Pertussis vaccine in pregnancy

The traditional whole cell vaccine was replaced with acellular or component vaccines in most developed countries in the mid 2000s. The uptake of vaccine has been as good as that of the other infant vaccines. The incidence of disease had been fairly low, but from 2010 the number of cases rose rapidly and far exceeded that of the usual 4 yearly peak. Although this situation has been replicated in many countries, the precise reasons are

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**The routine immunisation schedule in UK, September 2015**

| Age | Diseases | Comments |
|---|---|---|
| 8 weeks | Diphtheria/tetanus/acellular pertussis/ inactivated polio vaccine/*Haemophilus influenzae* type b (DTaP/IPV/Hib) | Single injection |
| | Pneumococcal conjugate vaccine (PCV) | |
| | Meningococcal B (MenB) | Only for children born on/after 1st May 2015 |
| | Rotavirus vaccine | Oral |
| 12 weeks | DTaP/Hib/IPV | |
| | Meningococcal C (MenC) | |
| | Rotavirus | |
| 16 weeks | DTaP/Hib/IPV | |
| | PCV | |
| | MenB | |
| 12–13 months | Measles/Mumps/Rubella (MMR) | Single injection |
| | Hib/MenC | |
| | PCV | |
| | MenB | |
| 2 years | Live attenuated influenza vaccine (LAIV) | Nasal spray |
| 3 years | LAIV | |
| 3 years 4 months | DTaP/IPV or dTaP/IPV | May be full or low dose diphtheria, depending on what is available |
| | MMR | |
| 4 years | LAIV | |
| School year 1 | LAIV | |
| School year 2 | LAIV | |
| 12–13 years | Human papilloma virus (HPV) – girls only | Two doses at least 6 months apart |
| Around 14 years | Meningococcal ACWY (MenACWY) | Exact timing may vary |
| Around 14 years | dT/IPV | Exact timing may vary |

**Table 1**

not clear, but it is known that neither disease nor vaccine provide lifelong immunity and the protection afforded by the acellular vaccines wears off faster than that from the whole cell vaccines.

The major concern in relation to the rise in incidence is the effect on infants who are most vulnerable to the disease. Most immunization programmes do not start until 2 months and so protection will not be gained until well into the high risk period. Various suggestions have been made to protect infants, the two most promising in the short term being cocooning and maternal immunization. Cocooning is the immunization of all those likely to be in close contact with a newborn infant, e.g., parents, grandparents, child-care providers, and healthcare personnel. This measure was introduced in USA in 2005. However while the uptake in postpartum women was reasonable, it was poor in the other groups of contacts and the time taken for the mother to develop immunity after immunization, leaves the infant exposed. It was known that if the vaccine was given in late pregnancy, the high antibodies produced in the period following immunization would be transferred to the unborn baby, possibly providing passive immunity. A policy to vaccinate all pregnant women was adopted in UK in 2012, with the vaccine being given at 28–32 weeks gestation, though it can be given later, even up to the time the baby receives their first dose of vaccine. The vaccine should be given in each pregnancy. While cocooning has not been shown to be effective in practice, we now know that maternal immunization has an efficacy of 91% in terms of protecting the young infant. Of the 12 infants that have died since the introduction of the programme in UK, only one mother had been immunized in pregnancy.

There is some evidence that in infants whose mother have had diphtheria/tetanus/acellular pertussis/inactivated polio vaccine, as is given in UK, the response to pertussis, diphtheria and some CRM-conjugated vaccines is reduced. It is not clear whether this is clinically significant, as most responses were in the protective range. It may be of importance in countries where one or more of these vaccines are not boosted in the second year of life.

### Meningococcal vaccines

In 1999, conjugate meningococcal C (MenC) vaccine was introduced into the schedule for infants. After some years of routine use, it became apparent that the protection from the vaccine waned and to prevent the disease recurring, a booster was introduced in the early years of secondary school. The programme has been very successful and now when meningococcal C disease does occur it is usually in adults, rather than children.

### Meningococcal B vaccine in infancy

Meningococcus B is now the commonest cause of invasive meningococcal disease in the UK, rising from 49% in 1998 to 64% in 2014. However, over the same period, the actual number