Primary prevention of hepatitis B virus infection

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KEY POINTS

- Universal vaccination programs for hepatitis B have had a profound impact on reducing the incidence of hepatitis B virus (HBV) infection.
- All infants should receive hepatitis B vaccination, with the first dose given at birth in the first 24 hours.
- Infants born to mothers positive for hepatitis B surface antigen (HBsAg) should receive both hepatitis B immunoglobulin and the first dose of hepatitis B vaccine, administered concomitantly, optimally within 4 hours of birth.
- For HBsAg-positive women with high viral loads (> 200,000 IU/mL), consider use of antiviral therapy to further reduce the risk of mother-to-child transmission.
- It is recommended that adolescents not vaccinated in childhood receive hepatitis B vaccines.
- Individuals at risk of exposure should be vaccinated.
- The Australian Immunisation handbook (updated 2021) contains current recommendations and is an important resource for clinicians https://immunisationhandbook.health.gov.au/vaccine-preventable-diseases/hepatitis-b

Introduction

Primary prevention of hepatitis B virus (HBV) infection includes:

- vaccination of non-immune individuals at risk of infection
- prevention of mother-to-child transmission, including routine antenatal testing of all women, universal infant immunisation, and appropriate management and follow-up of both hepatitis B surface antigen (HBsAg)-positive women during pregnancy and their infants (see: Managing hepatitis B virus infection in pregnancy and children)
- universal precautions to prevent exposure and post-exposure prophylaxis for individuals exposed to potentially infectious body fluids (see: Infection control and occupational health).

Aims of vaccination

Hepatitis B vaccination aims to prevent HBV infection and its complications, which include fulminant hepatitis, cirrhosis, liver failure and hepatocellular carcinoma (HCC). In acute cases, fulminant hepatitis occurs rarely, but it is associated with significant mortality, especially in infants (2).

The World Health Organization (WHO) strategy for the control of HBV infection aims to provide universal infant hepatitis B immunisation, with the first dose given at birth (3). By the end of 2015, global coverage for hepatitis B vaccine in routine childhood vaccination schedules reached 185 countries (84%) (4). The vaccine induces antibodies to hepatitis B surface antigen (anti-HBs), and a titre of 10 mIU/mL or more is considered to be protective against HBV infection. With the introduction of universal infant vaccination programs in countries with a high prevalence of hepatitis B (e.g. Taiwan), universal hepatitis B vaccination programs have had a profound impact on reducing the incidence of chronic infection, dropping the HBsAg prevalence rate in children from 10% to 1% (5), and halving the incidence of HCC in children aged 6–14 years (6-8).

Target groups for vaccination in Australia

Target groups for adult vaccination in Australia are essentially the same groups in whom testing for evidence of chronic infection should be considered (see: Hepatitis B virus testing and interpreting test results) (9). High-priority groups include:

- household, close, and sexual contacts of people with chronic hepatitis B (CHB)
- Aboriginal and Torres Strait Islander peoples
- people from countries that have a high- or intermediate-prevalence of hepatitis B.

Other priority groups that should be offered testing and vaccination include men who have sex with men, people living with hepatitis C or human immunodeficiency virus (HIV), people who inject drugs, people in custodial settings and people in at-risk professions. A complete list of the groups that should be considered for vaccination is given in Table 5.1.

Table 5.1 Groups at risk of exposure or significant morbidity from exposure to HBV infection that should be targeted for vaccination

The Australian National Immunisation program	1. Infants – recommended as part of routine childhood immunisation and funded for children under the Immunise Australia Program. The first dose is given at birth, followed by another three doses at 2, 4 and 6 months of age 2. Adolescents – recommended for adolescents who have not yet received a primary course of hepatitis B vaccine
People at higher risk of hepatitis B virus infection	1. Household, family and other close contacts of people with acute or chronic hepatitis B 2. Sexual contacts of people with hepatitis B 3. Migrants from hepatitis B-endemic countries 4. Men who have sex with men 5. Sex workers 6. Aboriginal and Torres Strait Islander peoples 7. People who inject drugs 8. Inmates or staff of correctional facilities 9. People adopting a child from a country with high-prevalence rates 10. Travellers to hepatitis B-endemic areas, either long-term or frequent travellers, and those likely to undertake exposure-prone activities 11. Vulnerable populations including the homeless and people with mental health issues
People prone to exposure or at risk of significant morbidity from exposure	1. Haemodialysis patients 2. People with clotting disorders and others who may need multiple blood or blood-product transfusions, especially if given overseas 3. HIV-positive and other immunosuppressed people 4. Transplant recipients 5. People with chronic liver disease or hepatitis C

	6. Clients and staff of facilities for the intellectually disabled
People at risk of occupational exposure	1. Health-care workers 2. People who have had accidental exposure (e.g. tattooists, body piercers, dentists) 3. Contact sports generally carry a low risk of hepatitis B infection. However, age-appropriate hepatitis B vaccination is recommended 4. Child-care workers 5. Embalmers 6. People working in accident and emergency services (e.g. paramedics, police, state emergency service, volunteer first aid givers – Red Cross, St John Ambulance)
As there are state and territory differences, primary-care providers should check with their local health departments for information on which of these groups may be entitled to funded vaccination. See: Health Professional Resources	
See The Australian Immunisation Handbook for further information (1) https://immunisationhandbook.health.gov.au/	

Transmission of HBV through blood transfusion and organ transplant has been almost entirely eliminated through the screening of blood and organ donors in Australia. However, there remains a small risk of exposure to HBV for patients with clotting disorders who receive blood-product concentrates.

The modes of transmission still relevant in Australia include:
• vertical or mother-to-child transmission
• household contact
• sexual contact
• re-use of injecting or tattooing equipment
• occupational exposure.

In addition to screening blood donors, organ donors and health-care workers for HBV, the strategy to control HBV infection in Australia includes universal hepatitis B vaccination of neonates and the administration of hepatitis B immunoglobulin (HBIG) at birth to neonates born to HBsAg-positive mothers. In the Northern Territory, the hepatitis B vaccine has been routinely administered to Aboriginal and Torres Strait Islander newborns since 1988, and to all newborns since August 1990. The universal infant program began in 2000, with the first dose given at birth. Hepatitis B vaccination for all adolescents commenced in 1997 in some Australian states and territories, but has now been phased out because those immunised for hepatitis B in the infant program have reached adolescence. Non-immune adolescents and adults younger than 20 years should still be considered for vaccination through the current National immunisation Program expansion, a funded catch up program. For further information see https://beta.health.gov.au/health-topics/immunisation

Recommendations for vaccination

The national recommendations for vaccinations are given in the latest edition of the Australian Immunisation Handbook (1). Table 5.2 summarises the vaccines available in Australia.

Table 5.2 Vaccines available in Australia

Monovalent vaccines	
Trade name (formulation)	**Dose of HBsAg protein and volume**
Engerix-B (adult formulation ≥ 20 years old)	20 µg in 1 mL
Engerix-B (paediatric formulation < 20 years old)	10 µg in 0.5 mL

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- universal precautions to prevent exposure and post-exposure prophylaxis for individuals exposed to potentially infectious body
- give a booster at 12 months of age without measuring the antibody titre (19).

Infants born to mothers positive for hepatitis B surface antigen with chronic hepatitis B

Infants born to HBsAg-positive mothers should be given HBIG (100 IU) in addition to the birth dose of monovalent hepatitis B vaccine (19) (see: Managing hepatitis B virus infection in pregnancy and children). HBIG should be given within 12 hours (ideally 4 hours) and certainly within 48 hours of birth (see Consensus Recommendation 23). The birth dose of HBV vaccine should be given at the same time but in separate sites. Monovalent vaccine alone has been shown to be protective and should not be delayed; it is most effective given within 24 hours of birth (ideally within 4 hours). In all infants, HBsAg and anti-HBs should be measured at 9–12 months of age (i.e. 3–12 months after completing the course of primary vaccination). If the anti-HBs level is less than 10 mIU/mL, further testing for evidence of HBV infection is advised.

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GESA Consensus Recommendation 23

Adolescents

It is recommended that adolescents not vaccinated in childhood receive hepatitis B vaccines (1). Two regimens are available:

- Three-dose regimen for adolescents aged up to 20 years: hepatitis B (paediatric formulation) – three doses of 0.5 mL. The optimal interval is 1 month between the first and second dose, and a third dose 5 months after the second dose.
- Two-dose regimen for adolescents aged 11–15 years: H-B-Vax II 10 µg (adult formulation) or Engerix-B 20 µg (adult formulation) at 0 and 4–6 months.

State and territory health authorities can provide further information on hepatitis B vaccine for this age group.

Adults aged 20 years or over

Groups recommended for vaccination (after testing) are listed in Table 5.1.

Monovalent hepatitis B vaccine is usually given in a three-dose schedule, at 0, 1 and 6 month or 0, 2 and 4 month intervals (1). The minimum interval is 1 month between the first and second doses, 2 months between the second and third doses, and 4 months between the first and third doses. Special consideration is needed for immunocompromised individuals, who may require alternative dosing regimens including double dosing.

The standard three-dose schedule is effective in achieving protective antibody titres in over 90% of immunocompetent adults with seroconversion rates of approximately 35% after the first dose and rising thereafter.

Accelerated vaccination schedules

Two products, Engerix-B (paediatric and adult) and Twinrix (720/20), are registered for use in accelerated schedules, which consist of four doses in total. Accelerated schedules should only be used if there is limited time before departure to endemic regions, or the need to achieve urgent protection (9). Whilst accelerated schedules result in a higher proportion of individuals with protective anti-HBs titres in the early months, antibody levels are lower than the standard schedule at 7 months. Thus, the fourth booster dose should always be given in this setting. (Table 5.3).

Table 5.3 Accelerated hepatitis B vaccination schedules

Vaccine	Age	Dose (HBsAg protein)	Volume	Schedule
Engerix-B (paediatric)	Up to 20 years	10 µg	0.5 mL	0, 1, 2 months; booster at 12 months
Engerix-B (adult)*	≥ 20 years	20 µg	1.0 mL	0, 7, 21 days; booster at 12 months or 0, 1, 2 months; booster at 12 months (preferred schedule)
Twinrix (720/20)*	> 15 years	20 µg	1.0 mL	0, 7, 21 days; booster at 12 months
*If time permits, it is recommended that the 0, 1, 2 month schedule be used, because higher seroprotective rates are observed following this schedule than with a 0, 7, 21 day schedule; a booster dose at 12 months is recommended for long-term protection.				

Booster doses

Although vaccine-induced antibody levels decline with time and may eventually become undetectable, booster doses are not recommended in immunocompetent people after a primary course, because there is good evidence that a completed primary course of hepatitis B vaccination provides long-lasting protection. This recommendation includes health-care workers. Booster doses are recommended, however, for people who are immunocompromised (e.g. those with HIV infection or renal failure) (1). The time for receipt of the boosting dose in these individuals should be determined by monitoring of anti-HBs levels.

Hepatitis B testing before vaccination

Testing before vaccination is recommended for those at increased risk of infection (see: Hepatitis B virus testing and interpreting test results, and Table 5.4), including people born overseas in high- or intermediate-prevalence countries, Aboriginal and Torres Strait Islander peoples, men who have sex with men, people who inject drugs, sex workers, immunocompromised people and people in custodial settings, or those who have ever been in such settings.

Table 5.4 Prevalence of chronic hepatitis B in Australia by risk group (10)

Group	HBsAg prevalence in risk group (%)	Proportion of CHB in Australia (%)
People born in high- or intermediate-prevalence countries	4.4	69.0
Aboriginal and Torres Strait Islander peoples	2	7.2
People who inject drugs	3.7	5.6
Men who have sex with men	2.8	4.3
Non-indigenous Australian-born individuals*	0.2	14.5
Other or not stated	1.0	4.9
*excluding those belonging to the other priority populations listed above CHB: chronic hepatitis B; HBsAg: hepatitis B surface antigen		

Hepatitis B testing post vaccination

Infants born to HBsAg-positive mothers should be tested 3–12 months after the primary course of vaccination is completed. Testing for post-vaccination response 4 weeks after the primary course is also recommended for:

- health-care workers involved with exposure-prone procedures (see: Infection control and occupational health)
- those at risk of severe or complicated disease (e.g. immunosuppressed patients and patients with chronic liver disease)
- those expected to have a poor response to hepatitis B vaccine (e.g. haemodialysis patients)
- those at high risk of acquiring hepatitis B (e.g. contacts of those with CHB, people who inject drugs, sex workers, and those living in communities with high prevalence of hepatitis B).

Adverse events following hepatitis B vaccination

Adverse events that can occur following hepatitis B vaccination include:

- soreness at the injection site (5%), fever (usually low grade, 2–3%), nausea, dizziness, malaise, myalgias and arthralgias. Fever can be expected in some neonates (0.6–3.7%) (1).
- anaphylaxis has been reported in adults, but only rarely (1).
- although various adverse events (e.g. demyelinating diseases, multiple sclerosis, Guillain-Barré syndrome and arthritis) have

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- universal precautions to prevent exposure and post-exposure prophylaxis for individuals exposed to potentially infectious body

Hepatitis B vaccination during pregnancy and breastfeeding

Hepatitis B vaccination during pregnancy is not routinely recommended. The vaccine can be given to susceptible pregnant women for whom it would otherwise be recommended, including for post-exposure prophylaxis in non-immune women exposed to a HBsAg-positive source (1). Vaccination is not contraindicated in breastfeeding, and breastfeeding the vaccinated infant by an HBsAg-positive mother poses no additional risk of viral transmission, despite evidence of HBV in breast milk (16).

For further information about these recommendations, please refer to the latest edition of The Australian Immunisation Handbook (1).

Information on access to free vaccination in each state and territory

Vaccination is provided free for priority populations by a number of State and Territory Governments and can be ordered by GPs through the health department. See State or Territory below for details and information on accessing the vaccine. Vaccination for household and sexual contacts of those with HBV is provided free in the ACT, NSW, NT, QLD, SA, VIC and WA.

Australian Capital Territory
Contact the Immunisation Branch to order vaccine.

New South Wales
Groups eligible for free vaccination
GP order form for free vaccine

Northern Territory
Vaccination for some groups is funded by the Northern Territory Department of Health - contact your local Centre for Disease Control

Queensland
Groups eligible for free vaccination
Order form for free vaccine

South Australia
Groups eligible for free vaccination
Order form for free vaccine

Victoria
Groups eligible for free vaccination
Order form for free vaccine

Tasmania
Contact the Public Health Hotline

Western Australia
Groups eligible for free vaccination
Order form for free vaccine

References

1. Australian Government. Australian Technical Advisory Group on Immunisation (ATAGI). The Australian Immunisation Handbook. (updated 2021) [internet]. Canberra: Department of Health; 2018. Available at: https://immunisationhandbook.health.gov.au/ (last accessed 29 April 2022).
2. Kao JH, Hsu HM, Shau WY, Chang MH, Chen DS. Universal hepatitis B vaccination and the decreased mortality from fulminant hepatitis in infants in Taiwan. J Pediatr 2001;139:349–52.
3. Goldstein ST, Fiore AE. Toward the global elimination of hepatitis B virus transmission. J Pediatr 2001;139:343–5.
4. World Health Organization (WHO). Global routine vaccination coverage, 2015. Weekly Epidemiol Rec 2016;46:537-48.
5. Ni YH, Huang LM, Chang MH, Yen CJ, Lu CY, You SL, et al. Two decades of universal hepatitis B vaccination in taiwan: impact and implication for future strategies. Gastroenterology 2007;132:1287–93.
6. Ni Y-H, Chang M-H, Wu J-F, Hsu H-Y, Chen H-L, Chen D-S. Minimization of hepatitis B infection by a 25-year universal vaccination program. J Hepatol 2012;57:730–5.
7. O'Sullivan BG, Gidding HF, Law M, Kaldor JM, Gilbert GL, Dore GJ. Estimates of chronic hepatitis B virus infection in Australia, 2000. Aust NZ J Public Health 2004;28:212–6.
8. Williams A. Reduction in the hepatitis B related burden of disease--measuring the success of universal immunisation programs. Commun Dis Intell Q Rep 2002;26:458–60.
9. National HBV Testing Policy Expert Reference Committee. National hepatitis B testing policy. Darlinghurst: Australasian Society for HIV Medicine (ASHM), 2012.
10. WHO Collaborating Centre for Viral Hepatitis Epidemiology, Doherty Institute, ASHM. Hepatitis B Mapping Project. Geographic diversity in chronic hepatitis B and C prevalence, management and treatment. National Report 2020. ASHM: Darlinghurst:2021.
11. Saari TN, American Academy of Pediatrics Committee on Infectious Diseases. Immunization of preterm and low birth weight infants. Pediatrics 2003;112:193–8.
12. World Health Organization (WHO). The Global Advisory Committee on Vaccine Safety rejects association between hepatitis B vaccination and multiple sclerosis (MS). 2002. [internet]. Available at: http://www.who.int/vaccine_safety/committee/topics/hepatitisb/ms/en/ (last accessed 26 June 2018).
13. Duclos P. Safety of immunisation and adverse events following vaccination against hepatitis B. Expert Opin Drug Saf 2003;2:225–31.
14. Ghebrehewet S, Baxter D, Falconer M, Paver K. Intradermal recombinant hepatitis B vaccination (IDRV) for non-responsive healthcare workers (HCWs). Human Vaccin 2008;4:280-5.
15. He C, Nomura F, Itoga S, Isobe K, Nakai T. Prevalence of vaccine-induced escape mutants of hepatitis B virus in the adult population in China: a prospective study in 176 restaurant employees. J Gastroenterol Hepatol 2001;16:1373–7.
16. Zheng Y, Lu Y, Ye Q, Xia Y, Zhou Y, Yao Q, et al. Should chronic hepatitis B mothers breastfeed? A meta analysis. BMC Public Health 2011;11(1):502.

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Previous chapter Next chapter