

Adult vaccination

VACCINES FOR AUSTRALIAN ADULTS: INFORMATION FOR IMMUNISATION PROVIDERS

This fact sheet gives an overview of the vaccines provided for adults under the Australian National Immunisation Program and those recommended for adults in the current (9th) edition of *The Australian Immunisation Handbook*. The information in this fact sheet is summarised in Table 1, which can be used as a stand alone resource.

Overview

- More vaccines are becoming available and recommended for use during adulthood.
- Of the vaccines recommended for adults, currently only seasonal influenza and pneumococcal polysaccharide vaccines are funded under the National Immunisation Program (NIP).
- Other vaccines recommended during adulthood are outlined in *The Australian Immunisation Handbook* (9th edition). Some of these are funded through state and territory programs, while others can be obtained through self or employer funding.
- There are a number of different circumstances in which adults may be recommended to receive a vaccination. These are discussed in this fact sheet and summarised in Table 1.
- Immunisation providers play an important role in promoting vaccination during adulthood and should seize every opportunity to identify and vaccinate eligible individuals.

Recent changes to national recommendations for adult vaccinations

- Eligibility for free seasonal influenza vaccine under the NIP was extended in 2010 to include pregnant women and children ≥ 6 months of age with specified medical conditions that put them at increased risk of serious influenza.
- It is important that Indigenous status is noted during consultation as the indications for NIP funded vaccines differ for Aboriginal and Torres Strait Islander people.
- Recommendations on vaccination of adults against herpes zoster have been recently added to *The Australian Immunisation Handbook*; however, the vaccine is not likely to be available for use until 2012.
- The government funded catch-up program for human papillomavirus (HPV) vaccination of women up to 26 years of age ceased in December 2009. Young women of this age can still obtain HPV vaccines through private prescription.

Recording and reporting

- There is no national register for recording all vaccinations administered to adults. Two vaccines can be recorded on disease specific registers – the National HPV Vaccination Program Register and the Australian Q Fever Register. Providing adult patients with hand held records is very important.
- Adverse events following immunisation are notifiable and should be reported to the Therapeutic Goods Administration via the mechanism preferred by your jurisdiction.

Epidemiology

Hospitalisations and deaths due to vaccine preventable diseases occur in adults. In 2005 and 2006, the Australian Institute of Health and Welfare (AIHW) National Mortality Database recorded over 180 deaths in adults due to vaccine preventable diseases, predominantly due to pneumococcus, influenza and hepatitis B.

- The elderly population suffer high rates of morbidity and mortality due to infectious diseases. Influenza, pneumococcal disease and herpes zoster have their highest mortality rates in older adults.¹
- Waning immunity contributes to the increased risk of certain vaccine preventable diseases in older adults. For example, serosurveys of tetanus immunity show that only 47% of the Australian adult population >70 years of age have measurable immunity to tetanus.²
- Reduced immunity in adults due to incomplete or missed childhood vaccine doses plays a role in the burden of disease. The highest numbers of measles cases are now recorded in young adults who grew up before routine provision for two doses of MMR vaccine.³
- Indigenous Australians, both children and adults, have higher rates of morbidity and mortality due to vaccine preventable diseases than non-Indigenous Australians. In young Indigenous adults, rates of invasive pneumococcal disease (IPD) are 11 times greater than in their non-Indigenous counterparts.⁴
- Certain lifestyle behaviours can put adults at increased risk of vaccine preventable diseases. For example, the majority of hepatitis B cases are in young adults 25–29 years of age who have higher rates of at-risk behaviours such as injection drug use.⁵

What vaccines are recommended for adults?

Routine vaccinations for all adults: NIP funded Influenza

Yearly seasonal influenza vaccinations are recommended for any person ≥ 6 months of age who would like to be protected against influenza. Influenza vaccination has been funded under the NIP for elderly Australians (≥ 65 years of age) since 1997. In 2010, the eligibility for NIP-funded influenza vaccination was extended to include:

- pregnant women
- any person ≥ 6 months of age with an underlying medical condition that puts them at increased risk of severe influenza (as outlined in the *Handbook*)

- Aboriginal and Torres Strait Islander people ≥ 15 years of age (independent of health status).

Details of this new program are available at: [http://www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/IMM123-cnt/\\$File/imm123-fs-2010.pdf](http://www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/IMM123-cnt/$File/imm123-fs-2010.pdf)

Pneumococcal disease

Two types of pneumococcal vaccine are available in Australia: **pneumococcal conjugate** vaccines (PCV; 7-valent, 10-valent and 13-valent) indicated for use in infants and children, and a 23-valent **pneumococcal polysaccharide** vaccine (23vPPV) which can be used in persons ≥ 2 years of age. Vaccination with 23vPPV is funded under the NIP for:

- Australians ≥ 65 years of age
- Aboriginal and Torres Strait Islander people aged ≥ 50 years of age
- Aboriginal and Torres Strait Islander people 15–49 years of age who have a medical condition that increases their risk of IPD (as outlined in the *Handbook*).

Vaccination with 23vPPV is also recommended for non-Indigenous adults who have a chronic illness predisposing them to IPD (as outlined in the *Handbook*) and can be accessed through PBS prescription for these individuals.

The immune response to the pneumococcal polysaccharide vaccine (23vPPV) is short-lived in adults and re-vaccination is recommended 5 years after the primary dose. Further information on 23vPPV re-vaccination schedules in adults is provided in Table 3.15.3 of the *Handbook*.

Routine vaccinations for all adults: *Handbook* recommended (non-NIP funded)

Tetanus, diphtheria and pertussis

A booster dose of a tetanus- and diphtheria-containing vaccine is recommended for adults who:

- are ≥ 50 years of age, and have not received a tetanus-containing vaccine in the previous 10 years (yet have previously completed a primary course)
- have a tetanus-prone wound and greater than 5 years have elapsed since their previous dose of a tetanus-containing vaccine (tetanus immunoglobulin may also be required).

Tetanus vaccinations can be given as either diphtheria-tetanus (dT) formulation or, preferably, the adult formulation of the diphtheria-tetanus-acellular pertussis vaccine, dTpa, (Boostrix[®] or Adacel[®]) which also provides immunity against pertussis.

While some adults would have received multiple tetanus vaccinations in their lifetime, others may have not received any since childhood. Multiple vaccinations with dT-containing vaccines can result in local reactions at the site of injection but are generally safe.

In some circumstances, such as in emergency departments, surgery or in general practice, where an emergency tetanus booster is required, the dose is sourced from the 'doctor's bag' and in most cases is given as dT. Although dTpa booster vaccination is not funded under the NIP, some states and territories do provide it free of charge to adults who care for newborns as a cocooning strategy for protection against pertussis (see [During and post pregnancy](#)).

Measles, mumps and rubella (MMR)

For greatest protection against measles, mumps and rubella, adults who were born after 1966 should have received two doses of MMR during childhood. It is expected that those born before 1966 have natural immunity to measles, mumps and rubella and do not require MMR vaccination. However, there are a number of young adults who are not immune or only partially immune because they were too young to be captured in the Australian Measles Control Campaign in the late 1990s and the subsequent Young Adults MMR program in 2001.^{6,7} Checking the measles, mumps and rubella vaccination status of adults is important.

Herpes zoster (HZ)

As of 2009, a single dose of Zostavax[®] for adults aged ≥60 years has been recommended in the *Handbook* online:

<http://www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/Handbook-updates>

However, current availability of Zostavax[®] in Australia and overseas is limited due to manufacturing difficulties. The vaccine is expected to be available for general use in late 2012. The varicella vaccine and the HZ vaccine cannot be used interchangeably.

Human papillomavirus (HPV)

Two vaccines, Gardasil[®] and Cervarix[®], are registered in Australia for use in adult women up to 45 years of age for the prevention of cervical cancer caused by HPV types 16 and 18. The 4-valent vaccine, Gardasil[®], also provides protection against extra-genital lesions, such as genital warts, caused by HPV types 6 and 11. HPV vaccination is:

- funded for adolescent girls 12–13 years of age through the ongoing school-based HPV vaccination program
- recommended for adult women up to 26 years of age and can be acquired through private prescription.

All effort should be made to identify women who may benefit from vaccination against HPV, keeping in mind that the vaccines are most effective when given before the onset of sexual activity as the protection offered will decrease with increased exposure to HPV.

Gardasil[®] is registered in Australia for use in males 9–26 years of age; however, routine vaccination of males is currently not recommended.

At-risk groups with specific vaccination recommendations

Travel

This fact sheet does not intend to provide comprehensive information on vaccines specifically for travel purposes. A table outlining vaccines recommended for travellers can be found in the *Handbook*.

- Travel is an important time to ensure that patients are up to date with standard vaccinations recommended for their age, including dT, MMR, hepatitis B, polio and influenza.
- Travel vaccination requirements differ depending on the travel destination, likely risks of exposure to vaccine preventable diseases and the individual's previous medical and vaccination history. It is recommended that patients are referred to specialist travel health clinics or GPs with experience in this area.

Immigrants

In many instances, adult immigrants entering Australia, either as permanent residents or temporary visa holders, do not have adequate immunity against one or more diseases for which vaccination is recommended in Australia. This may include hepatitis B, tetanus, diphtheria, polio and measles.⁸ Catch-up schedules may be required.⁹

- Developing catch-up programs for migrants can be complex: advice can be found in the *Handbook*.
- If no valid documentation of vaccination exists, a standard catch-up schedule should be commenced.
- If documentation is provided, it is important to check that the intervals between doses are appropriate.
- Serological testing is not routinely recommended but may be appropriate for some antigens.
- It is important to provide hand held documentation of any vaccinations given and dates of future vaccinations.

Aboriginal and Torres Strait Islander people

Due to the higher rates of IPD and influenza in Aboriginal and Torres Strait Islander people compared to non-Indigenous Australians, the provisions for eligibility of NIP funded vaccinations differ. Every effort should be made to identify Indigenous patients in mainstream GP clinics to ensure the appropriate immunisations are given at the correct age.

- Free pneumococcal vaccination is provided for all Indigenous adults ≥ 50 years of age, and any Indigenous person (aged 15–49 years) with a medical condition that puts them at greater risk of IPD (as outlined in the *Handbook*).
- Free seasonal influenza vaccination is provided for all Aboriginal and Torres Strait Islander people aged ≥ 15 years, independent of their health status.

During and post pregnancy

Except for inactivated influenza vaccine, vaccination during pregnancy is not routinely recommended in Australia. Live viral vaccines, such as MMR, are contraindicated during pregnancy.

- As of 2010, seasonal influenza vaccination is funded under the NIP for pregnant women and can be given at any stage during pregnancy. It is particularly important for women who will be in their second or third trimester during the influenza season.

Influenza vaccines have a good safety profile in pregnant women. Recent evidence suggests that vaccination during pregnancy may also provide protection against influenza to the newborn.¹⁰

If a woman is planning pregnancy, it is advisable to review her vaccination history, in particular for hepatitis B, rubella, varicella and pertussis.

- Immunity to rubella should be established via serological screening before pregnancy. Seronegative women are recommended to receive MMR vaccine as outlined in the *Handbook*.
- Pertussis vaccination is recommended for all mothers, fathers and carers of newborns. Vaccination with the adult formulation of dTpa can be given to women either when planning pregnancy or soon after birth of the child.

At-risk occupations

Certain occupations put employees at greater risk of acquiring and/or transmitting a vaccine preventable disease than the general population. These are described in more detail in Table 2.3.6 in the *Handbook* and include:

- healthcare workers
- those who care for children
- carers of people with intellectual disabilities or the elderly
- students in healthcare related fields
- laboratory personnel
- those who work with or are in contact with animals
- anyone exposed to human tissue, blood, bodily fluids or sewage.

Healthcare workers, in particular, are a priority group for a number of vaccinations including pertussis, MMR, hepatitis B and influenza, due to their personal risk of acquiring vaccine preventable diseases from patients. They also have a duty of care to protect their patients who are often vulnerable to serious complications following infection.

At-risk medical conditions

Pre-existing chronic diseases can increase a person's risk of acquiring vaccine preventable diseases and developing serious complications of these diseases.

- Influenza vaccination is recommended for people with certain underlying medical conditions that increase their risk of serious influenza disease and complications, including, but not restricted to, severe asthma, chronic cardiac disease, neurological conditions and diabetes mellitus, as outlined in the *Handbook*.
- As of January 2010, all Australians ≥ 6 months of age with these specified medical conditions are eligible for free seasonal influenza vaccinations under the NIP.
- People with specific underlying medical conditions are also indicated for pneumococcal, hepatitis A and hepatitis B vaccination and are described in more detail in the *Handbook*.

Immunisation of immune impaired patients can be complex and is best considered on a case by case basis in consultation with the patient's specialist healthcare provider or an immunisation expert.

- Certain vaccinations are recommended for immune impaired individuals, including, but not limited to:
 - oncology patients
 - solid organ and bone marrow transplant recipients
 - HIV-infected individuals
 - individuals with functional or anatomical asplenia.

- Live vaccines, including MMR, varicella, HZ and BCG vaccines, are generally contraindicated in adult patients with impaired immunity. In some instances, vaccination of household contacts is recommended to prevent transmission to the vulnerable individual.

If immunity following vaccination is uncertain, serological testing of antibody levels may be useful in some circumstances. For detailed information on vaccinating immune impaired individuals see section 2.3.3 in the *Handbook*.

At-risk lifestyle behaviours

Lifestyle behaviours such as sexual practices, drug use and smoking are indications for certain vaccinations.

- Hepatitis A and hepatitis B vaccinations are recommended for men who have sex with men and injecting drug users.
- The combined hepatitis A/hepatitis B vaccines may be considered for these individuals if they are not immune to both viruses.
- Serology is not routinely recommended to determine immunity to hepatitis A or hepatitis B, but may be required in some circumstances as outlined in the *Handbook*.
- Tobacco smoking is a risk factor for IPD and vaccination with 23vPPV is recommended.

How are adult vaccinations recorded?

The national system currently in place for recording vaccinations is the Australian Childhood Immunisation Register (ACIR). This records vaccination for up to 99% of children up to 7 years of age. There is no 'whole-of-life' immunisation register in Australia to capture vaccinations given to adults. Immunisations given to adolescents through school-based vaccination programs are recorded independently via state and territory health departments. In some instances, immunisation registers have been developed to record coverage of certain vaccinations, for example, the National HPV Vaccination Program Register and the Australian Q Fever Register.

- Immunisation providers are encouraged to notify all Gardasil[®] and Cervarix[®] vaccinations to the HPV Register <http://www.hpvregister.org.au/health-professionals.aspx>.
- The Australian Q Fever Register can assist in determining an individual's immunity to Q Fever: <http://www.qfever.org/>
- To assist in the monitoring of vaccinations given to adults, it is recommended that immunisation providers

record all vaccinations on the patient's medical record as well as provide the patient with written documentation.

- Some state and territory health departments have developed their own adult vaccination record forms and jurisdictional immunisation databases to assist in monitoring of their adult immunisation programs.

What are vaccine coverage rates in adults?

As there is no immunisation register for adults, government health departments and health professionals rely on population surveys to estimate vaccination coverage in the adult population.

- Results from the most recent Australian Institute of Health and Welfare (AIHW) survey, the 2009 Adult Vaccination Survey, are expected to be published in 2010: http://www.aihw.gov.au/pophealth/adult_vaccination_survey.cfm.
- The most current data available from the 2004 AIHW survey reports that 79% of Australians aged ≥ 65 years received the seasonal influenza vaccine and 51% had been vaccinated against pneumococcal disease.¹¹
- The uptake of vaccinations recommended for adults, but not funded under the NIP, is not as well known. In some instances where specific monitoring systems have been introduced for certain vaccinations, such as HPV and 2009 pandemic H1N1 influenza, coverage data can be accessed.
- Vaccinations among groups who are at high risk of acquiring vaccine preventable diseases are low, in particular healthcare workers. In 2005, only 38% of staff in Victorian hospitals reported being vaccinated against seasonal influenza that year.¹²

How are adverse events following immunisation in adults reported?

Adverse events following immunisation are notifiable conditions and should be reported to the Therapeutic Goods Administration (TGA). It is recommended that only 'significant' adverse events are reported, rather than minor adverse events which may be expected following vaccination such as minor injection site reactions. A detailed description of adverse event severity is provided in the *Handbook*.

- Providers in all states and territories (except Tasmania) should report any significant or unexpected adverse event directly to the relevant

health authority in their state or territory which then forwards the details of the notified adverse event to the TGA. Direct reporting to the TGA is also accepted.

- Immunisation providers in Tasmania should report adverse events directly to the TGA via the completion of the adverse drug reaction reporting form (the 'blue card') found at: <http://www.tga.gov.au/adr/bluecard.htm>

Advice on how to best manage patients who have experienced an adverse event following immunisation can be obtained from local health departments. Specific adverse event clinics for adult patients have been developed in some states, for example, in Victoria through the Surveillance of Adverse Events Following Vaccination in the Community (SAEFVIC) program.

Additional resources

Australian Government Department of Health and Ageing Immunise Australia Program (including 9th edition of *The Australian Immunisation Handbook*)

<http://immunise.health.gov.au>

Website of the health department in your state or territory:

ACT Health

<http://www.health.act.gov.au/c/health?a=da&did=10134232&pid=1175122954>

NSW Public Health Units (under 'Health' in the white pages)

<http://www.health.nsw.gov.au/PublicHealth/Infectious/phus.asp>

Northern Territory Department of Health and Families

http://www.health.nt.gov.au/Centre_for_Disease_Control/index.aspx

Queensland Health

<http://access.health.qld.gov.au/hid/ChildHealth/Immunisation/index.asp>

South Australia Health

<http://www.health.sa.gov.au/>

Tasmania Department of Health and Human Services

http://www.dhhs.tas.gov.au/service_information/services_files/immunisation

Victoria Department of Health

<http://www.health.vic.gov.au/immunisation>

Western Australia Department of Health

http://www.health.wa.gov.au/health_index/i/immunisation.cfm

References

1. Maggi S. Vaccination and healthy aging. *Expert Review of Vaccines* 2010;9(3 Suppl):3-6.
2. Gidding HF, Backhouse JL, Burgess MA, Gilbert GL. Immunity to diphtheria and tetanus in Australia: a national serosurvey. *Medical Journal of Australia* 2005;183:301-304.
3. Australian Government Department of Health and Ageing. National Notifiable Diseases Surveillance System (NNDSS) summary tables. 2008. Available at: <http://www9.health.gov.au/cda/source/cda-index.cfm> (accessed July 2010).
4. Menzies R, Turnour C, Chiu C, McIntyre P. Vaccine preventable diseases and vaccination coverage in Aboriginal and Torres Strait Islander people, Australia, 2003 to 2006. *Communicable Diseases Intelligence* 2008;32:S2-S67.
5. Chiu C, Dey A, Wang H, et al. Vaccine preventable diseases in Australia, 2005 to 2007. *Communicable Diseases Intelligence* 2010; In Press.
6. Aratchige PE, McIntyre PB, Quinn HE, Gilbert GL. Recent increases in mumps incidence in Australia: the "forgotten" age group in the 1998 Australian Measles Control Campaign. *Medical Journal of Australia* 2008;189:434-437.
7. Kelly HA, Gidding HF, Karapanagiotidis T, Leydon JA, Riddell MA. Residual susceptibility to measles among young adults in Victoria, Australia following a national targeted measles-mumps-rubella vaccination campaign. *BMC Public Health* 2007;7:99.
8. Skull SA, Ngeow JY, Hogg G, Biggs BA. Incomplete immunity and missed vaccination opportunities in East African immigrants settling in Australia. *Journal of Immigrant and Minority Health* 2008;10:263-268.
9. Phillips CB, Benson J. Better primary health care for refugees - catch up immunisation. *Australian Family Physician* 2007;36:440-443.
10. Zaman K, Roy E, Arifeen SE, et al. Effectiveness of maternal influenza immunization in mothers and infants. *New England Journal of Medicine* 2008;359:1555-1564.
11. Australian Institute of Health and Welfare (AIHW). 2004 Adult Vaccination Survey summary results. AIHW Cat. No. PHE 56. Canberra: AIHW and Australian Government Department of Health and Ageing; 2005.
12. Bull AL, Bennett N, Pitcher HC, Russo PL, Richards MJ. Influenza vaccine coverage among health care workers in Victorian public hospitals. *Medical Journal of Australia* 2007;186:185-186.

Table 1: Summary of vaccines for use in adults in *The Australian Immunisation Handbook*, 9th edition, including the circumstances which may indicate their use*. Cells that are shaded represent adult vaccinations funded under the National Immunisation Program.

Vaccine	All adults	Elderly	Indigenous	At-risk			Pregnancy	
				Medical	Lifestyle	Occupational	During	Planning or Postpartum
Annual influenza	✓ ₁	✓ ≥65 years	✓ ≥15 years	✓ ₂		✓ ₃	✓ ₄	
Pneumococcal (23vPPV)		✓ ≥65 years	✓ ≥50 years	✓ ₅				
Measles, mumps, rubella (MMR)	✓ ₆					✓ ₇		✓ ₈
Diphtheria and tetanus (dT)	✓ ₉			✓ ₁₀				
Pertussis	✓ ₁₁					✓ ₁₂		✓ ₁₃
Varicella	✓ ₁₄					✓ ₁₄		✓ ₁₄
Herpes zoster		✓ ≥60 years						
Hepatitis A				✓ ₁₅	✓ ₁₅	✓ ₁₅		
Hepatitis B				✓ ₁₆	✓ ₁₆	✓ ₁₆		
Human papillomavirus (HPV)	✓ ₁₇							
Meningococcal C				✓ ₁₈		✓ ₁₈		
Japanese encephalitis					✓ ₁₉	✓ ₁₉		
Q fever						✓ ₂₀		

* Not including vaccinations specific for travel outside of Australia.

Footnotes represent recommendations in *The Australian Immunisation Handbook*, 9th edition. The specific pages of the *Handbook* that relate to each footnote are in brackets (the *Handbook* is also available online at <http://www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/Handbook-home>. Page numbers may have changed in the online version as updates are added).

- 1 Influenza vaccination is recommended for anyone (≥ 6 months of age) who wishes to be protected against influenza (page 190).
- 2 Anyone ≥ 6 months of age who has a medical condition that puts them at increased risk of severe influenza (pages 190–192).
- 3 People who are in contact with individuals at increased risk of severe influenza, people who work in the commercial poultry industry, and people providing essential services (pages 192–193).
- 4 Women planning pregnancy or pregnant women who will be in their second or third trimester during the influenza season (page 192).
- 5 Available through the PBS for adults with certain medical conditions (e.g. splenectomy); funded under the NIP for Aboriginal and Torres Strait Islander people 15–49 years of age who have a medical condition that puts them at risk of invasive pneumococcal disease (pages 246–247).
- 6 Adults born after 1966 who are non-immune or have only received one dose of MMR should receive a second dose (page 204).
- 7 Healthcare workers or people who work with children should be vaccinated if they are non-immune or have only received one dose of MMR (page 204).
- 8 Women planning pregnancy or as soon as possible after delivery if seronegative for rubella (pages 275–279).
- 9 Adults who are 50 years of age and have not received a booster dose of a tetanus-containing vaccine in the previous 10 years. This can be given as dT or the adult formulation dTpa which provides additional protection against pertussis (page 232).
- 10 Adults who have received a tetanus-prone wound should receive a dT (or dTpa) booster dose if more than 5 years have elapsed since their last dose.
- 11 Any adult who requires a booster dose of dT vaccine should be encouraged to do so with dTpa (pages 231–233).
- 12 Healthcare workers and those who work with children are recommended a booster dose of dTpa if no documented booster has been received (page 232).
- 13 Adults planning pregnancy or any household contact of infants and young children should receive a single booster dose of dTpa if no documented dTpa booster dose has been received (page 232). This is currently funded in some states and territories through short-term pertussis vaccination programs.
- 14 Adults who are not immune (serology recommended) to varicella require two doses of varicella vaccine to achieve adequate protection, in particular, non-immune adults who work with children, women before pregnancy, and contacts of young children or people with impaired immunity (pages 313–315).
- 15 Adults who are at increased risk of acquiring hepatitis A due to their occupation, lifestyle or medical status (pages 144–145). For certain groups the combined hepatitis A/hepatitis B vaccine should be considered.
- 16 Adults who are at increased risk of acquiring hepatitis B due to their occupation, lifestyle or medical status, including household and sexual contacts of hepatitis B carriers (pages 158–160). For certain groups the combined hepatitis A/hepatitis B vaccine should be considered.
- 17 Adult females up to 26 years of age; however, both HPV vaccines are registered for use in females up to 45 years of age and can be considered for this age group (page 171). Gardasil[®] is approved for use in adult males up to 26 years of age; however, routine vaccination of males is not recommended.
- 18 Adults at high risk for meningococcal disease including close contacts of meningococcal C cases, adults who suffer from complement defects or functional/anatomical asplenia, and laboratory personnel who handle *Neisseria meningitidis* (pages 218–219).
- 19 Adults who live in the outer islands in the Torres Strait or non-residents who will live or work on the outer islands for a cumulative total of 30 days or more during the wet season, as well as laboratory personnel who might be exposed to the virus (page 198).
- 20 Workers who may be exposed to infected animals and are seronegative for Q fever, including farmers, animal transporters, veterinarians, and agricultural college staff and students; also, laboratory personnel handling veterinary specimens or working with *Coxiella burnetii* (pages 260–262).