

# Pneumococcal

## PNEUMOCOCCAL MENINGITIS NOTIFIABLE

### The disease

Pneumococcal disease is the term used to describe infections caused by the bacterium *Streptococcus pneumoniae* (also called pneumococcus).

*S. pneumoniae* is an encapsulated Gram-positive coccus. The capsule is the most important virulence factor of *S. pneumoniae*; pneumococci that lack the capsule are normally not virulent. Over 90 different capsular types have been characterised. Prior to routine conjugate vaccination, around 66% of the serious infections in adults and 80% of invasive infections in children were caused by eight to ten capsular types (Health Protection Agency, 2003).

Some serotypes of the pneumococcus may be carried in the nasopharynx without symptoms, with disease occurring in a small proportion of infected individuals. Other serotypes are rarely identified in the nasopharynx but are associated with invasive disease. The incubation period for pneumococcal disease is not clearly defined but it may be as short as one to three days. The organism may spread locally into the sinuses or middle ear cavity, causing sinusitis or otitis media. It may also affect the lungs to cause pneumonia, or cause systemic (invasive) infections including bacteraemic pneumonia, bacteraemia and meningitis.

Transmission is by aerosol, droplets or direct contact with respiratory secretions of someone carrying the organism. Transmission usually requires either frequent or prolonged close contact. There is a seasonal variation in pneumococcal disease, with peak levels in the winter months.

Invasive pneumococcal disease is a major cause of morbidity and mortality. It particularly affects the very young, the elderly, those with an absent or non-functioning spleen and those with other causes of impaired immunity. Recurrent infections may occur in association with skull defects, cerebrospinal fluid (CSF) leaks, cochlear implants or fractures of the skull.

### History and epidemiology of the disease

Currently, the pneumococcus is one of the most frequently reported causes of bacteraemia and meningitis. During 2005, 6207 laboratory isolates from

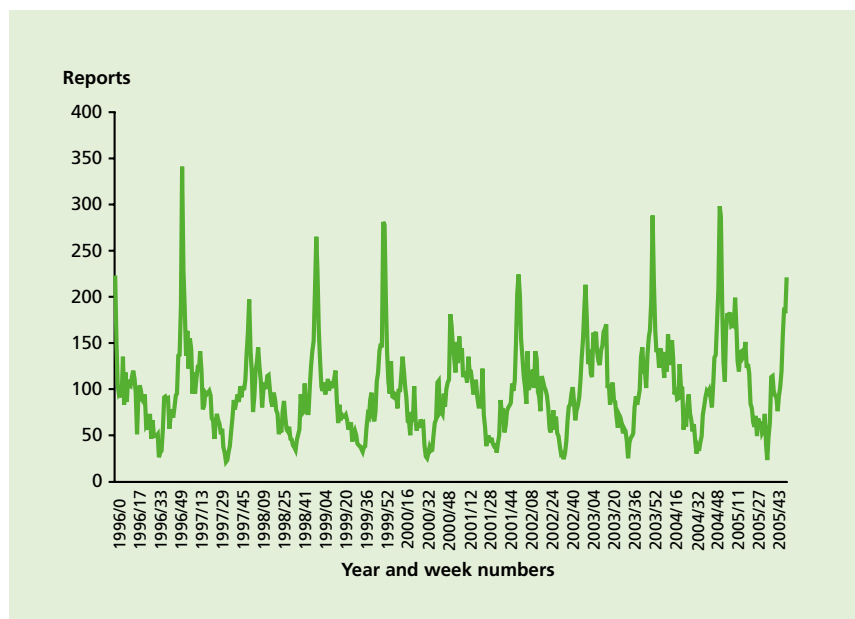


Figure 25.1 Weekly number of invasive pneumococcal disease cases in England and Wales (1996–2005)

blood, CSF or other normally sterile sites were reported to the Health Protection Agency Centre for Infection (HPA CfI) from laboratories in England and Wales (Health Protection Agency, 2010). Figure 25.1 shows the weekly number of invasive pneumococcal disease cases in England and Wales between 1996 and 2005. The pneumococcus is also the commonest cause of community- acquired pneumonia (Bartlett and Mundy, 1995). Pneumococcal pneumonia is estimated to affect one in a thousand adults each year and has a case fatality ratio of 10 to 20% (World Health Organization, 1999).

Antimicrobial resistance among pneumococci occurs and susceptibility to macrolide antimicrobials, penicillin and cephalosporin can no longer be assumed. In 2000, 13% of invasive isolates in England and Wales reported to the HPA CDSC were resistant to erythromycin and 7% showed full or intermediate resistance to penicillin (George and Melegaro, 2001, 2003). An increase in pneumococcal antibiotic resistance has been reported worldwide (Appelobaum, 1992; Butler *et al.*, 1996; Davies *et al.*, 1999).

Since 1992, pneumococcal polysaccharide immunisation (see below) has been recommended for people with medical conditions for whom pneumococcal infection was likely to be more common or serious.

In recent years, the pneumococcal vaccination recommendations have undergone a number of changes:

- in 2002, a pneumococcal conjugate vaccine (PCV) containing polysaccharide from seven common capsular types (PCV7) became available and was recommended for immunisation of at-risk groups under the age of two years
- in 2003, pneumococcal polysaccharide (PPV) immunisation was recommended for all people aged 65 and over
- in 2004, the PCV7 policy was extended to at-risk children under five years of age
- in 2006, PCV7 was added to the routine childhood immunisation programme
- in 2010, a pneumococcal conjugate vaccine containing polysaccharide from thirteen common capsular types (PCV13) replaced PCV7. PCV13 aims to protect against 6 additional serotypes compared with PCV7.

## The pneumococcal vaccination

There are two types of pneumococcal vaccine:

- pneumococcal polysaccharide vaccine (PPV) contains purified capsular polysaccharide from each of 23 capsular types\* of pneumococcus (PPV23)
- pneumococcal conjugate vaccine (PCV) contains polysaccharide from thirteen common capsular types (PCV13).† These are conjugated to protein (CRM197) using similar manufacturing technology to that used for *Haemophilus influenzae* type b (Hib) and meningococcal conjugate vaccines.

The pneumococcal polysaccharide and pneumococcal conjugate vaccines do not contain thiomersal. The vaccines are inactivated, do not contain live organisms and cannot cause the diseases against which they protect.

## Pneumococcal polysaccharide vaccine (PPV)

Most healthy adults develop a good antibody response to a single dose of PPV by the third week following immunisation. Antibody response may be reduced in those with immunological impairment and those with an absent or dysfunctional spleen. Children younger than two years of age show poor antibody responses to immunisation with PPV.

\* 1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19F, 19A, 20, 22F, 23F, 33F

† 1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F, 23F

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It is difficult to reach firm conclusions about the effectiveness of PPV, but overall efficacy in preventing pneumococcal bacteraemia is probably 50 to 70% (Mangtani *et al.*, 2003; Fedson, 1999; Fine *et al.*, 1994; Butler *et al.*, 1993; Melegaro and Edmunds, 2004). Current evidence suggests that PPV is not effective in protecting against non-bacteraemic pneumococcal pneumonia (Jackson *et al.*, 2003). It does not prevent otitis media or exacerbations of chronic bronchitis. The vaccine is relatively ineffective in patients with multiple myeloma, Hodgkin's and non-Hodgkin's lymphoma (especially during treatment) and chronic alcoholism.

The vaccine does not protect against pneumococcal infection due to capsular types not contained in the vaccine, but the 23 types included account for about 96% of the pneumococcal isolates that cause serious infection in the UK (Health Protection Agency, 2003).

The length of protection is not known and may vary between capsular types. Post-immunisation antibody levels usually begin to wane after about five years, but may decline more rapidly in asplenic patients and children with nephrotic syndrome (Butler *et al.*, 1993).

There is no evidence of effectiveness of PPV in children under two years of age (Fedson *et al.*, 1999).

## Pneumococcal conjugate vaccine (PCV)

The antibody response in young children can be improved by conjugating the polysaccharide to proteins such as CRM197. The conjugated vaccine is known to be immunogenic in children from two months of age. Data on immunogenicity comes from four studies using the UK childhood immunisation schedule of a primary course of two doses, at least two months apart, and a third dose in the second year of life. In a study conducted in the UK comparing the seven valent (Prevenar®) and thirteen valent (Prevenar13®) PCV, the functional antibody responses were comparable for all serotypes common to both vaccines (Wyeth, 2010). Studies have also shown good functional antibody responses to the additional six serotypes in the thirteen valent PCV (Prevenar13®).

Post-licensure surveillance, following introduction of the seven valent PCV in the UK in 2006 as part of a universal infant immunisation programme, has shown a large reduction in both invasive and non-invasive disease incidence due to vaccine serotypes in both vaccinated and to a smaller degree in older unvaccinated populations ('herd protection')(HPA website, 2010). During the same period, the UK has seen an increase in invasive disease due to non-vaccine serotypes (termed 'serotype replacement')(HPA website, 2010).

Replacement disease has been caused in a large part by the extra six serotypes which are now covered by PCV13 that replaced PCV7 in 2010.

## Storage

Vaccines should be stored in the original packaging at +2°C to +8°C and protected from light. All vaccines are sensitive to some extent to heat and cold. Heat speeds up the decline in potency of most vaccines, thus reducing their shelf life. Effectiveness cannot be guaranteed for vaccines unless they have been stored at the correct temperature. Freezing may cause increased reactogenicity and loss of potency for some vaccines. It can also cause hairline cracks in the container, leading to contamination of the contents.

## Presentation

Both PCV13 and PPV23 are supplied as single doses of 0.5ml.

### PCV13

Storage can cause the vaccine to separate into a white deposit and clear supernatant. The vaccine should be shaken well to obtain a white homogeneous suspension and should not be used if there is any residual particulate matter after shaking.

### PPV23

The polysaccharide vaccine should be inspected before being given to check that it is clear and colourless.

Vaccines must not be given intravenously.

## Dosage and schedule

### PCV13

For infants under one year of age:

- First dose of 0.5ml of PCV13 at two months of age.
- Second dose of 0.5ml at four months of age (at least two months after the first dose).
- A third dose of 0.5ml should be given at 12 months (at least 2 months after the last PCV13 dose).

Unimmunised or partially immunised children aged one year and up to two years of age:

- A single dose of 0.5ml of PCV13.

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Children and adults in a clinical risk group (table 25.1):

- See recommendations below.

### PPV23

Adults over 65 years and at-risk groups aged two years or over:

- A single dose of 0.5ml of PPV23.

## Administration

Vaccines are routinely given into the upper arm in children and adults or the anterolateral thigh in infants under one year of age. This is to reduce the risk of localised reactions, which are more common when vaccines are given subcutaneously (Mark *et al.*, 1999; Diggle and Deeks, 2000; Zuckerman, 2000). However, for individuals with a bleeding disorder, vaccines should be given by deep subcutaneous injection to reduce the risk of bleeding.

Pneumococcal vaccines can be given at the same time as other vaccines such as DTaP/IPV/Hib, MMR, MenC, Hib/MenC and influenza. The vaccines should be given at separate sites, preferably in different limbs. If given in the same limb, they should be given at least 2.5cm apart (American Academy of Pediatrics, 2003) (see chapter 11). The site at which each vaccine was given should be noted in the individual's records.

## Disposal

Equipment used for vaccination, including used vials, ampoules, or partially discharged vaccines should be disposed of at the end of a session by sealing in a proper, puncture-resistant 'sharps' box according to local authority regulations and guidance in the technical memorandum 07-01 (Department of Health, 2006).

## Recommendations for the use of pneumococcal vaccine

The objective of the immunisation programme is to protect all of those for whom pneumococcal infection is likely to be more common and/or serious, i.e.:

- infants as part of the routine childhood immunisation programme
- those aged 65 years or over
- children and adults in the clinical risk groups shown in Table 25.1.

Table 25.1 Clinical risk groups who should receive the pneumococcal immunisation

Clinical risk group	Examples (decision based on clinical judgement)
<b>Asplenia or dysfunction of the spleen</b>	This also includes conditions such as homozygous sickle cell disease and coeliac syndrome that may lead to splenic dysfunction.
<b>Chronic respiratory disease</b>	This includes chronic obstructive pulmonary disease (COPD), including chronic bronchitis and emphysema; and such conditions as bronchiectasis, cystic fibrosis, interstitial lung fibrosis, pneumoconiosis and bronchopulmonary dysplasia (BPD). Children with respiratory conditions caused by aspiration, or a neurological disease (e.g. cerebral palsy) with a risk of aspiration. Asthma is not an indication, unless so severe as to require continuous or frequently repeated use of systemic steroids (as defined in Immunosuppression below).
<b>Chronic heart disease</b>	This includes those requiring regular medication and/or follow-up for ischaemic heart disease, congenital heart disease, hypertension with cardiac complications, and chronic heart failure.
<b>Chronic kidney disease</b>	Nephrotic syndrome, chronic kidney disease at stages 4 and 5 and those on kidney dialysis or with kidney transplantation.
<b>Chronic liver disease</b>	This includes cirrhosis, biliary atresia and chronic hepatitis.
<b>Diabetes</b>	Diabetes mellitus requiring insulin or oral hypoglycaemic drugs. This does not include diabetes that is diet controlled.
<b>Immunosuppression</b>	Due to disease or treatment, including patients undergoing chemotherapy leading to immunosuppression, bone marrow transplant, asplenia or splenic dysfunction, HIV infection at all stages, multiple myeloma or genetic disorders affecting the immune system (e.g. IRAK-4, NEMO, complement deficiency)  Individuals on or likely to be on systemic steroids for more than a month at a dose equivalent to prednisolone at 20mg or more per day (any age), or for children under 20kg, a dose of 1mg or more per kg per day.
<b>Individuals with cochlear implants</b>	<i>It is important that immunisation does not delay the cochlear implantation.</i>
<b>Individuals with cerebrospinal fluid leaks</b>	This includes leakage of cerebrospinal fluid such as following trauma or major skull surgery.

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Primary care staff should identify patients for whom vaccine is recommended and use all opportunities to ensure that they are appropriately immunised, for example:

- when immunising against influenza
- at other routine consultations, especially on discharge after hospital admission.

## Primary immunisation

### PCV13

PCV13 is recommended for infants from two months of age as part of the routine childhood immunisation schedule.

The primary course of PCV13 vaccination consists of two doses with an interval of two months between each dose. The recommended schedule for vaccination is two and four months of age. If the primary course is interrupted, it should be resumed but not repeated, allowing an interval of two months between doses.

### PPV23

#### Adults 65 years or over

A single dose of PPV23 should be administered.

## Reinforcing immunisation

### PCV13

A reinforcing (booster) dose of PCV13 is recommended at 12 months of age for children who have received a complete primary course of two PCVs. This vaccine is given at the same time as the Hib/MenC and MMR vaccines (see Chapter 11).

### PPV23

Antibody levels are likely to decline rapidly in individuals with no spleen, splenic dysfunction or chronic renal disease (Giebink *et al.*, 1981; Rytel *et al.*, 1986) and therefore re-immunisation with PPV23 is recommended every five years in these groups. Revaccination is well tolerated (Jackson *et al.*, 1999). Testing of antibody levels prior to vaccination is not required.

Although there is evidence of a decline in protection with time (Shapiro *et al.*, 1991), there are no studies showing additional protection from boosting individuals with other indications, including age, and therefore routine revaccination is not currently recommended.



Individuals who have previously received a 12- or 14-valent PPV should be immunised with PPV23 to gain protection from the additional serotypes.

## Individuals with unknown or incomplete vaccination histories

Unless there is a reliable history of previous immunisation, individuals should be assumed to be unimmunised. The full UK recommendations should be followed. Unimmunised or partially immunised children who present late for vaccination should receive two doses of PCV13 two months apart \* before the age of one year (if possible), and a further dose at 12 months of age (two months after the last PCV13 dose)\*. An unimmunised or partially immunised child aged between one and under two years of age should have a single dose of PCV13.

## Risk groups

### Children diagnosed at-risk under two years of age

At-risk infants younger than one year (Table 25.1) should be given PCV13 according to the schedule for the routine immunisation programme, at 2 and 4 months and 12 months of age (Table 25.2). At-risk infants who present late for vaccination should be offered two doses of PCV13 two months apart\* before the age of one year (if possible), and a further dose at 12 months of age (two months after the last PCV13 dose)\*. All at-risk children should receive a dose of PPV23 after their second birthday.

At-risk children aged between one year and under two years (excluding those with asplenia or splenic dysfunction, or who are immunocompromised) should receive the routine 12-month PCV13 booster only. If this dose has not been administered at 12 months, then it may be given at any time up to two years of age. Children in this age group who have asplenia or splenic dysfunction, or who are immunocompromised, may have a sub-optimal immunological response to the first dose of vaccine, and a second dose of PCV13 should be given two months after the first dose. All at-risk children should receive a dose of PPV23 after their second birthday and at least 2 months after the last PCV13 dose.

### Children diagnosed at-risk aged two to five years of age

At-risk children aged at least two years and under 5 years (excluding those with asplenia or splenic dysfunction, or who are immunocompromised) who

\* the intervals may be reduced to one month if necessary to ensure that the immunisation schedule is completed.

completed the recommended routine immunisation schedule at 2, 4 and 12 months should receive a single dose of PPV23 at least two months after the last dose of PCV13. At risk children in this group who are previously unvaccinated or partially vaccinated (including those who only received PCV7) should receive one dose of PCV13, followed by PPV23 at least two months later.

Children in this age group who have asplenia or splenic dysfunction, or who are immunocompromised, may have a sub-optimal immunological response to vaccination. If fully vaccinated, these children should receive one dose of PCV13 followed by PPV23 at least two months later. Children who are previously unvaccinated or partially vaccinated (including those who only received PCV7) should receive two doses of PCV13 at least two months apart, followed by PPV23 at least two months later.

At-risk children who are eligible for one or two doses of PCV13 (as above) but who have already received PPV23 should wait at least six months after the PPV23 dose to receive PCV13 in order to reduce the theoretical risk of pneumococcal serotype-specific hypo-responsiveness.

Table 25.2 Vaccination schedule for those in a clinical risk group

Patient age at presentation	Vaccine given and when to immunise	
	13-valent PCV (PCV13)	23-valent PPV
At-risk children 2 months to under 12 months of age (including infants who have asplenia or splenic dysfunction or who are immunosuppressed)	Vaccination according to the routine immunisation schedule at 2, 4 and 12 months	One dose after the second birthday.
At-risk children 12 months to under 5 years of age who have asplenia or splenic dysfunction or who are immunosuppressed	Two doses, with an interval of 2 months between doses	One dose after the second birthday and at least 2 months after the final dose of PCV13
All other at-risk children 12 months to under 5 years of age	One dose	One dose after the second birthday and at least 2 months after the final dose of PCV13
At-risk children aged 5 years and at-risk adults	PCV is not recommended unless severely immunocompromised (see below for advice for severely immunocompromised)	One dose (see below for advice for severely immunocompromised)

### **Severely immunocompromised children diagnosed from five years onwards and adults**

Severely immunocompromised children aged at least five years and adults – including bone marrow transplant patients, patients with acute and chronic leukaemia, multiple myeloma or genetic disorders affecting the immune system (e.g. IRAK-4, NEMO, complement deficiency) – should be offered a single dose of PCV13 followed by PPV23 at least two months later (irrespective of their routine childhood vaccinations).

For leukaemia patients, PCV13 should be given from six months after completion of chemotherapy, and for bone marrow transplant patients, PCV13 should be offered 9-12 months following transplantation.

Severely immunocompromised patients who have already received PPV23 should be offered PCV13 with an interval of at least six months following the dose of PPV23 to reduce the risk of pneumococcal serotype-specific hypo-responsiveness.

### **All other children aged at least five years and adults in clinical risk groups**

All children aged five years and above and adults in a clinical risk group other than those who are severely immunocompromised (see Table 25.2) should receive a single dose of PPV23 only.

### **Children and adults requiring splenectomy or commencing immunosuppressive treatment**

Previously unvaccinated children and adults requiring splenectomy or commencing immunosuppressive treatment may be at an increased risk of pneumococcal disease and should be vaccinated according to the schedule for this specific risk group.

Ideally, pneumococcal vaccine should be given four to six weeks before Pneumococcal elective splenectomy or initiation of treatment such as chemotherapy or radiotherapy. Where this is not possible, it can be given up to two weeks before treatment. If it is not possible to vaccinate beforehand, splenectomy, chemotherapy or radiotherapy should never be delayed.

If it is not practicable to vaccinate two weeks before splenectomy, immunisation should be delayed until at least two weeks after the operation. This is because there is evidence that functional antibody responses may be better from this

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time (Shatz *et al.*, 1998). If it is not practicable to vaccinate two weeks before the initiation of chemotherapy and/or radiotherapy, immunisation can be delayed until at least three months after completion of therapy in order to maximise the response to the vaccine. Immunisation of these patients should not be delayed if this is likely to result in a failure to vaccinate.

### Individuals at occupational risk

There is an association between exposure to metal fume and pneumonia and infectious pneumonia, particularly lobar pneumonia (Palmer *et al.*, 2003; Palmer *et al.*, 2009; Industrial Injuries Advisory Council, 2010; Toren *et al.*, 2011) and between welding and invasive pneumococcal disease (Wong *et al.*, 2010). PPV23 (single 0.5ml dose in those who have not received PPV previously) should be considered for those at risk of frequent or continuous occupational exposure to metal fume (e.g. welders) taking into account the exposure control measures in place. Vaccination may reduce the risk of invasive pneumococcal disease but should not replace the need for measures to prevent or reduce exposure.

### Contraindications

There are very few individuals who cannot receive pneumococcal vaccines. When there is doubt, appropriate advice should be sought from a consultant paediatrician, immunisation co-ordinator or consultant in communicable disease control rather than withholding the vaccine.

The vaccines should not be given to those who have had:

- a confirmed anaphylactic reaction to a previous dose of the vaccines
- a confirmed anaphylactic reaction to any component of the vaccines.

Confirmed anaphylaxis is rare. Other allergic conditions, such as rashes, may occur more commonly and are not contraindications to further immunisation. A careful history of the event will often distinguish between true anaphylaxis and other events that are either not due to the vaccine or not life-threatening. In the latter circumstance, it may be possible to continue the immunisation course. Specialist advice must be sought on the vaccines and the circumstances in which they could be given. The risk to the individual of not being immunised must be taken into account.

## Precautions

Minor illnesses without fever or systemic upset are not valid reasons to postpone immunisation. If an individual is acutely unwell, immunisation should be postponed until they have fully recovered. This is to avoid confusing the differential diagnosis of any acute illness by wrongly attributing any signs or symptoms to the adverse effects of the vaccine.

## Pregnancy and breast-feeding

Pneumococcal vaccines may be given to pregnant women when the need for protection is required without delay. There is no evidence of risk from vaccinating pregnant women or those who are breast-feeding with inactivated viral or bacterial vaccines or toxoids (Plotkin and Orenstein, 2004).

## 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 hours (Pfister *et al.* 2004; Ohlsson *et al.* 2004; Schulzke *et al.* 2005; Pourcyrous *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.

## Immunosuppression and HIV infection

Individuals with immunosuppression and HIV infection (regardless of CD4 count) should be given pneumococcal vaccines in accordance with the recommendations above.

Studies on the clinical efficacy of PPV23 in HIV-infected adults have reported inconsistent findings, including one study from the developing world where a higher risk of pneumonia was observed in vaccinees (Watera *et al.*, 2004). Observational studies in developed countries have not confirmed this finding, and most experts believe that the potential benefit of pneumococcal vaccination outweighs the risk in developed countries (USPHS/IDSA, 2001).

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For children with HIV infection (regardless of CD4 count), clinicians may also wish to consider the joint guidance from the Paediatric European Network for Treatment of AIDS Vaccines Group and the Children's HIV Association (Menson *et al.*, 2012). Further guidance for adults is provided by the British HIV Association (BHIVA) Immunisation guidelines for HIV-infected adults (<http://www.bhiva.org/Guidelines.aspx>).

### Adverse reactions

#### PCV13

Prevenar13<sup>®</sup> vaccine carries a black triangle symbol (▼). This is a standard symbol added to the product information of a vaccine during the earlier stages of its introduction, to encourage reporting of all suspected adverse reactions. Anyone can report a suspected adverse reaction to the Medical and Healthcare products Regulatory Agency (MHRA) using the Yellow Card reporting scheme ([www.yellowcard.gov.uk](http://www.yellowcard.gov.uk)).

The safety of the vaccine was assessed in controlled clinical studies and the safety profile of Prevenar13<sup>®</sup> was similar to Prevenar<sup>®</sup>. For Prevenar13<sup>®</sup>, very common or common reactions reported included decreased appetite; pyrexia; irritability; any injection-site erythema: induration/swelling or pain/tenderness; somnolence; poor quality sleep (Wyeth, 2010). Reports of all adverse reactions can be found in the summary of product characteristics for Prevenar 13<sup>®</sup> (Wyeth, 2010).

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Mild soreness and induration at the site of injection lasting one to three days and, less commonly, a low grade fever may occur. More severe systemic reactions are infrequent. In general, local and systemic reactions are more common in people with higher concentrations of antibodies to pneumococcal polysaccharides.

### Management of cases, contacts and outbreaks

#### Cases of invasive pneumococcal disease (IPD)

Any case of invasive pneumococcal infection or lobar pneumonia believed to be due to *S. pneumoniae* should prompt a review of the patient's medical history to establish whether they are in a recognised risk group and whether they have been appropriately immunised. Unimmunised or partially immunised at risk individuals should be vaccinated upon discharge from hospital whenever possible.

## Cases in small children under five years of age

Clinicians should ensure that children diagnosed with IPD have completed the recommended national immunisation schedule. Infants who are younger than 12 months of age at the time of IPD and who are unvaccinated or partially vaccinated should complete the recommended immunisation schedule.

Immunised children who subsequently develop IPD caused by one of the pneumococcal vaccine serotypes should be investigated for possible underlying immune deficiency. If the child falls into one of the clinical risk groups in Table 25.1, then additional vaccinations should be offered as recommended in this chapter.

Isolates from all cases of IPD should be referred to the national reference laboratory for serotyping. All new cases of IPD in children in aged <5 years England and Wales, regardless of serotype, will be followed up by Public Health England (for England and Wales) and Health Protection Scotland. Some cases may require serotype-specific antibody and/or additional pneumococcal vaccination testing depending on the pneumococcal vaccination status of the child and the infecting pneumococcal serotype.

## Contacts

Close contacts of pneumococcal meningitis or other invasive pneumococcal disease are not normally at an increased risk of pneumococcal infection and therefore antibiotic prophylaxis is not indicated. Clusters of invasive pneumococcal disease should be discussed with local health protection teams.

## Outbreaks

Outbreaks of pneumococcal respiratory disease in hospitals and residential care homes need prompt investigation. Control measures including vaccination may be appropriate; these should be agreed in discussion with local health protection or infection control teams. For further information see the interim UK guidelines for the public health management of clusters of serious pneumococcal disease in closed settings (Health Protection Agency, 2008).

### Supplies

- 13-valent PCV (Prevenar 13<sup>®</sup>) is manufactured by Pfizer (Medical Information Tel: 01737 331111; Fax: 01737 332507; E-mail: MedInfoUK@Pfizer.com). It is supplied by Movianto UK Ltd (01234 248631) as part of the national childhood immunisation programme.
- 23-valent plain PPV (Pneumovax<sup>®</sup> II) is manufactured by Sanofi Pasteur MSD  
(Tel: 0800 085 5511)  
(Fax: 0800 085 8958).

In Northern Ireland, supplies should be obtained from local childhood vaccine-holding centres. Details of these are available from the regional pharmaceutical procurement service (Tel: 028 9055 2386).

### Information materials

A patient card and information sheet for asplenic and hyposplenic patients are available from:

Department of Health publications (Tel: 0300 123 1002).  
(E-mail: [dh@prolog.uk.com](mailto:dh@prolog.uk.com)). or in Scotland from:  
The Health Protection Team (Immunisation) Health Directorates  
Scottish Executive Area 3ES  
St Andrews House Regent road Edinburgh  
EH1 3DG  
(Tel: 0131 244 2241).  
(Fax: 0131 244 2157).  
(E-mail: [chris.sinclair@scotland.gsi.gov.uk](mailto:chris.sinclair@scotland.gsi.gov.uk)).

or in Wales a leaflet *A guide for people without a working spleen* and a patient card are available from:

The Welsh Assembly Government Publications Centre  
(02920 823683)  
(E-mail: [assembly-publications@wales.gsi.gov.uk](mailto:assembly-publications@wales.gsi.gov.uk))



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