Hepatitis B and Hepatitis B Vaccine

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Hepatitis B Virus

- Hepadnaviridae family (DNA)
- Numerous antigenic components
- Humans are only known host
- May retain infectivity for more than 7 days at room temperature
Hepatitis B Virus

**HBsAg** (Australia antigen)

**HBcAg**

**HBeAg**
(presence indicates high infectivity)
Hepatitis B Virus Infection

- 850,000 – 2.2 million chronic infections in US
- 240 million chronically infected worldwide
- Established cause of chronic hepatitis and cirrhosis
- Human carcinogen—cause of up to 50% of hepatocellular carcinomas
- Causes about 786,000 deaths worldwide

www.cdc.gov/hepatitis/hbv/hbvfaq.htm#overview
Incidence of acute hepatitis B, by year
United States, 1980-2014

Reported Number of Cases

Year

www.cdc.gov/hepatitis/hbv/hbvfaq.htm#overview
Hepatitis B clinical Features

- Incubation period 45-160 days (average 120 days)
- Illness not specific for hepatitis B
- Nonspecific prodrome of malaise, fever, headache, myalgia
- At least 50% of infections asymptomatic
Hepatitis B Complications

- Fulminant hepatitis (1%-2%)
- Hospitalization
- Cirrhosis
- Hepatocellular carcinoma
- Death
Chronic Hepatitis B Virus Infection

- Responsible for most mortality
- 3,000–4,000 HBV cirrhosis deaths
- 1,000–1,500 HBV related liver cancer deaths
- Often asymptomatic
Hepatitis B Perinatal Transmission*

- If mother positive for HBsAg and HBeAg
  - 70%-90% of infants infected
  - 90% of infected infants become chronically infected

- If positive for HBsAg
  - only 10% of infants infected
  - 90% of infected infants become chronically infected

*in the absence of postexposure prophylaxis
Risk of Chronic HBV Carriage

- 1-6 mos
- 7-12 mos
Hepatitis B Epidemiology

- **Reservoir**: Human
- **Transmission**: Bloodborne
  - Subclinical cases transmit 1-2 months before and after onset of symptoms
- **Communicability**: Persons with either acute or chronic HBV infection with HBsAg present in blood
Age of Infection of Acute and Chronic Hepatitis B Virus Infection

- **Acute infection**
  - 84%
  - 8%
  - 4%
  - 4%

- **Chronic infection**
  - 58%
  - 6%
  - 12%
  - 24%

Legend:
- Adolescent
- Children
- Perinatal
- Adult
Risk Factors for Hepatitis B

- Heterosexual, multiple partners: 39%
- MSM: 24%
- IDU: 16%
- Other: 16%
- Unknown: 16%

MMWR 2006;55(RR-16):6-7
Strategy to Eliminate Hepatitis B Virus Transmission—United States

- Prevent perinatal HBV transmission
- Routine vaccination of all infants
- Vaccination of children in high-risk groups
- Vaccination of adolescents
- Vaccination of adults in high-risk groups
# Hepatitis B (HepB) Vaccine

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
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<tbody>
<tr>
<td><strong>Composition</strong></td>
<td>Recombinant HBsAg</td>
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<tr>
<td><strong>Efficacy</strong></td>
<td>95% (Range, 80%-100%)</td>
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<tr>
<td><strong>Duration of Immunity</strong></td>
<td>20 years or more</td>
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<tr>
<td><strong>Schedule</strong></td>
<td>3 Doses</td>
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<tr>
<td><strong>Booster doses not routinely recommended</strong></td>
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</tbody>
</table>
HepB Vaccine Indications

- All children through 18 years of age beginning at birth

- Persons 19 years and older at increased risk of exposure because of behavior (multiple sexual partners, injection drug use) or occupation (exposure to blood or sharps injury)
HepB Vaccine Formulations

- **Recombivax HB (Merck)**
  - 5 mcg/0.5 ml (pediatric)
  - 10 mcg/1 ml (adult)
  - 40 mcg/1 ml (dialysis)

- **Engerix-B (GSK)**
  - 10 mcg/0.5 ml (pediatric)
  - 20 mcg/1 ml (adult)
# Recommended Dosage of HepB Vaccine

<table>
<thead>
<tr>
<th>Age Category</th>
<th>Recombivax HB Dose (mcg)</th>
<th>Engerix-B Dose (mcg)</th>
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</thead>
<tbody>
<tr>
<td>Infants and children younger than 11 years of age</td>
<td>0.5 mL (5)</td>
<td>0.5 mL (10)</td>
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<tr>
<td>Adolescents 11-19 years</td>
<td>0.5 mL (5)</td>
<td>0.5 mL (10)</td>
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<tr>
<td>Adults 20 years of age and older</td>
<td>1.0 mL (10)</td>
<td>1.0 mL (20)</td>
</tr>
</tbody>
</table>
Figure 1. Recommended immunization schedule for persons aged 0 through 18 years – United States, 2016.

For those who fall behind or start late, see the catch-up schedule (Figure 2).

These recommendations must be read with the footnotes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars in Figure 1. To determine minimum intervals between doses, see the catch-up schedule (Figure 2). School entry and adolescent vaccine age groups are shaded.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Birth</th>
<th>1 mo</th>
<th>2 mos</th>
<th>4 mos</th>
<th>6 mos</th>
<th>9 mos</th>
<th>12 mos</th>
<th>15 mos</th>
<th>18 mos</th>
<th>19–23 yrs</th>
<th>2–3 yrs</th>
<th>4–6 yrs</th>
<th>7–10 yrs</th>
<th>11–12 yrs</th>
<th>13–15 yrs</th>
<th>16–18 yrs</th>
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<tbody>
<tr>
<td>Hepatitis B (HepB)</td>
<td>1st</td>
<td>2nd</td>
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<td>RotaVirus* (RV1; RV2 2-dose series; RVS 3-dose series)</td>
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<td>2nd</td>
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<td>Diphtheria, tetanus, &amp; acellular pertussis* (DTaP; ≤ 5 yrs)</td>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
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<td>Haemophilus influenzae type b* (HiB)</td>
<td>1st</td>
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<td>Pneumococcal conjugate* (PCV13)</td>
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<tr>
<td>Inactivated poliovirus* (IPV; ≤ 18 yrs)</td>
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<tr>
<td>Influenza (IM; LAIV)</td>
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<td></td>
<td>Annual vaccination (IM only) 1 or 2 doses</td>
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<tr>
<td>Measles, mumps, rubella* (MMR)</td>
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<td>Annual vaccination (LAIV or IV) 1 or 2 doses</td>
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<td>Varicella* (VAR)</td>
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<td>Annual vaccination (LAIV or IV) 1 or 2 doses</td>
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<td>Hepatitis A (HepA)</td>
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<td>Annual vaccination (LAIV or IV) 1 or 2 doses</td>
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<td>1st</td>
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<tr>
<td>Meningococcal C* (Hib-MenCY ≥ 6 yrs; MenACWY-D ≥ 16 mos; MenACWY-CRM ≥ 2 mos)</td>
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<td>Annual vaccination (LAIV or IV) 1 or 2 doses</td>
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<tr>
<td>Tetanus, diphtheria, &amp; acellular pertussis* (Tdap; ≥ 7 yrs)</td>
<td></td>
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<td>Annual vaccination (LAIV or IV) 1 or 2 doses</td>
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<tr>
<td>Human papillomavirus* (HPV; females only; 4HPV, 9HPV; males and females)</td>
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<td>Annual vaccination (LAIV or IV) 1 or 2 doses</td>
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<tr>
<td>Meningococcal B*</td>
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<td>Annual vaccination (LAIV or IV) 1 or 2 doses</td>
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<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
<td></td>
<td></td>
<td>Annual vaccination (LAIV or IV) 1 or 2 doses</td>
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</tbody>
</table>

This schedule includes recommendations in effect as of January 1, 2016. Any dose not administered at the recommended age should be administered at a subsequent visit, when indicated and feasible. The use of a combination vaccine generally is preferred over separate injections of its equivalent component vaccines. Vaccination providers should consult the relevant Advisory Committee on Immunization Practices (ACIP) statement for detailed recommendations, available online at http://www.cdc.gov/vaccines/hcp/acip-recs/index.html. Clinically significant adverse events that follow vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS) online (http://www.vaers.hhs.gov/) or by telephone (800-822-7967). Suspected cases of vaccine-preventable diseases should be reported to the state or local health department. Additional information, including precautions and contraindications for vaccination, is available from CDC online (http://www.cdc.gov/vaccines/recs/vacc-admin/contraindications.htm) or by telephone (800-232-4636).

This schedule is approved by the Advisory Committee on Immunization Practices (http://www.cdc.gov/vaccines/acip), the American Academy of Pediatrics (http://www.aap.org), the American Academy of Family Physicians (http://www.aafp.org), and the American College of Obstetricians and Gynecologists (http://www.acog.org).

NOTE: The above recommendations must be read along with the footnotes of this schedule.
Prevention of Perinatal Hepatitis B Virus Infection

- Begin treatment within 12 hours of birth
- HepB vaccine (first dose) and HBIG at different sites
- Complete vaccination series at 6 months of age
- Test for response after completion of at least 3 doses of the HepB series at 9 through 12 months of age (generally at the next well-child visit)
Preterm Infants

- Birth dose and HBIG if mother HBsAg positive (within 12 hours of birth)

- Preterm infants who weigh less than 2,000 grams have a decreased response to vaccine administered before 1 month of age

- Delay first dose until chronologic age 1 month if mother documented to be HBsAg negative at the time of birth
**HepB Vaccine Routine Infant Schedule**

<table>
<thead>
<tr>
<th>Dose+</th>
<th>Usual Age</th>
<th>Minimum Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary 1</td>
<td>Birth</td>
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<tr>
<td>Primary 2</td>
<td>1- 2 months</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Primary 3+</td>
<td>6-18 months*</td>
<td>8 weeks**</td>
</tr>
</tbody>
</table>

* Infants whose mothers are HBsAg+ or whose HBsAg status is unknown should receive the third dose at 6 months of age
** At least 16 weeks after the first dose
+ An additional dose at 4 months is acceptable if the clinician prefers to use a combination vaccine that contains hepatitis B vaccine
Third Dose of HepB Vaccine

- Minimum of 8 weeks after second dose, and
- At least 16 weeks after first dose, and
- For infants, at least 24 weeks of age
Pediarix

- DTaP – Hep B – IPV combination

- Approved for 3 doses at 2, 4, and 6 months

- Not approved for booster doses

- Approved for children 6 weeks to 7 years of age
Pediarix

- Minimum age 6 weeks
  - Cannot be used for HepB birth dose

- Can be given at 2, 4, and 6 months in infants who received a birth dose of HepB vaccine (total of 4 doses)

- May be used in infants whose mothers are HBsAg positive or status unknown*

*ACIP off-label recommendation
HepB Vaccine
Adolescent Vaccination

- Routine vaccination recommended through age 18 years
- Integrate into routine adolescent immunization visit
- Flexible schedules
# HepB Vaccine
## Adolescent and Adult Schedule

<table>
<thead>
<tr>
<th>Dose</th>
<th>Usual Interval</th>
<th>Minimum Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary 1</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Primary 2</td>
<td>1 month</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Primary 3</td>
<td>5 months</td>
<td>8 weeks*</td>
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</tbody>
</table>

*Third dose must be separated from first dose by at least 16 weeks*
Alternative Adolescent Vaccination Schedule

- Two 1.0 mL (10 mcg) doses of Recombivax HB separated by 4 to 6 months
- Approved only for adolescents 11–15 years of age
- Only applies to Merck HepB vaccine
Figure 2. Vaccines that might be indicated for adults aged 19 years or older based on medical and other indications

<table>
<thead>
<tr>
<th>VACCINE</th>
<th>INDICATION</th>
<th>Pregnancy</th>
<th>Immuno-compromising conditions (excluding HIV infection)</th>
<th>HIV infection CD4+ count (cells/µL)</th>
<th>Men who have sex with men (MSM)</th>
<th>Kidney failure, end-stage renal disease, on hemodialysis</th>
<th>Heart disease, chronic lung disease, chronic alcoholism</th>
<th>Asplenia and persistent complement deficiencies</th>
<th>Chronic liver disease</th>
<th>Diabetes</th>
<th>Healthcare personnel</th>
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</thead>
<tbody>
<tr>
<td>Influenza</td>
<td>1 dose annually</td>
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<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap)</td>
<td>1 dose Td each pregnancy</td>
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<td>Varicella</td>
<td>Contraindicated</td>
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<tr>
<td>Human papillomavirus (HPV) Female</td>
<td>3 doses through age 26 yrs</td>
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<tr>
<td>Human papillomavirus (HPV) Male</td>
<td>3 doses through age 26 yrs</td>
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<td>Zoster</td>
<td>Contraindicated</td>
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<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td>1 or 2 doses depending on indication</td>
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<tr>
<td>Pneumococcal 13-valent conjugate (PCV13)</td>
<td>1 dose</td>
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<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
<td>1, 2, or 3 doses depending on indication</td>
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<tr>
<td>Hepatitis A</td>
<td>2 or 3 doses depending on vaccine</td>
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<td>Hepatitis B</td>
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<td>Meningococcal 4-valent conjugate (MenACWY) or polysaccharide (MPSV4)</td>
<td>1 or more doses depending on indication</td>
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<tr>
<td>Meningococcal B (MenB)</td>
<td>2 or 3 doses depending on vaccine</td>
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<tr>
<td>Haemophilus influenza type b (Hib)</td>
<td>3 doses post-HSCT recipients only</td>
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</table>

1. Covered by the Vaccine Injury Compensation Program
2. Recommended for all persons who meet the age requirement, lack documentation of vaccination, or lack evidence of past infection; zoster vaccine is recommended regardless of past episode of zoster
3. Recommended for persons with a risk factor (medical, occupational, lifestyle, or other indication)
4. No recommendation

These schedules indicate the recommended age groups and medical indications for which administration of currently licensed vaccines is commonly recommended for adults aged ≥19 years, as of February 2016. For all vaccines being recommended on the Adult Immunization Schedule, a vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Licensed combination vaccines may be used whenever any components of the combination are indicated and when the vaccine’s other components are not contraindicated. For detailed recommendations on all vaccines, including those used primarily for travelers or that are issued during the year, consult the manufacturers’ package inserts and the complete statements from the Advisory Committee on Immunization Practices (http://www.cdc.gov/vaccines/hcp/acip-recs/index.html). Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.
Adults at Risk for HBV Infection

- **Sexual exposure**
  - Sex partners of HBsAg-positive persons
  - Sexually active persons not in a long-term, mutually monogamous relationship*
  - Persons seeking evaluation or treatment for a sexually transmitted disease
  - Men who have sex with men

* Persons with more than one sex partner during the previous 6 months
Adults at Risk for HBV Infection

- Percutaneous or mucosal exposure to blood
  - Current or recent IDU
  - Household contacts of HBsAg-positive persons
  - Residents and staff of facilities for developmentally disabled persons
  - Healthcare and public safety workers with risk for exposure to blood or blood-contaminated body fluids
  - Persons with end-stage renal disease
  - Persons with diabetes mellitus
CDC has become increasingly concerned about risks for transmitting HBV during assisted blood glucose monitoring and insulin administration.

In the last 10 years, at least 15 outbreaks of HBV have been associated with providers failing to follow basic principles of infection control when assisting with blood glucose monitoring, particularly in long-term care settings (e.g., nursing homes and assisted living facilities).
ACIP Recommendation for Diabetics

- HepB vaccine (3-dose series) **should** be administered to unvaccinated adults (19 through 59 years of age) with diabetes (insulin and non-insulin dependent)

- HepB vaccine (3-dose series) **may** be administered to unvaccinated adults (60 years of age and older) with diabetes (insulin and non-insulin dependent)
Adults at Risk for HBV Infection

- **Other groups**
  - International travelers to regions with high or intermediate levels (HBsAg prevalence of 2% or higher) of endemic HBV infection
  - Persons with HIV infection
Twinrix

- Combination HepA vaccine (pediatric dose) and HepB (adult dose)

- Schedules
  - 0, 1, 6 months, or
  - 0, 7, 21-30 days and a booster dose at 12 months

- Approved for persons 18 years of age and older
Prevaccination Serologic Testing

- Not indicated before routine vaccination of infants or children

- Recommended for:
  - All persons born in Africa, Asia, the Pacific Islands, and other regions with HBsAg prevalence of 2% or higher
  - Household, sex, and needle-sharing contacts of HBsAg-positive persons
  - Men who have sex with men
  - Injection drug users
  - Certain persons receiving cytotoxic or immunosuppressive therapy
Postvaccination Serologic Testing

- Not routinely recommended following vaccination of infants, children, adolescents, or most adults

- Recommended for:
  - Chronic hemodialysis patients
  - Other immunocompromised persons
  - Persons with HIV infection
  - Sex partners of HBsAg+ persons
  - Infants born to HBsAg+ women
  - Healthcare personnel
Postvaccination Serologic Testing

- Healthcare personnel who have contact with patients or blood should be tested for anti-HBs (antibody to hepatitis B surface antigen) 1 to 2 months after completion of the 3-dose series.
Management of Nonresponse to HepB Vaccine

- Complete a second series of 3 doses
- Should be given on the usual schedule of 0, 1, and 6 months
  - May be given on a 0, 1, and 4 month or 0, 2 and 4 month schedule
- Retest 1-2 months after completing the second series
Persistent Nonresponse to HepB Vaccine

- Less than 5% of vaccinees do not develop anti-HBs after 6 valid doses
- May be nonresponder or “hyporesponder”
- Check HBsAg status
- If exposed, treat as nonresponder with postexposure prophylaxis
HepB Vaccine and HCP
New Recommendations

- Management of HCP who have written documentation of a complete series of HepB vaccine doses in the past who were not tested for antibody response following the vaccination series and who now test negative for anti-HBs
  - Administer 1 dose of HepB vaccine, then test for anti-HBs 1 to 2 months later
  - If positive, stop (the person is immune)
  - If negative, complete second series

www.cdc.gov/mmwr/pdf/rr/rr6210.pdf
HepB Vaccine

- Once a person has tested positive for anti-HBs, no additional testing or “booster” doses are recommended.

- Provide the person with a copy of the laboratory result sand advise that it be kept forever.
CDC Guidance for Evaluating Health-Care Personnel for Hepatitis B Virus Protection and for Administering Postexposure Management
<table>
<thead>
<tr>
<th>Health-care personnel status</th>
<th>Postexposure testing</th>
<th>Postexposure prophylaxis</th>
<th>Postvaccination serologic testing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Source patient (HbsAg)</td>
<td>HCP testing (anti-HBs)</td>
<td>HBIG*</td>
</tr>
<tr>
<td>Documented responder* after complete series (≥3 doses)</td>
<td>No action needed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Documented nonresponder* after 6 doses</td>
<td>Positive/unknown</td>
<td>—**</td>
<td>HBIG x2 separated by 1 month</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>No action needed</td>
<td></td>
</tr>
<tr>
<td>Response unknown after 3 doses</td>
<td>Positive/unknown</td>
<td>&lt;10mIU/mL **</td>
<td>HBIG x1</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>&lt;10mIU/mL</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Any result</td>
<td>≥10mIU/mL</td>
<td>No action needed</td>
</tr>
<tr>
<td>Unvaccinated/incompletely vaccinated or vaccine refusers</td>
<td>Positive/unknown</td>
<td>—**</td>
<td>HBIG x1</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>—</td>
<td>None</td>
</tr>
</tbody>
</table>

Abbreviations: HCP = health-care personnel; HbsAg = hepatitis B surface antigen; anti-HBs = antibody to hepatitis B surface antigen; HBIG = hepatitis B immune globulin. * HBIG should be administered intramuscularly as soon as possible after exposure when indicated. The effectiveness of HBIG when administered >7 days after percutaneous, mucosal, or nonintact skin exposures is unknown. HBIG dosage is 0.06 mL/kg. † Should be performed 1–2 months after the last dose of the HepB vaccine series (and 4–6 months after administration of HBIG to avoid detection of passively administered anti-HBs) using a quantitative method that allows detection of the protective concentration of anti-HBs (≥10 mIU/mL). A responder is defined as a person with anti-HBs ≥10 mIU/mL after ≥3 doses of HepB vaccine. A nonresponder is defined as a person with anti-HBs <10 mIU/mL after ≥6 doses of HepB vaccine. ** HCP who have anti-HBs <10mIU/mL, or who are unvaccinated or incompletely vaccinated, and sustain an exposure to a source patient who is HbsAg-positive or has unknown HbsAg status, should undergo baseline testing for HBV infection as soon as possible after exposure, and follow-up testing approximately 6 months later. Initial baseline tests consist of total anti-HBC; testing at approximately 6 months consists of HbsAg and total anti-HBc.
HepB Vaccine
Contraindications and Precautions

- Severe allergic reaction to a vaccine component or following a prior dose
- Moderate or severe acute illness
## HepB Vaccine Adverse Reactions

<table>
<thead>
<tr>
<th>Adverse Reaction</th>
<th>Adults</th>
<th>Infants and Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain at injection site</td>
<td>13%-29%</td>
<td>3%-9%</td>
</tr>
<tr>
<td>Mild systemic complaints (fatigue, headache)</td>
<td>11%-17%</td>
<td>0%-20%</td>
</tr>
<tr>
<td>Temperature greater 37.7 C</td>
<td>1%</td>
<td>0.4%-6%</td>
</tr>
<tr>
<td>Severe systemic reactions</td>
<td>rare</td>
<td>rare</td>
</tr>
</tbody>
</table>
Use of Hepatitis B Vaccination for Adults with Diabetes Mellitus: Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Hepatitis B virus (HBV) infection is a serious and chronic infection of the liver leading to substantial morbidity and mortality. In the United States, since 1988, a total of 29 outbreaks of HBV infection in one or more multiple long-term-care (LTC) facilities, including nursing homes and assisted living facilities, were reported to CDC of these, 25 involved adults with diabetes requiring insulin or blood glucose monitoring (J. CDC, unpublished data, 2011). These outbreaks prompted the Hepatitis B Vaccine Work Group of the Advisory Committee on Immunization Practices (ACIP) to evaluate the risk for HBV infection among adults with diagnosed diabetes.

The Work Group reviewed HBV infection-related morbidity and mortality and the effectiveness of implementing infection prevention and control measures. The strength of scientific evidence regarding protection was evaluated using the Guideline for Recommendations Assessment, Development, and Evaluation (GRADE) methodology and safety data, and case-effectiveness were incorporated into a recommendation using the GRADE system. Based on the Work Group findings, on October 25, 2011, ACIP recommended that all previously unvaccinated adults aged 19 through 59 years with diabetes mellitus (type 1 and type 2) be vaccinated against HBV as soon as possible after a diagnosis of diabetes is made (recommendation category A). Even in the risk for HBV infection among adults aged 60 years or less robust. Therefore, risk for HBV infection among adults aged 60 years was estimated from 805 confirmed infection reported during 2009-2010. f infections program (IPF) data estimate 17% of the U.S. population. The risk for HBV infection among adults aged 60 years is estimated from 805 confirmed infection reported during 2009-2010. The annual incidence rate of HBV infection among adults aged 18 through 59 years was estimated to be 1.4 per 100,000 (95% confidence interval [CI]: 1.2-1.6). In addition, the annual incidence rate of HBV infection among adults aged 60 years or more is estimated to be 2.3 per 100,000 (95% CI: 2.1-2.5). In addition, the annual incidence rate of HBV infection among adults aged 60 years or more is estimated to be 2.3 per 100,000 (95% CI: 2.1-2.5). In addition, the annual incidence rate of HBV infection among adults aged 60 years or more is estimated to be 2.3 per 100,000 (95% CI: 2.1-2.5). In addition, the annual incidence rate of HBV infection among adults aged 60 years or more is estimated to be 2.3 per 100,000 (95% CI: 2.1-2.5).
Hepatitis B Resources

- ACIP’s Hepatitis B Recommendations web page
  www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/hepb.html

- CDC’s Hepatitis B Infection web page
  www.cdc.gov/hepatitis/HBV/index.htm

- CDC’s Hepatitis B Vaccination web page
  www.cdc.gov/vaccines/vpd-vac/hepb/default.htm

- Immunization Action Coalition Hepatitis B web page
  www.immunize.org/hepatitis-b/

- Children’s Hospital of Philadelphia Vaccine Education Center Hepatitis B web page
  www.chop.edu/service/vaccine-education-center/a-look-at-each-vaccine/hepatitis-b-vaccine.html