

11

The UK immunisation schedule

The routine immunisation schedule

The overall aim of the routine immunisation schedule is to provide protection against the following vaccine-preventable infections:

- diphtheria
- tetanus
- pertussis (whooping cough)
- *Haemophilus influenzae* type b (Hib)
- polio
- meningococcal disease (certain serogroups)
- measles
- mumps
- rubella
- pneumococcal disease (certain serotypes)
- human papillomavirus (certain serotypes)
- rotavirus
- influenza
- shingles

The schedule for routine immunisations and instructions for how they should be administered are given in Table 11.1. The relevant chapters on each of these vaccine-preventable diseases provide detailed information about the vaccines and the immunisation programmes.

The immunisation schedule of childhood vaccinations has been designed to provide early protection against infections that are most dangerous for the very young. This is particularly important for diseases such as whooping cough, and those due to pneumococcal, Hib and meningococcal infections. Providing subsequent immunisations and booster doses as scheduled should ensure continued protection. Further vaccinations are offered at other points

Table 11.1 Schedule for the UK's routine immunisations (excluding catch-up campaigns)

Age due	Vaccine given	How it is given ¹
Eight weeks old	Diphtheria, tetanus, pertussis, polio and <i>Haemophilus influenzae type b</i> (Hib) (DTaP/IPV/Hib)	One injection
	Pneumococcal conjugate vaccine (PCV)	One injection
	Meningococcal B (MenB) ²	One injection
	Rotavirus	One oral application
Twelve weeks old ³	Diphtheria, tetanus, pertussis, polio and Hib (DTaP/IPV/Hib)	One injection
	Rotavirus	One oral application
Sixteen weeks old	Diphtheria, tetanus, pertussis, polio and Hib (DTaP/IPV/Hib)	One injection
	Meningococcal B (MenB) ²	One injection
	Pneumococcal conjugate vaccine (PCV)	One injection
One year old (i.e. within a month of the first birthday) ⁴	Hib/MenC booster	One injection
	Pneumococcal conjugate vaccine (PCV) booster	One injection
	Measles, mumps and rubella (MMR)	One injection
	Meningococcal B (MenB) booster ²	One injection
Two years to less than 17 years old, annually (programme phased in over several years; see Chapter 19 for age eligibility)	Live attenuated influenza vaccine (LAIV)	Nasal spray, single application in each nostril annually (injection of inactivated influenza vaccine if nasal spray contra-indicated; see Chapter 19)
Three years four months old or soon after	Diphtheria, tetanus, pertussis and polio (DTaP/IPV or dTaP/IPV)	One injection
	Measles, mumps and rubella (MMR)	One injection
Girls aged 12 to 13 years old	Human papillomavirus (HPV) ⁵	Course of two injections at least six months apart
Fourteen years old (school year 9)	Tetanus, diphtheria and polio (Td/IPV)	One injection
	Meningococcal ACWY conjugate (MenACWY)	One injection
65 years old	Pneumococcal polysaccharide vaccine (PPV)	One injection
65 years of age and older	Inactivated influenza vaccine	One injection annually
70 years old	Shingles	One injection

1 Where two or more injections are required at the same time these should ideally be given in different limbs. Where this is not possible, injections in the same limb should be given 2.5cm apart.

2 Infants born on or after 1 July 2015 are eligible for routine MenB vaccination

3 The 12 week dose of MenC vaccine is being phased out of the schedule during 2016

4 For the vaccinations given as toddlers, local reactions are uncommon but the rate of local reactions was slightly higher after PCV than after MMR or Menitorix (Miller et al., 2011). Based on this evidence where injections can only be given in two limbs, it may be preferable to give the PCV in one limb and MMR and combined Hib/MenC in the other limb. Based on this evidence, where injections can only be given in two limbs, it is recommended that the MMR, as the vaccine least likely to cause local reactions, is given in the same limb as the MenB and the PCV and Hib/MenC boosters are given into the other limb.

5 In 2014, the Joint Committee on Vaccination and Immunisation (JCVI) recommended the removal of a third dose of HPV vaccine. The two-dose HPV vaccination schedule took effect on 01 September 2014.

throughout life to provide protection against infections before eligible individuals reach an age when they become at increased risk from certain vaccine-preventable diseases.

Recommendations for the age at which vaccines should be administered are informed by the age-specific risk for a disease, the risk of disease complications and the ability to respond to the vaccine. The schedule should therefore be followed as closely as possible. Where patients are eligible for additional vaccines, the relevant intervals should be followed as outlined in the specific chapters.

The first dose of primary immunisations can be given from six weeks of age if required in certain circumstances e.g. travel to an endemic country. A four week interval is recommended between each of the three doses of DTaP-containing vaccine in the primary schedule although if one of these doses is given up to a week early, either inadvertently or deliberately e.g. for travel reasons, then this can be counted as a valid dose and does not need to be repeated. However, no more than one dose should be given early in the three dose schedule. Similarly, MMR vaccine can be given from six months, for example during a local outbreak or when travelling to endemic countries. Any dose of MMR given below the age of one year should be discounted, and two further doses will be required at the appropriate ages. For other multiple dose schedule vaccines e.g. HPV, giving subsequent doses at a slightly shorter than recommended interval is unlikely to be highly detrimental to the overall immune response but should be avoided unless necessary to ensure rapid protection or to improve compliance.

Every effort should be made to ensure that all children are immunised, even if they are older than the recommended age range; no opportunity to immunise should be missed. A notable exception is the rotavirus vaccine, where the first dose should not be given to babies older than 15 weeks of age and the second dose should not be given if the child is over 24 weeks of age.

If any course of immunisation is interrupted, it should be resumed and completed as soon as possible. There is generally no need to start any course of immunisation again, as immunological memory from the priming dose(s) is likely to be maintained. Where vaccination was commenced some time previously, however, the product received may have changed and the relevant chapter should therefore be consulted.

Details of immunisation procedures are given in **Chapter 4** and in the relevant disease-specific chapters. Following immunisation all the patient's clinical records including the GP held record and, if a child, the record on the Child

Health Information System (CHIS) and the Personal Child Health Record (Red Book) should be updated with all the relevant details (see **Chapter 4**).

When children attend for any vaccination, it is important to also check that they are up-to date for vaccines that they should have received earlier. The table below gives an example checklist at each key stage; doses of the listed vaccines that have not been received by that age should be caught up. Catch-up doses should be administered as soon as possible but leaving the appropriate intervals as advised in the relevant chapters.

At these key ages children’s immunisation status should be checked and, wherever necessary, they should be offered catch-up vaccinations as follows:

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| By the age of 12 months: ¹ | <p>Three doses of diphtheria, tetanus, polio, pertussis and Hib containing vaccines.</p> <p>Two doses of PCV vaccine.</p> <p>Two doses of MenB vaccine.²</p> |
| By the age of 24 months: | <p>Three doses of diphtheria, tetanus, polio, pertussis containing vaccines.</p> <p>A single dose of Hib/MenC and PCV vaccines after the age of one year.</p> <p>Either 2 doses of MenB under the age of one and one dose after the age of one; or 2 doses of MenB after the age of one.²</p> <p>A single dose of MMR vaccine after the age of one year.</p> |
| By school entry: | <p>Four doses of diphtheria, tetanus, pertussis and polio containing vaccines.</p> <p>Two doses of MMR vaccine after the age of one year.</p> <p>A single dose of Hib/MenC conjugate vaccine after the age of one year.</p> |
| By transfer to secondary school: | <p>Four doses of diphtheria, tetanus, polio vaccine.</p> <p>Two doses of MMR vaccine after the age of one year.</p> <p>A single dose of Hib/MenC conjugate vaccine after the age of one year.</p> |

Before leaving school:	Five doses of diphtheria, tetanus, polio vaccine. A single dose of MenACWY vaccine after the age of 10 years. ³ Two doses of MMR vaccine. Two doses of HPV vaccine (for girls only). ⁴
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- 1 The 12 week dose of MenC vaccine is being phased out of the schedule during 2016.
- 2 Infants born on or after 1 July 2015 are eligible for routine MenB vaccination
- 3 From September 2015, the routine adolescent MenC booster dose was replaced with MenACWY vaccine.
- 4 The two-dose HPV vaccination schedule took effect on 1 September 2014.

The phased introduction of the influenza vaccine began in 2013 with the inclusion of children aged two and three years in the routine programme. Each year, more age groups are being added to the programme. The annual letters on the influenza programme should be consulted for age eligibility:

England: <https://www.gov.uk/government/collections/annual-flu-programme>

Northern Ireland: <https://www.health-ni.gov.uk/topics/professional-medical-and-environmental-health-advice/hssmd-letters-and-urgent-communications>

Scotland: <http://www.sehd.scot.nhs.uk/index.asp>

Wales: <http://gov.wales/topics/health/nhswales/circulars/public-health/?lang=en>

When babies are immunised in special care units, or children and adolescents are immunised opportunistically in accident and emergency units or inpatient facilities, it is most important that a record of the immunisation is entered onto the relevant CHIS and sent to the patient's GP for entry onto the practice-held patient record by return of an 'unscheduled immunisation form'. Details should also be recorded in the child's Personal Child Health Record (Red Book) in a timely manner.

Vaccination of individuals with unknown or incomplete immunisation status

For a variety of reasons, some individuals may not have been immunised or their immunisation history may be unknown. If children and adults coming to the UK are not known to have been completely immunised, they should be assumed to be unimmunised and a full course of required immunisations should be planned.

Where a child born in the UK presents with an inadequate immunisation history, every effort should be made to clarify what immunisations they may have had.

A child who has not completed the routine childhood programme should have the outstanding doses as described in the relevant chapters.

Individuals coming to the UK who have a history of completing immunisation in their country of origin may not have been offered protection against all the antigens currently protected against in the UK. Current country-specific schedules are available on the WHO website (http://apps.who.int/immunization_monitoring/globalsummary), but will not necessarily reflect what older children and adults will have received in the past.

Individuals coming from developing countries, from areas of conflict or from hard-to-reach population groups may not have been fully immunised. Where there is no reliable history of previous immunisation, it should be assumed that individuals are unimmunised and the full UK recommendations should be followed.

Children coming to the UK may have had a fourth dose of a diphtheria/tetanus/pertussis-containing vaccine that is given at around 18 months in some countries. Booster doses given before three years of age should be discounted, as it may not provide continued satisfactory protection until the time of the teenage booster. The routine pre-school and subsequent boosters should be given according to the UK schedule.

Some countries only offer single measles vaccines, rather than MMR, or have only recently started to offer a rubella containing vaccine. Measles vaccine is also given below the age of one year in many countries. Doses of measles-containing vaccine given below the age of one should be discounted and two further doses given to ensure adequate protection against both measles and rubella.

An algorithm for vaccinating individuals with uncertain or incomplete immunisation status is available at <https://www.gov.uk/government/publications/vaccination-of-individuals-with-uncertain-or-incomplete-immunisation-status>.

Premature infants

It is important that premature infants have their immunisations at the appropriate chronological age, according to the schedule. The occurrence of apnoea following vaccination is especially increased in infants who were born very prematurely.

Very premature infants (born \leq 28 weeks of gestation) who are in hospital should have respiratory monitoring for 48-72 hrs when given their first immunisation, particularly those with a previous history of respiratory

immaturity. If the child has apnoea, bradycardia or desaturations after the first immunisation, the second immunisation should also be given in hospital, with respiratory monitoring for 48-72 hrs (Pfister *et al.*, 2004; Ohlsson *et al.*, 2004; Schulzke *et al.*, 2005; Pourcyrus *et al.*, 2007; Klein *et al.*, 2008).

As the benefit of vaccination is high in this group of infants, vaccination should not be withheld or delayed.

Selective childhood immunisation programmes

There are a number of selective childhood immunisation programmes that target children at particular risk of certain diseases, such as hepatitis B, tuberculosis, influenza, meningococcal and pneumococcal infection. For more information please see the relevant chapters.

Adult immunisation programme

Five doses of diphtheria, tetanus and polio vaccines ensure long-term protection through adulthood. Individuals who have not completed the five doses should have their remaining doses at the appropriate interval. Where there is an unclear history of vaccination, adults should be assumed to be unimmunised. A full course of diphtheria, tetanus and polio vaccine should be offered in line with advice contained in the relevant chapters.

Measles, mumps and rubella vaccine should be offered to all young adults who have not received two doses as outlined in **Chapter 21**, **Chapter 23** and **Chapter 28**. In particular, vaccine status should be checked on all women of child bearing age who arrive from overseas, who may need to be offered MMR to prevent rubella in pregnancy. In addition, MenACWY vaccine should be offered to those aged 10 years up to 25 years who have never received a MenC-containing vaccine (see **Chapter 22**). Other vaccinations should be considered for any adult with underlying medical conditions and those at higher risk because of their lifestyle or occupation. These vaccinations include Hib, MenB, MenACWY, influenza, pneumococcal and hepatitis B. For more information please see the relevant chapters.

An algorithm for vaccinating individuals with uncertain or incomplete immunisation status is available at <https://www.gov.uk/government/publications/vaccination-of-individuals-with-uncertain-or-incomplete-immunisation-status>

Older adults (65 years or older) should be routinely offered a single dose of pneumococcal polysaccharide vaccine, if they have not previously received it. Annual influenza vaccination should also be offered. Adults aged 70 and 78 years should also be offered shingles vaccine. In addition, individuals who have been or who have become eligible since the start of the shingles programme in September 2013 remain eligible until their 80th birthday. A shingles eligibility chart is available:

<https://www.gov.uk/government/publications/who-is-eligible-for-the-shingles-vaccine-beyond-2016>

Vaccination during and after pregnancy

A temporary programme for the vaccination of pregnant women against pertussis was introduced in October 2012. The purpose of the programme is to boost antibodies in these women so that they are passed from mother to baby. This should protect the infant against pertussis infection from birth until they are vaccinated at two months of age. Pregnant women should be offered dTaP/IPV vaccine in weeks 16-32 of their pregnancy (for operational reasons, vaccination is probably best offered on or after the foetal anomaly scan at around 20 weeks), for each pregnancy. Pertussis vaccine can be given at the same time as influenza vaccine but pertussis vaccination should not be given early in order to offer the vaccines at the same time as this will compromise the passive protection to the infant. This temporary programme is described in more detail in the following documents:

<https://www.gov.uk/government/publications/whooping-cough-vaccination-programme-for-pregnant-women>

<http://webarchive.nationalarchives.gov.uk/20130123170526/>

In 2010, routine influenza immunisation of certain clinical risk categories was extended to include pregnancy. This was based on evidence of the increased risk from influenza to the mother and because vaccination during pregnancy will provide passive immunity against influenza to infants in the first few months of life following birth. Protection of the mother should also reduce the risk of her transmitting infection to a newborn baby. Inactivated influenza vaccine should therefore be offered to pregnant women at any stage of pregnancy (first, second or third trimesters), ideally before influenza viruses start to circulate. Influenza vaccination is usually carried out between October and January, however clinical judgement should be used to assess whether a pregnant woman should be vaccinated after this period, taking into account factors including the level and severity of influenza-like illness in the community and the availability of inactivated influenza vaccine. Influenza vaccine can be given at the same time as

pertussis vaccine but influenza vaccination should not be delayed in order to offer the vaccines at the same time. Inactivated influenza vaccines are preferred to live attenuated vaccines for pregnant women (see **Chapter 19**).

<https://www.gov.uk/government/collections/annual-flu-programme>

<https://www.gov.uk/government/publications/influenza-vaccination-in-pregnancy-advice-for-healthcare-professionals>

<https://www.gov.uk/government/publications/flu-vaccination-leaflet-for-pregnant-women>

From 2016, the routine antenatal testing of women for rubella susceptibility ceased. Pregnant women should have their vaccine status checked during or after pregnancy, for example at the post-natal check, and be offered any outstanding doses of MMR soon after delivery.

References

Klein NP, Massolo ML, Greene J *et al.* (2008) Risk factors for developing apnea after immunization in the neonatal intensive care unit. *Pediatrics* **121**(3): 463-9.

Miller E, Andrews N, Waight P *et al.* (2011). Safety and immunogenicity of coadministering a combined meningococcal serogroup C and *Haemophilus influenzae* type b conjugate vaccine with 7-valent pneumococcal conjugate vaccine and measles, mumps, and rubella vaccine at 12 months of age. *Clin Vaccine Immunol* **18**(3): 367-72.

Ohlsson A and Lacy JB (2004) Intravenous immunoglobulin for preventing infection in preterm and/or low-birth-weight infants. *Cochrane Database Syst Rev* (1): CD000361.

Pfister RE, Aeschbach V, Niksic-Stuber V *et al.* (2004) Safety of DTaP-based combined immunization in very-low-birth-weight premature infants: frequent but mostly benign cardiorespiratory events. *J Pediatr* **145**(1): 58-66.

Pourcyrus M, Korones SB, Arheart KL *et al.* (2007) Primary immunization of premature infants with gestational age <35 weeks: cardiorespiratory complications and C-reactive protein responses associated with administration of single and multiple separate vaccines simultaneously. *J Pediatr* **151**(2): 167-72.

Schulzke S, Heining U, Lucking-Famira M *et al.* (2005) Apnoea and bradycardia in preterm infants following immunisation with pentavalent or hexavalent vaccines. *Eur J Pediatr* **164**(7): 432-5.