Hepatitis B Vaccination and Prevention

There are two components to preventing hepatitis B:

- Prevention of transmission of the virus.
- Immunisation.

Hepatitis B virus (HBV) is spread by exposure to infected blood or body fluids. Methods of transmission include:\[1\]:

- Vaginal or anal sexual intercourse.
- Blood-to-blood transmission:
  - Sharing of injection equipment by intravenous drug users.
  - Needlestick injuries.
  - Blood transfusion - now rare in the UK as blood products are screened.
- Infected tattoo equipment.
- Bites (rare).
- Perinatal transmission from mother to child.

The relative frequency of these methods of transmission varies from country to country. In low-risk countries such as the UK, transmission is most often through sexual contact or between injecting drug users.

Epidemiology
See separate Hepatitis B article.

Prevention of transmission

Measures to be taken include:
- Practise safe sex.
- Avoid sharing intravenous drug equipment.
- Immunise at-risk individuals.
- Wear gloves when exposed to blood or body fluids.
- Clear up blood or body fluids, using warm water and detergent.
- Ensure surgical instruments are disposable or adequately sterilised.
- Handle 'sharps' safely.
- Wear goggles if there is risk of infected material splashing into the eye.
- Do not permit healthcare workers who are positive for hepatitis B antigen to work in areas where they could be a risk to others.

Immunisation\[1\]

Clinical Editor’s comment (September 2017)
Dr Hayley Willacy has recently read guidelines from Public Health England relevant to vaccination against hepatitis B\[2\]. Temporary recommendations have been developed in light of recent global shortages of hepatitis B vaccine, including combination hepatitis A/B vaccine, which have severely impacted on the UK supply. These supply constraints do not affect the hexavalent vaccine (DTaP/IPV/Hib/HepB) due to be used in the routine childhood immunisation programme. These recommendations include advice on prioritisation of vaccine for those at highest, immediate need. Provision of post-exposure vaccination should not be deferred.

- The vaccine contains hepatitis B surface antigen (HBsAg) adsorbed on to aluminium hydroxide adjuvant.
- There is also a combined vaccine available with provides protection against hepatitis A and hepatitis B.
- Hepatitis B vaccines do not contain live organisms.
- The vaccine should be stored in a refrigerator at a temperature between 2°C and 8°C.
- Hepatitis B vaccine is safe and effective but should not be seen as an alternative to a strategy of prevention of transmission.
The hepatitis B vaccination is recommended for:

- Those who may be exposed to blood or blood products through their occupation:
  - Healthcare workers who may have contact with blood or body fluids.
  - Laboratory staff.
  - Carers of high-risk or known patients.
  - Morticians and embalmers.
  - Police and fire and rescue workers.

- People travelling to or going to reside in areas of high or intermediate prevalence, particularly travellers with pre-existing medical conditions, who may be at higher risk of requiring medical procedures abroad.
- Those individuals who change sexual partners frequently, particularly commercial sex workers.
- Injecting drug users. Also:
  - Partners and children of injecting drug users.
  - Non-injecting drug users who live with injecting drug users.
- Individuals and staff in residential accommodation for those with learning difficulties.
- People receiving regular blood or blood products - for example, those with haemophilia or chronic anaemias.
- Prisoners and prison officers.
- Family contacts of those with chronic hepatitis B infection.
- Families adopting children from high-risk countries.
- Foster carers.
- Those patients with chronic kidney disease or chronic liver disease.

Since 1982, over one billion doses of hepatitis B vaccine have been used worldwide. In many countries where 8% to 15% of children used to become chronically infected with HBV, vaccination has reduced the rate of chronic infection to less than 1% among immunised children[3]. There is also evidence that the hepatitis B vaccine reduces the risk of developing hepatocellular carcinoma[4].

**Immunisation schedule**[1]

- Dosage depends on age and brand. The manufacturer's guidance should be followed.
- Injections are given intramuscularly in the upper arm or anterolateral thigh. It should not be given into the buttock.
- The standard course of immunisation involves three injections at 0, 1 and 6 months.
- An accelerated course of 0, 1 and 2 months is possible - also for combined hepatitis A and B vaccines.
- Adults who need protection very quickly (eg, within 48 hours of exposure) can have a schedule of 0, 7 and 21 days. Adults and children considered at very high risk should also have an accelerated schedule. After an accelerated course, a booster at one year is recommended.
- Accelerated courses may also be best for drug abusers, as they are notoriously difficult to get to complete a course.
- The duration of protection provided by the hepatitis B vaccine is still unknown but is believed to be at least 20 years[5].
- It is quite possible that a course may give lifelong immunity. However, it is recommended that individuals at continuing risk of infection should be offered a single booster dose of vaccine, once only, around five years after primary immunisation. Measurement of hepatitis B surface antibody (anti-HBs) levels is not required either before or after this dose.
Testing for hepatitis B surface antibody following immunisation

Testing for anti-HBs routinely is not recommended. It is only advised in certain groups:

- Those at risk of occupational exposure (particularly healthcare and laboratory workers):
  - Antibody titres should be checked one to four months after the completion of a primary course of vaccine.
  - Under the Control of Substances Hazardous to Health (COSHH) Regulations, individual workers have the right to know whether or not they have been protected.
  - This information allows appropriate decisions to be made concerning post-exposure prophylaxis (PEP) following known or suspected exposure to the virus.
  - Antibody responses to hepatitis B vaccine vary widely between individuals. 10-15% of adults fail to respond, or have a poor response.
  - It is preferable to achieve anti-HBs levels above 100 mIU/mL.
  - However, levels of 10 mIU/mL or more are generally accepted as enough to protect against infection.
  - Responders with anti-HBs levels greater than or equal to 100 mIU/mL do not require any further primary doses.
  - Further assessment of antibody levels is then not indicated. They should then receive the reinforcing booster dose at five years.
  - Responders with anti-HBs levels of 10-100 mIU/mL should receive one additional dose of vaccine at that time. Following this, further assessment of antibody levels is not indicated. They should then receive the reinforcing dose at five years.
  - An antibody level below 10 mIU/mL is classified as a non-response to vaccine. In this situation, testing for markers of current or past infection is considered good clinical practice. A repeat course of vaccine is advised, followed by retesting one to four months after the second course. Those who still have anti-HBs levels below 10 mIU/mL and who have no markers of current or past infection will require hepatitis B immunoglobulin (HBIG) for protection in the event of exposure to the virus.

- People with chronic kidney disease on dialysis:
  - The role of immunological memory in patients with chronic kidney disease on renal dialysis is not clear. Protection may persist only as long as anti-HBs levels remain above 10 mIU/mL.
  - Antibody levels should be monitored annually and if they fall below 10 mIU/mL, a booster dose of vaccine should be given to patients who have previously responded to the vaccine.
  - Booster doses should also be offered to any haemodialysis patients who are intending to travel to high-risk countries if they have previously responded to the vaccine, especially if they are to receive haemodialysis and have not received a booster in the preceding 12 months.

Hepatitis B immunoglobulin

- Specific HBIG provides passive immunity.
- It can give immediate but temporary protection in the event of exposure.
- HBIG is given concurrently with hepatitis B vaccine and does not affect the development of active immunity. HBIG gives protection until the hepatitis B vaccine becomes effective. The two should be given in different sites.
- It is recommended in high-risk situations, or for those known to be non-responders.
- If the infection occurred at the time of immunisation, administration of HBIG may still prevent the development of carrier status.

Post-exposure management

PEP involves giving hepatitis B vaccine and possibly immunoglobulin too if required. PEP may be indicated even if the exposed person has received hepatitis B vaccine previously. It should be given ideally within 48 hours but no later than seven days after exposure. The vaccine is not needed for those people who have HbsAg or anti-HBs. However, the vaccine should not be delayed whilst awaiting blood test results.
Post-exposure vaccination is required in the following situations:

- Babies born to mothers who are chronic carriers of HBV or to mothers who have had acute hepatitis B during pregnancy. (Full course of primary vaccine +/- HBIG.)
- Sexual contacts of people known to have acute hepatitis B. (Vaccine for sexual contacts at diagnosis, additional HBIG if unprotected contact occurred in the preceding week.)
- Accidental exposure from blood. For example needlestick injuries, or contaminated blood coming into contact with open areas of skin, eyes or mouth. See separate Needlestick Injury article. Vaccination schedule depends on degree of risk and vaccination/response history. If the site of exposure is a ‘needlestick’ injury, cut or abrasion, the site should be washed immediately with soap and water.

### Neonatal screening and immunisation[^1,^6]

Babies born to mothers infected with hepatitis B have a high risk of acquiring infection, which can be prevented by vaccination at birth. Therefore all women in the UK are screened during each pregnancy for hepatitis B. If a mother not previously booked for antenatal care presents in labour, she should have urgent hepatitis B screening, so that if needed the vaccine can be given to the infant within 24 hours of birth. Those women who are HbeAg-positive are particularly infectious, and there is a 70-90% risk of transmitting infection to the baby.

Timely vaccination can reduce the risk of infection of neonates by over 90%.

All babies with seropositive mothers should have the full primary course of hepatitis B immunisation and most should also have HBIG within 24 hours of birth in addition. All babies weighing less than 1500 g born to infected mothers should have HBIG as well as primary immunisation. An accelerated schedule is preferred in all babies born to infected mothers, with a fourth dose along with testing for HBsAg at one year of age. Those for whom vaccination has not been effective and who have become infected with hepatitis B are then identified early and can be followed up and managed appropriately. This reduces the risk of serious liver disease in later life.

### Clinical Editor’s notes (July 2017)

Dr Hayley Willacy draws your attention to the introduction of a new routine vaccine for all infants born in the United Kingdom from August 1st 2017[^7]. They will be offered a hexavalent (six components) vaccine (Hib-DTaP-hepatitis B-poliovirus). The new vaccine will replace the existing pentavalent (five component) vaccine to extend its protection against hepatitis B virus (HBV) in addition to diphtheria, tetanus, pertussis, poliomyelitis, and *Haemophilus influenzae* type b disease. There will not be any change to the timing of the routine childhood immunisation schedule, with the hexavalent vaccine replacing the vaccine previously given at 8, 12, and 16 weeks of age.

### Complications[^1]

Adverse reactions to the vaccine are few and usually mild:

- There may be some soreness and erythema around the site. These are the most common reactions.
- Fatigue, malaise and influenza-like symptoms are rare.
- Rare associations with a Guillain-Barré-type syndrome and also multiple sclerosis have been reported but a causal relationship has not been substantiated.

HBIG is well tolerated. Reactions and side-effects are rare.

### Contra-indications[^1]

The only contra-indication to hepatitis B vaccines is previous anaphylactic reaction to the vaccine or one of its components. Vaccination should be postponed in the presence of acute illness with fever and systemic symptoms.

Pregnancy and breast-feeding are not contra-indications and there is no evidence of risk in giving hepatitis B vaccinations in these situations.

Live vaccines should not be given within three months of administering HBIG, as it may interfere with development of immunity (other than yellow fever).

### Further reading & references

[^1]: Hepatitis B: the green book, chapter 18; Public Health England (December 2013)
[^2]: Hepatitis B: guidance, data and analysis; Public Health England (July 2014)
3. Hepatitis B Fact sheet; World Health Organization, updated March 2015
6. Hepatitis B antenatal screening and newborn immunisation programme - best practice guidance; Dept of Health (April 2011)

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