

# Key points

Following are the key points from each of the chapters that focus on a particular disease (chapters 3–17). See page xvi for an explanation of the abbreviations. For catch up schedules for unimmunised or partially immunised children see Appendix 2.

## Hepatitis B key points (see chapter 3)

### Illness or risks of infection

- Hepatitis B is mainly transmitted by infected blood, or the exchange of bodily fluids during sexual intercourse/activity.
- Vertical transmission occurs from mother to infant.
- Asymptomatic infection occurs in 60 percent of individuals.
- The host immune response leads to death of the infected liver cell.

### Disease complications

- Fulminant hepatitis.
- The chronic carrier state leads to chronic active hepatitis or cirrhosis, hepatocellular carcinoma and death. Chronic carriers are the most common source of hepatitis B infection.

### New Zealand epidemiology

- New Zealand overall has a low endemic level (< 2 percent) of hepatitis B carriage, but there are areas with medium (2–7 percent) and high ( $\geq$  8 percent) endemic levels.
- In 2004 the case notification rate was 1.6 per 100,000 population.
- In 2005 there were no new cases identified in the 0–15 years age group, and one case in the 15–19 years age group.

### National Immunisation Schedule

Age*	Immunisation given	Special Programme	
6 weeks	DTaP-IPV	<b>Hib-Hep B</b>	MeNZB™
3 months	DTaP-IPV	<b>Hib-Hep B</b>	MeNZB™
5 months	DTaP-IPV	<b>Hep B</b>	MeNZB™
10 months			MeNZB™
15 months	Hib	MMR	
4 years	DTaP-IPV	MMR	
11 years	dTap-IPV		
45 years	Td		
65 years	Td	Influenza (annually)	

\* Hep B and HBIG are offered at birth to babies of HBsAg positive mothers

### Vaccine and dosage

- Hep B – hepatitis B vaccine (HBvaxPRO<sup>®</sup>, MSD), 0.5 mL dose, intramuscular injection.
- Hib-Hep B – *Haemophilus influenzae* type b-hepatitis B vaccine (COMVAX<sup>®</sup>, MSD), 0.5 mL dose, intramuscular injection.

### Vaccine efficacy

- The protective level of antibodies is  $\geq 10$  mIU/mL.
- After three doses of vaccine, 95 percent of infants, children and adolescents develop protection.
- In high risk groups vaccine efficacy is 85–95 percent.
- The response rate declines with age and other risk factors such as smoking, obesity, HIV infection and chronic disease.

### Vaccine composition

- HBvaxPRO<sup>®</sup> – 5  $\mu$ g hepatitis B surface antigen (without preservative).
- COMVAX<sup>®</sup> – 5  $\mu$ g hepatitis B surface antigen, 7.5  $\mu$ g *Haemophilus influenzae* type b purified capsular polysaccharide, 125  $\mu$ g *Neisseria meningitidis* (without preservative).

### Expected responses and AEFI

- Expected responses: local soreness and redness, nausea, diarrhoea, general malaise and fever are more common in adults than in children, and are similar to placebo except for local reactions.
- AEFI: rarely thrombocytopenia, myalgia and arthralgia. Allergic reactions are reported but rare. Anaphylaxis has been reported in adults but is extremely rare.

### Vaccine contraindications

- Anaphylaxis following a previous dose.

# Diphtheria key points (see chapter 4)

## Illness or risks of infection

- A serious, often fatal disease, diphtheria causes a membranous inflammation of the upper respiratory tract, and it can also cause infection at other sites, notably the skin.
- The organism is not usually invasive, but produces a powerful toxin that damages the myocardium, peripheral nerves, kidneys and other organs.

## Disease complications

- These include myocarditis and heart failure, nerve demyelination and paralysis and kidney failure.
- The case fatality rate is 2–10 percent.

## New Zealand epidemiology

- The antibody decline apparent with age suggests there is likely to be a large and increasing pool of adults susceptible to diphtheria in New Zealand.
- This was the reason for the introduction of adult tetanus diphtheria (Td) vaccination in 1994.

## National Immunisation Schedule

Age	Immunisation given		Special Programme
6 weeks	DTaP-IPV	Hib-Hep B	MeNZB™
3 months	DTaP-IPV	Hib-Hep B	MeNZB™
5 months	DTaP-IPV	Hep B	MeNZB™
10 months			MeNZB™
15 months	Hib	MMR	
4 years	DTaP-IPV	MMR	
11 years	dTap-IPV		
45 years	Td*		
65 years	Td*	Influenza (annually)	

\* Administration is not funded.

## Vaccine and dosage

- DTaP-IPV – diphtheria-tetanus-acellular pertussis-inactivated polio vaccine (INFANRIX™-IPV, GSK), 0.5 mL dose, intramuscular injection.
- dTap-IPV – adult diphtheria-tetanus-acellular pertussis-inactivated polio vaccine (BOOSTRIX®-IPV, GSK), 0.5 mL dose, intramuscular injection.

- DT – diphtheria-tetanus vaccine (CDT™, CSL), 0.5 mL dose, intramuscular injection for children under seven years of age requiring an alternative to pertussis containing vaccine.
- Td – adult diphtheria-tetanus vaccine (ADT®, CSL), 0.5 mL dose, intramuscular injection for children over seven years of age requiring an alternative to pertussis containing vaccine, and adults.

### Vaccine efficacy

- Efficacy is 87–98 percent protection.
- Immunised cases have been shown to have less severe disease.

### Vaccine composition

- INFANRIX™-IPV – not less than 30 IU of adsorbed diphtheria toxoid, not less than 40 IU of adsorbed tetanus toxoid, 25 µg of PT, 25 µg of FHA, 8 µg of pertactin, 40 D antigen units of type 1 (Mahoney), 8 D antigen units of type 2 (MEF1), and 32 D antigen units of type 3 (Saukett) of the polio virus; inactivated by formaldehyde, and containing traces of neomycin and polymyxin.
- BOOSTRIX®-IPV – not less than 2 IU of adsorbed diphtheria toxoid, not less than 20 IU of adsorbed tetanus toxoid, 8 µg of PT, 8 µg of FHA, 2.5 µg of pertactin, 40 D antigen units of type 1 (Mahoney), 8 D antigen units of type 2 (MEF1), and 32 D antigen units of type 3 (Saukett) of the polio virus; inactivated by formaldehyde and containing traces of neomycin and polymyxin.
- CDT™ – see diphtheria and tetanus components of INFANRIX™-IPV.
- ADT® – see diphtheria and tetanus components of BOOSTRIX®-IPV.

### Expected responses and AEFI

- DTaP-IPV and dTap-IPV – local and systemic reactions do occur, especially when infant vaccine is used in older children and adults. (See Pertussis key points.)
- Td – fever, headache and malaise; serious adverse events in 2.1 events per million doses.

### Vaccine contraindications

- DTaP-IPV and dTap-IPV – see Pertussis key points.
- Td and DT – serious reaction to a previous dose.

## Tetanus key points (see chapter 5)

### Illness or risks of infection

- Infection may follow even a trivial wound.
- Tetanus is a clinical diagnosis, and is characterised by muscular rigidity and very painful contraction spasms.
- Initial symptoms include weakness, stiffness or cramps, and difficulty chewing or swallowing food.
- Reflex muscle spasms usually occur within one to four days of the initial symptoms.

### Disease complications

- When severe tetanus is associated with a characteristic facial grimace (risus sardonius) and arching of the back (opisthotonus).
- The patient suffering from tetanus remains alert unless they become severely hypoxic.
- Respiratory failure can occur.

### New Zealand epidemiology

- Eight cases were notified from 2001 to 2004, and among these was an unimmunised child aged one year diagnosed with tetanus in 2001.
- The single case notified in 2004 was a female age 60–65 years with an unknown immunisation history.
- However, there were five cases hospitalised with tetanus in 2004 (not all cases are notified).

### National Immunisation Schedule

Age	Immunisation given		Special Programme
6 weeks	DTaP-IPV	Hib-Hep B	MeNZB™
3 months	DTaP-IPV	Hib-Hep B	MeNZB™
5 months	DTaP-IPV	Hep B	MeNZB™
10 months			MeNZB™
15 months	Hib	MMR	
4 years	DTaP-IPV	MMR	
11 years	dTap-IPV		
45 years	Td*		
65 years	Td*	Influenza (annually)	

\* Administration is not funded.

**Vaccine and dosage**

- See Table 5.1 for vaccine and immunoglobulin recommendations for wound care.
- See Diphtheria key points.

**Vaccine efficacy**

- The tetanus vaccine was 100 percent effective when given to pregnant women to protect against neonatal tetanus in a randomised controlled trial.
- In most studies, 100 percent of infants have protective levels of tetanus antibody after three doses of vaccine given at intervals of one month or longer.

**Vaccine composition**

- See Diphtheria key points.

**Expected responses and AEFI**

- Local reactions such as pain, redness and swelling around the injection site have been reported in 0–95 percent of recipients.
- Sterile abscesses and persistent nodules at the injection site may develop if the injection is not given deeply enough into the muscle.
- Brachial plexus neuropathy from tetanus vaccine occurs at a rate of 0.5 to 1 per 100,000 doses within one month of immunisation.
- See also Pertussis key points.

**Vaccine contraindications**

- Immunisation with Td (or tetanus toxoid) should not be repeated in individuals who have had previous severe hypersensitivity reactions.

## Pertussis key points (see chapter 6)

### Illness or risks of infection

- This is a highly infectious bacterial disease spread by droplets.
- The initial catarrhal stage, which is the most infectious period, is of insidious onset with rhinorrhoea and an irritating cough that can progress to severe paroxysms of coughing, characterised by a series of short expiratory bursts, followed by an inspiratory gasp or typical whoop and/or vomiting.
- Risk of infection is nearly universal without immunisation.

### Disease complications

- Secondary infections include otitis media and pneumonia, and the physical sequelae of paroxysmal coughing (eg, subconjunctival haemorrhages, petechiae, epistaxes, central nervous system haemorrhages, pneumothoraces and herniae).
- Prolonged periods of apnoea may result in cyanosis, anoxic encephalopathy, convulsions and death.

### New Zealand epidemiology

- The most recent epidemic was in 2004/05.
- The population case rate in 2004 was 93.4 per 100,000, with 3.4 percent of cases hospitalised.
- Infants less than one year of age had the highest disease rate (327.5 per 100,000), although rates were high up to age 19 years.

### National Immunisation Schedule

Age	Immunisation given		Special Programme
6 weeks	DTaP-IPV	Hib-Hep B	MeNZB™
3 months	DTaP-IPV	Hib-Hep B	MeNZB™
5 months	DTaP-IPV	Hep B	MeNZB™
10 months			MeNZB™
15 months	Hib	MMR	
4 years	DTaP-IPV	MMR	
11 years	dTap-IPV		
45 years	Td		
65 years	Td	Influenza (annually)	

### Vaccine

- See Diphtheria key points.
- It is recommended that for students who have recently received a tetanus diphtheria (Td) vaccine booster, eg, at the time of an injury, the age 11 (year 7), dTap-IPV immunisation should be delayed until two years after the dose of Td,

and offered before the student reaches the age of 16 years. Students who would normally receive the year 7 event at school should be referred to their general practitioner for follow up and recall.

### **Vaccine efficacy**

- The acellular pertussis vaccine is 76–90 percent effective in the first two years of life.
- Protection lasts at least six years, and immunity gradually wanes if not boosted with vaccine or natural infection.
- Adolescents and adults are known to pass infection on to babies and infants.
- Pertussis containing vaccine given at age 11 years from 1 February 2006 is expected to prevent outbreaks of pertussis in young adults.

### **Vaccine composition and dosage**

- See Diphtheria key points.

### **Expected responses and AEFI**

- Redness at site of injection (33 percent) and mild fever (20 percent) after a dose of acellular pertussis. The frequency increases with increasing number of doses. (See section 6.6.)
- Persistent (> 3 hours) inconsolable screaming (44 per 100,000 doses); seizures (7 per 100,000); hypotonic, hyporesponsive episode (0–26 per 100,000 doses); anaphylaxis is very rare. (See section 6.6.)

### **Vaccine contraindications**

- These include a severe reaction following a previous dose of pertussis vaccine (ie, immediate severe anaphylactic reaction to the vaccine, or any component of the vaccine), or an encephalopathy within seven days.
- Those with an evolving neurological disorder should not be immunised until stabilised (eg, uncontrolled epilepsy or a deteriorating neurological state).

# **Haemophilus influenzae type b (Hib) key points** (see chapter 7)

## **Illness or risks of infection**

- Before immunisation, Hib was the commonest cause of life threatening bacterial infection, usually meningitis, in children under five years of age.

## **Disease complications**

- Hib causes meningitis, pneumonia, epiglottitis, septic arthritis, bacteraemia, cellulitis, and empyema in infants and young children, particularly under the age of two years but up to four years.

## **New Zealand epidemiology**

- Since the introduction of Hib vaccine there has been a greater than 90 percent reduction in the incidence of Hib disease in children less than five years of age.
- Of the small numbers of children who have developed Hib infection in New Zealand since the change to conjugated Hib vaccine in 2000, most were incompletely vaccinated for their age.

## **National Immunisation Schedule**

Age	Immunisation given		Special Programme
6 weeks	DTaP-IPV	<b>Hib-Hep B</b>	MeNZB™
3 months	DTaP-IPV	<b>Hib-Hep B</b>	MeNZB™
5 months	DTaP-IPV	Hepatitis B	MeNZB™
10 months			MeNZB™
15 months	<b>Hib</b>	MMR	
4 years	DTaP-IPV	MMR	
11 years	dTap-IPV		
45 years	Td		
65 years	Td	Influenza (annually)	

## **Vaccine and dosage**

- Hib-Hep B – *Haemophilus influenzae* type b-hepatitis B vaccine (COMVAX®, MSD), 0.5 mL dose, intramuscular injection.
- Hib – monovalent Hib vaccine (Hib-PRP-T, Hiberix™, GSK), intramuscular injection.

## **Vaccine composition**

- COMVAX® – see Hepatitis B key points.
- Hiberix™ – when reconstituted each dose contains 10 µg of purified polyribosyl-ribitol-phosphate capsular polysaccharide (PRP) of Hib covalently bound to approximately 30 µg tetanus toxoid.

**Vaccine efficacy**

- A primary course of Hib-OMP at two and four months of age and a booster dose at 12 months had an efficacy of 100 percent in 2588 Navajo children less than 15 months of age, who had received either one or two doses.
- Disease following a full course of Hib vaccine is rare.
- In the US, 15 cases per year are expected in children who have completed their Hib immunisation.

**Expected responses and AEFI**

- COMVAX® – sleepiness and irritability; local reactions.
- Hiberix™ – local reactions (up to 32 percent of children) and a fever higher than 38°C (5–10 percent).

**Vaccine contraindications**

- Known hypersensitivity or anaphylaxis to any component of the vaccine, or those who develop symptoms of hypersensitivity after a previous Hib injection.

# Poliomyelitis (Polio) key points (see chapter 8)

## Illness or risks of infection

- Polio is transmitted by the faecal-oral route, or by pharyngeal secretions.
- Infection is more common in young children.
- Symptoms include fever, headache, gastrointestinal disturbances, malaise, stiffness of the neck and back, and pain in the limbs, back and neck, with or without paralysis.
- Infection may be clinically inapparent in up to 95 percent of infections.

## Disease complications

- These include viral meningitis and flaccid paralysis (paralysis is more common in adults), and post-polio syndrome.

## New Zealand epidemiology

- New Zealand was certified polio free in 2000, with no indigenous cases since 1997.
- Since the change from OPV to IPV in 2002 there have been no cases of VAPP.

## National Immunisation Schedule

Age	Immunisation given		Special Programme
6 weeks	DTaP-IPV	Hib-Hep B	MeNZB™
3 months	DTaP-IPV	Hib-Hep B	MeNZB™
5 months	DTaP-IPV	Hep B	MeNZB™
10 months			MeNZB™
15 months	Hib	MMR	
4 years	DTaP-IPV	MMR	
11 years	dTap-IPV*		
45 years	Td		
65 years	Td	Influenza (annually)	

\* dTap-IPV is given in 2006/07 so that children receive 4 doses of polio vaccine.

## Vaccine and dosage

- DTaP-IPV – see Diphtheria key points.
- dTap-IPV – see Diphtheria key points.
- IPV – inactivated polio vaccine (IPOL, Sanofi Pasteur), 0.5 mL dose, subcutaneous injection.

### Vaccine efficacy

- IPV – virtually all infants seroconvert after three doses of IPV; over 85 percent seroconvert after two doses. Efficacy of IPV is over 90 percent.
- DTaP-IPV and dTap-IPV – one month after the three-dose primary vaccination series with DTaP-IPV the overall seropositivity for poliovirus serotypes 1, 2 and 3 was 99.5 percent. One month after dTap-IPV the immune responses to poliovirus were similar to the responses to IPV alone.

### Vaccine composition

- IPOL – 40 D antigen units of type 1 (Mahoney), 8 D antigen units of type 2 (MEF1), and 32 D antigen units of type 3 (Saukett) of the polio virus; inactivated by formaldehyde, and containing 2-phenoxyethanol (5 percent v/v) as a preservative, and traces of streptomycin and/or polymyxin B.
- INFANRIX™-IPV and BOOSTRIX®-IPV – see Diphtheria key points.

### Expected responses and AEFI

- IPV – erythema (33 percent); induration (1 percent); pain (13 percent); sleepiness, fussiness, crying and change in feeding (5 percent).
- DTaP-IPV and dTap-IPV – see Pertussis key points.

### Vaccine contraindications

- IPV – previous history of an anaphylactic reaction to a previous dose of IPV or to the antibiotics streptomycin, neomycin or polymyxin.
- DTaP-IPV and dTap-IPV – see Pertussis key points.

# Measles key points (see chapter 9)

## Illness or risks of infection

- Measles is an acute, highly communicable viral illness usually transmitted via exposure to infected respiratory secretions.
- The characteristic maculopapular rash appears on day three to seven, spreads over three to four days from the head over the trunk to the extremities, and lasts for up to one week.

## Disease complications

- These include otitis media, pneumonia, croup or diarrhoea in 1 out of 10 cases.
- Encephalitis has been reported in 1 per 1000 cases.
- Death occurs in 1 per 1000 cases.

## New Zealand epidemiology

- In 2003 there were 67 cases of measles notified, of which 11 were laboratory confirmed; and in 2004 33 were notified, of which nine were laboratory confirmed.
- It has been calculated that to prevent future measles epidemics (and possibly to eradicate measles) in New Zealand, there needs to be over 90 percent coverage of both doses of MMR at 15 months and four years of age.

## National Immunisation Schedule

Age	Immunisation given		Special Programme
6 weeks	DTaP-IPV	Hib-Hep B	MeNZB™
3 months	DTaP-IPV	Hib-Hep B	MeNZB™
5 months	DTaP-IPV	Hep B	MeNZB™
10 months			MeNZB™
15 months	Hib	<b>MMR</b>	
4 years	DTaP-IPV	<b>MMR</b>	
11 years	dTap-IPV		
45 years	Td		
65 years	Td	Influenza (annually)	

## Vaccine and dosage

- MMR – live attenuated measles, mumps and rubella vaccine (M-M-R® II, MSD), 0.5 mL, subcutaneous injection.

## Vaccine efficacy

- Seroconversion to all three viruses of MMR vaccine occurs in 85–100 percent of recipients, with 90–95 percent efficacy against measles.

- Primary vaccine failure occurs in 5–10 percent of recipients after the first dose and is rare after a second dose.

### Vaccine composition

When reconstituted, the vaccine contains  $\geq 1000$  CCID<sub>50</sub> (50 percent cell culture infectious dose) of measles virus (Enders' Edmonston [Moraten] strain); 12,500 CCID<sub>50</sub> of mumps virus (Jeryl Lynn strain); and 1000 CCID<sub>50</sub> of rubella virus (RA 27/3 strain); 25 µg neomycin (no preservative).

### Expected responses and AEFI

- Rash in 1.6 percent of children and high fever in 1.4 percent could be attributed to MMR in a placebo controlled study.
- Febrile convulsions occur in 1 in 3000 children, 6–12 days after immunisation.
- Thrombocytopenia occurs in approximately 1 in 30,000 doses, 15–35 days after immunisation.
- Central nervous system symptoms following measles vaccine are reported to occur in 1 in 1 million children.

### Vaccine contraindications

- Anaphylaxis following a previous dose of measles vaccine or MMR is a contraindication to a further dose of MMR.
- Other contraindications are: individuals with proven anaphylaxis (but not contact dermatitis) to neomycin; children with immune suppression; children who have received another live vaccine, including BCG, within the previous month; pregnant women; women of childbearing age, who should be advised to avoid pregnancy for the next 28 days after the MMR or measles vaccines; individuals who have received immunoglobulin or a blood transfusion during the preceding 11 months; children with HIV infection who are severely immune compromised.

## Mumps key points (see chapter 10)

### Illness or risks of infection

- An acute viral illness, mumps is characterised by fever, headache, and swelling and tenderness of one or more salivary glands.
- At least 30 percent of mumps infections in children are asymptomatic.

### Disease complications

- Aseptic meningitis occurs in 15 percent of cases, orchitis (usually unilateral) in up to 20 percent of post-pubertal males, and oophoritis in 5 percent of post-pubertal females.
- Encephalitis occurs in 1 in 6000 cases. The case fatality for mumps encephalitis is 1.4 percent.
- The overall mumps case fatality rate is 1.8 per 10,000 cases.

### New Zealand epidemiology

- There have been no mumps epidemics since 1994, due to the introduction of the MMR vaccine.

### National Immunisation Schedule

Age	Immunisation given		Special Programme
6 weeks	DTaP-IPV	Hib-Hep B	MeNZB™
3 months	DTaP-IPV	Hib-Hep B	MeNZB™
5 months	DTaP-IPV	Hep B	MeNZB™
10 months			MeNZB™
15 months	Hib	<b>MMR</b>	
4 years	DTaP-IPV	<b>MMR</b>	
11 years	dTap-IPV		
45 years	Td		
65 years	Td	Influenza (annually)	

### Vaccine and dosage

- MMR – see Measles key points.

### Vaccine efficacy

- See Measles key points.
- The protective efficacy of the Jeryl Lynn strain of mumps is 95–96 percent.

### Vaccine composition

- See Measles key points.

**Expected responses and AEFI**

- See Measles key points.

**Vaccine contraindications**

- See Measles key points.

## Rubella key points (see chapter 11)

### Illness or risks of infection

- Rubella is a common childhood disease that can affect adults, and often occurs in epidemics.
- It is most common in children of early school age.
- Clinical features include a transient erythematous rash, lymphadenopathy (particularly in the posterior auricular and suboccipital nodes), without respiratory symptoms.
- In adults, arthritis or arthralgia may occur.

### Disease complications

- These include encephalitis, arthritis or arthralgia, and neonatal death.
- Congenital rubella syndrome (CRS) is associated with cataracts, nerve deafness, cardiac malformations, microcephaly, mental retardation and behavioural problems. Inflammatory changes may also be found in the liver, lungs and bone marrow.

### New Zealand epidemiology

- Outbreaks continue to occur and emphasise the need to immunise both boys and girls to reduce the risk of exposure in pregnant women, as well as to reduce illness in men.
- No new cases of CRS have been reported between 1998 and 2004.

### National Immunisation Schedule

Age	Immunisation given		Special Programme
6 weeks	DTaP-IPV	Hib-Hep B	MeNZB™
3 months	DTaP-IPV	Hib-Hep B	MeNZB™
5 months	DTaP-IPV	Hep B	MeNZB™
10 months			MeNZB™
15 months	Hib	<b>MMR</b>	
4 years	DTaP-IPV	<b>MMR</b>	
11 years	dTap-IPV		
45 years	Td		
65 years	Td	Influenza (annually)	

### Vaccine and dosage

- MMR – see Measles key points.
- Note – there is no single antigen rubella vaccine available in New Zealand.

**Vaccine efficacy**

- The rubella vaccine is 90–97 percent effective in an outbreak after a single dose.
- One dose of rubella at  $\geq 12$  months induces an antibody response in  $\geq 95$  percent of recipients.
- In 90 percent of recipients antibodies persist for longer than 16 years.
- See Measles key points.

**Vaccine composition**

- See Measles key points.

**Expected responses and AEFI**

- See Measles key points.

**Vaccine contraindications**

- See Measles key points.

# Tuberculosis (TB) key points (see chapter 12)

## Illness or risks of infection

- TB most commonly causes disease in the lungs, but any part of the body may be affected.
- The lifetime risk for infected people progressing from the latent phase to active TB disease is ~5–15 percent, but this risk is strongly affected by the size of the infecting dose and the strength of the infected person's immunity.

## Disease complications

- A small proportion of those infected progress directly to pulmonary TB, or by lympho-haematogenous dissemination of bacilli to miliary, meningial or other extrapulmonary involvement.
- Complications are greater in infants, young children, older people and the immune compromised.

## New Zealand epidemiology

- The overall incidence rate is low compared with many other countries, but there are high rates among population groups from Asia, Africa and the Pacific, particularly recent immigrants from these areas.
- Extrapulmonary TB continues to occur in New Zealand, and Pacific, African and Asian children are disproportionately affected.

## National Immunisation Schedule

Age	Vaccine
Birth*	BCG**

\* Offered to babies at risk of TB if: they live in a house with either current TB or a past history of TB; they have household members who within the past 5 years have lived for a period of 6 months or longer in countries where TB is common; one or both parents identify as being Pacific people; in their first 5 years they will be living for 3 months or more in a country where TB is common; live in geographical area as defined by the medical officer of health after consultation with the Ministry of Health.

\*\* Only gazetted vaccinators may give BCG immunisations.

- See chapter 12 for more details.

## Vaccine and dosage

- BCG – freeze-dried *Bacillus Calmette-Guérin* vaccine (CSL), 0.05–0.1 mL, intradermal injection.

## Vaccine efficacy

- BCG is regarded as efficacious in preventing serious extrapulmonary disease in neonates, and young children.

- BCG may protect individuals at high risk of intensive exposure, but it does not have a significant impact on the incidence of disease.

### **Vaccine composition**

- Contains a live attenuated strain of *Mycobacterium bovis* as freeze-dried material, with a diluent in a separate ampoule.

### **Expected responses and AEFI**

- Expected responses: a local reaction, followed by healing and scar formation within three months (90–95 percent of recipients); minor adenitis.
- AEFI: local subcutaneous abscess; regional lymphadenopathy; musculoskeletal lesions; multiple lymphadenitis; non-fatal disseminated lesions; fatal disseminated lesions.

### **Vaccine contraindications**

- Immune compromised or receiving immunosuppressive therapy; malignant conditions; HIV; positive Mantoux reaction; significant fever; generalised septic skin conditions; pregnancy.

# Influenza key points (see chapter 13)

## Illness or risks of infection

- Influenza is very contagious, and the virus is primarily spread from person to person by the aerosol route.
- In older children and adults the illness usually begins abruptly with fever, chills, malaise, headache, myalgia, non-productive cough, rhinitis, sore throat and mild conjunctivitis.
- In children, but less often in adults, vomiting and diarrhoea may be present.
- Children under five years of age most commonly have fever, cough and rhinitis, while in infants only rhinitis may be present.

## Disease complications

- These include exacerbation of underlying medical conditions, leading to secondary bacterial or primary viral pneumonia.
- Other complications included myositis, encephalopathy, myocarditis, pericarditis and Reye syndrome (associated with aspirin use in children), and death.

## New Zealand epidemiology

- Peak incidence is usually during the winter months, between May and October.

## National Immunisation Schedule

Age	Immunisation given		Special Programme
6 weeks	DTaP-IPV	Hib-Hep B	MeNZB™
3 months	DTaP-IPV	Hib-Hep B	MeNZB™
5 months	DTaP-IPV	Hep B	MeNZB™
10 months			MeNZB™
15 months	Hib	MMR	
4 years	DTaP-IPV	MMR	
11 years	dTap-IPV		
45 years	Td		
65 years	Td	<b>Influenza (annually)*</b>	

\* See chapter 13 for schedule and dosage for influenza vaccination to those under 65 years with chronic medical conditions.

- Influenza vaccine is funded for those over 65 years and all persons under 65 years with chronic medical conditions including children.

## Vaccine

- Trivalent split virion or purified antigen vaccine.

**Vaccine efficacy**

- Efficacy depends primarily on the age and immune competence of the vaccine recipient, and the degree of similarity between the virus strains in the vaccine and those in circulation.

**Vaccine composition**

- The final product contains 15 µg of the surface haemagglutinins of each component strain (H1N1, H3N2, B), as recommended in September/October each year by the WHO following the WHO southern hemisphere strain selection meeting.

**Expected responses and AEFI**

- Local reactions occur in 10–64 percent of recipients, systemic reaction in 1 percent of adults (higher in children not previously immunised).

**Vaccine contraindications**

- Contraindications are anaphylactic allergy to egg or egg protein, and anaphylactoid hypersensitivity to polymyxin or neomycin, or any other vaccine component or previous influenza vaccine dose.

**Note:** For the following non-Schedule vaccines (with the exception of Meningococcal and Pneumococcal Key Points), refer to the relevant chapters for more information.

## **Hepatitis A key points** (see chapter 14)

### **Illness or risks of infection**

- Infection is characterised by an acute febrile illness with jaundice, anorexia, nausea, abdominal discomfort, malaise and dark urine.
- The virus is usually transmitted by the faecal-oral route, either from person to person contact or through contaminated food or drink.

### **Disease complications**

The case fatality rate is 1.8 percent in adults over the age of 50 years.

### **New Zealand epidemiology**

- Viral spread occurs in households and early childhood services leading to community outbreaks.
- Sewage contaminated shellfish can lead to epidemics.

### **National Immunisation Schedule**

Hepatitis A vaccine is not publicly funded, but is recommended for the following groups:

- individuals with chronic liver disease
- travellers to countries with high or intermediate endemicity
- certain occupational groups – see chapter 14
- other at-risk groups – see chapter 14.

### **Vaccine information**

- See chapter 14.

## Meningococcal Invasive Disease key points (see chapter 15)

### Illness or risks of infection

- There is usually a sudden onset, with fever, malaise, prostration and a variety of other possible symptoms including nausea, vomiting and headache.
- Approximately two-thirds of cases have a rash, which may be petechial, purpuric or (less commonly) maculopapular and urticarial.
- Those particularly at risk of meningococcal disease are children under five years of age, although all age groups may be infected and there is a higher case fatality rate in adults.

### Disease complications

- In fulminant cases, disseminated intravascular coagulation, shock, coma and death can occur in a few hours despite appropriate treatment.
- Invasive meningococcal infection can also give rise to arthritis, myocarditis, pericarditis, endophthalmitis and pneumonia.
- Other presentations include primary pneumonia, occult bacteraemia, conjunctivitis and chronic meningococcaemia.

### New Zealand epidemiology

- Since 1991 there has been a New Zealand wide epidemic of serogroup B disease with the B:4:P1.4 strain.
- The rate of *Neisseria meningitidis* serogroup B disease in 2004 was 11.6 per 100,000 total population in the northern region, compared with 9.7 per 100,000 in the midland region, and 7.0 per 100,000 in both the central and southern regions.
- Rates are consistently higher in Māori and Pacific children compared with the total population.
- Outbreaks of serogroups A and C disease have occurred in New Zealand over the past 20 years.

## National Immunisation Schedule – Special Programme

Age	Immunisation given		Special Programme*
6 weeks	DTaP-IPV	Hib-Hep B	MeNZB™
3 months	DTaP-IPV	Hib-Hep B	MeNZB™
5 months	DTaP-IPV	Hep B	MeNZB™
10 months**			MeNZB™
15 months	Hib	MMR	
4 years	DTaP-IPV	MMR	
11 years	dTap-IPV		
45 years	Td		
65 years	Td	Influenza (annually)	

\* MeNZB vaccine will be available providing provisional consent is extended. For other individuals who are eligible for MeNZB™, see chapter 15: Meningococcal Invasive Disease.

\*\* Infants who receive their 3<sup>rd</sup> dose between 5 to 6 months of age, have the 4<sup>th</sup> at a minimum of 10 months of age. Infants who receive their 3<sup>rd</sup> dose after 6 months of age or older, have the 4<sup>th</sup> dose at a minimum of four months after the 3<sup>rd</sup> dose.

### Vaccine and dosage

- MeNZB™ – meningococcal group B outer membrane vesicle (OMV) vaccine (Chiron), 0.5 mL dose, intramuscular injection.
- See chapter 15 for publicly funded vaccines against serogroups A, C, Y and W135, offered to adults pre- and post-splenectomy; and to children (upon secondary care specialist recommendation) pre- and post-splenectomy or with functional asplenia.

### Vaccine efficacy

MeNZB™ – 55 percent of infants (aged 6–10 weeks), 74 percent of older infants (aged 6–8 months), 75 percent of toddlers (aged 16–24 months), 76 percent of children (aged 8–12 years), and 93 percent of adults developed a four-fold rise (compared with pre-vaccination values) in serum bactericidal assay titres four to six weeks after the third dose.

### Vaccine composition

- 25 µg of *N. meningitidis* group B outer membrane protein.

### Expected responses and AEFI

- Very common (> 10 percent): injection site reactions (all age groups), crying (infants), irritability, sleepiness, change in eating habits, diarrhoea and vomiting, and fever of at least 38.0°C (infants, toddlers).
- In children and adults, very common (> 10 percent): headache, malaise, nausea and myalgia.

### Vaccine contraindications

- Anaphylaxis to a prior dose of MeNZB™ is a contraindication to a further dose.
- Fever > 38°C.

## Pneumococcal Disease key points (see chapter 16)

### Illness or risks of infection

- Transmission of the pneumococcus is from person to person, usually by droplet contact.
- The pneumococcus is the most common bacterial cause of otitis media in children and a frequent cause of sinusitis and pneumonia in all age groups.

### Disease complications

- Meningitis and bacteraemia are complications, especially in the very young, and pneumococcal disease is often the cause of bacteraemia with no obvious primary site of infection.
- The pneumococcus may also cause endocarditis, and, less commonly, sites such as joints, the peritoneal cavity and the fallopian tubes are affected.
- The mortality rate is 10–20 percent, but may exceed 50 percent in high risk groups.

### New Zealand epidemiology

- The incidence of pneumonia caused by *Streptococcus pneumoniae* may be under reported.
- Incidence rates are high for children under five years of age and in those 65 years of age and over, and higher in Māori and Pacific compared to the total population.

## Recommendations and Funding for Pneumococcal Vaccine

Funded vaccine* recommendations		Not funded but recommended		
Splenectomy or functional asplenia	Children with high risk conditions (< 5 years):	Children with other risk conditions (< 16 years):	Adults at higher risk ( $\geq 16$ years):	Healthy children (< 5 years):
Children (0–16 years) pre- or post-splenectomy or with functional asplenia  Adults pre- or post-splenectomy	On immunosuppressive therapy or radiation therapy  Primary immune deficiencies  HIV  Renal failure or nephrotic syndrome  Organ transplants  Cochlear implants or intracranial shunts  With chronic CSF leaks  On corticosteroid therapy for more than 2 weeks, at daily dose of prednisone of 2mg/kg or greater, or a total daily dosage of 20mg or more	Preterm infants, born at under 28 weeks gestation  Preterm infants with chronic lung disease discharged home on oxygen  Cardiac disease with cyanosis or failure  Bronchiectasis  Insulin dependent diabetes  Down's syndrome  Children over age 5 years with a high risk condition	Adults over the age of 65 years  Adults with chronic illness (eg, cardiac, renal or pulmonary disease, diabetes, alcoholism)  CSF leaks, cochlear implants  Immune compromised (eg, nephrotic syndrome, myeloma, Hodgkin's disease or post-organ transplant  HIV infection  Previous pneumococcal invasive disease	Particularly Māori and Pacific children  All children attending early childhood services

\* Vaccine administration is also funded.

- The funded vaccines are available upon the recommendation of a paediatrician or other secondary care specialist (such as haematologist or infectious diseases physician).

### Schedule for pneumococcal vaccines for eligible children under five years of age with no prior history of pneumococcal vaccines

Age of child at start of course	Conjugate pneumococcal vaccine, Prevenar® (PCV7)	Polysaccharide pneumococcal vaccine, Pneumovax®23 (23PPV)
6 weeks to 6 months	3 doses PCV7 at least 6–8 weeks apart, or at same time as the usual schedule; plus a 4th dose at age 15 months	One dose of 23PPV at age 2 years and a second dose at age 4–5 years
7–11 months	2 doses of PCV7 at least 6–8 weeks apart; plus a 3rd dose at age 15 months	One dose of 23PPV at age 2 years and a second dose at age 4–5 years
12–59 months	2 doses of PCV7 given at 6–8 weeks apart	One dose of 23PPV at age 2 years and a second dose at age 4–5 years

### Schedule for pneumococcal vaccines for adults pre- and post-splenectomy and children pre- and post-splenectomy or with functional asplenia

Age of child at start of course	Conjugate pneumococcal vaccine (PCV7)	Polysaccharide pneumococcal vaccine (23PPV)
6 weeks to 6 months	3 doses PCV7 at least 6–8 weeks apart, or at same time as the usual schedule; plus a 4th dose at age 15 months	One dose of 23PPV at age 2 years and a second dose at age 4–5 years Booster dose of 23PPV 5 yearly
7–11 months	2 doses of PCV7 at least 6–8 weeks apart; plus a 3rd dose at age 15 months	One dose of 23PPV at age 2 years and a second dose at age 4–5 years Booster dose of 23PPV 5 yearly
12–59 months	2 doses of PCV7 given at 6–8 weeks apart	One dose of 23PPV at age 2 years and a second dose at age 4–5 years Booster dose of 23PPV 5 yearly
5–9 years	One dose of PCV7	One dose of 23PPV 6–8 weeks after PCV7 Booster dose of 23PPV 5 yearly
10–16 years	(A dose of PCV7 may be recommended for some children)	One dose of 23PPV Booster dose of 23PPV 5 yearly
Adults > 16 years		One dose of 23PPV Booster dose of 23PPV 5 yearly

Key: PCV7 –Prevenar®; 23PPV – Pneumovax®23.

## Vaccine and dosage

- PCV7 – pneumococcal conjugate vaccine, 7-valent (Prevenar<sup>®</sup>, Wyeth), 0.5 mL, intramuscular injection.
- 23PPV – pneumococcal polysaccharide vaccine, 23-valent (Pneumovax<sup>®</sup>23, MSD), 0.5 mL, intramuscular or subcutaneous injection.

## Vaccine efficacy

- PCV7 – 97.4 percent efficacy against *Streptococcus pneumoniae* invasive disease in children who had completed a four-dose vaccine course at 2, 4, 6 and 12–15 months of age, and 85.7 percent efficacy in partially vaccinated children who had received one dose or more of vaccine, against the seven vaccine serotypes. (See chapter 16: Pneumococcal Disease.)
- 23PPV – the efficacy depends on whether immune competent or immune compromised patients are compared, and whether the end point is pneumococcal pneumonia or bacteraemia. (See chapter 16: Pneumococcal Disease.)

## Vaccine composition

- Prevenar<sup>®</sup> – 2 µg of saccharide for serotypes 4, 9V, 14, 18C, 19F, and 23F, and 4 µg of serotype 6B per dose (16 µg total saccharide) conjugated to CRM<sub>197</sub> carrier protein and adsorbed on aluminium phosphate (0.5 mg).
- Pneumovax<sup>®</sup>23 – 25 µg of each capsular polysaccharide antigen (1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19A, 19F, 20, 22F, 23F and 33F), dissolved in isotonic saline solution with phenol (0.25 percent) added as preservative and no adjuvant.

## Expected responses and AEFI

- PCV7 – local reactions (redness and swelling). Rare events ( $\geq 0.01$  percent and  $< 0.1$  percent) include: febrile seizures and hypotonic, hyporesponsive episode. Very rare events ( $< 0.01$  percent) include: urticaria, angioneurotic oedema, erythema multiforme, and hypersensitivity including anaphylaxis.
- 23PPV – local discomfort, erythema and induration in 1–10 percent of recipients; side effects requiring a general practitioner consultation occur in 8 per 1000 vaccinations, and more severe side effects in 1 per 100,000.

## Vaccine contraindications

- Contraindications include a severe reaction to a previous dose, or known hypersensitivity to any components of either vaccine.
- Deferral of immunisation in pregnancy is recommended unless the risk of infection is substantial.

## Varicella (chickenpox) key points (see chapter 17)

### Illness or risks of infection

- Varicella is a highly infectious disease.
- A maculo-papular rash, which becomes vesicular, appears first on the face and scalp, later spreading to the trunk and abdomen and eventually to the limbs.
- The rash is pruritic and is usually associated with mild fever, malaise, anorexia and listlessness.

### Disease complications

- These include bacterial superinfection of the skin lesions, leading to hospitalisation; varicella pneumonia, acute cerebellar ataxia, and rarely encephalitis with permanent neurological disability or fatal outcome.
- Transverse myelitis, thrombocytopenia, and rarely, involvement of the viscera and joints may also occur.
- Congenital varicella syndrome.
- Herpes zoster (shingles) can occur in later life.

### New Zealand epidemiology

- Per year in New Zealand it is estimated there are 50,000 chickenpox infections, of which 150–200 result in hospitalisation, one to two cases result in residual long term disability or death, and 0.5–1 cases result in severe congenital varicella syndrome.
- About two-thirds of this burden is borne by otherwise healthy children, and less than one-tenth by children with a disease associated with immune suppression.

### National Immunisation Schedule

Varicella vaccine is not publicly funded but is recommended for the following groups:

- adults and adolescents who were born and resident in tropical countries if they have no history of varicella infection
- children with chronic liver disease who may in future be candidates for transplantation
- children with deteriorating renal function, as early as possible before transplantation
- children likely to undergo solid organ transplant
- children with HIV infection at CDC stage N1 or A1.

For further information and recommendations for health care workers, immune suppressed, and healthy infants, adolescents, and adults, see chapter 17: Varicella.

### Vaccine information

- See chapter 17: Varicella.