Hepatitis B Vaccination and Prevention

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What is Hepatitis B?

- A **virus** that lives in blood and other bodily fluids
- An **infectious disease** that causes liver disease and cancer
- 100 x more infectious than the HIV
### Concentrations of Hep B in body fluids

<table>
<thead>
<tr>
<th>High</th>
<th>Moderate</th>
<th>Low/Not Detectable</th>
</tr>
</thead>
<tbody>
<tr>
<td>blood</td>
<td>semen</td>
<td>urine</td>
</tr>
<tr>
<td>serum</td>
<td>vaginal fluid</td>
<td>feces</td>
</tr>
<tr>
<td>wound exudates</td>
<td>saliva</td>
<td>sweat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tears</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Breast milk</td>
</tr>
</tbody>
</table>
Transmission of Hep B Infection

- Transfusion (blood, blood products)
- Bodily Fluids (Sex)
- Organs and Tissue Transplantation
- Household contact (razors, toothbrushes)
- Contaminated Needles and Syringes (IV Drug use, tattoos)
- Hemodialysis
- Mother to Baby (during birth)
- Child to Child (cuts, wounds)
Clinical Outcomes of Hepatitis B infection

- Infected Person
- Susceptible Person
- Virus

- Fulminant Hepatitis/Death
- Chronic infection
- Immune
Immune Status

- Your body has successfully fought off the virus completely
- You will not get this disease again
- You cannot transmit the virus to others
Chronic Hepatitis B

- You may develop cirrhosis or liver cancer
- You may not look or feel sick unless the disease is very advanced
- You can spread Hepatitis B to others
Hepatitis B Disease Progression

- Chronic Infection
  - 5%–10%¹
- Cirrhosis
  - 30%¹
  - 23% in 5 yr²
- Liver Cancer (HCC)
  - 6% in 5 yr²
- Liver Failure
  - 23% in 5 yr²
- Liver Transplantation
- Death


Chronic Hep B is the 6th leading indication for liver transplantation in the United States:³ ~5%
Chronic Hepatitis B

- People who have chronic Hep B infection might be called “hepatitis B carriers.”

- About 1.25 million people living in the United States have chronic (life-long) Hep B infection.

- About 15%-25% of persons with chronic Hep B infection might die from either cirrhosis or liver cancer.

- Chronic infection occurs in:
  - ~ 90% of infants infected with Hep B at birth
  - ~ 30% of children infected at age 1-5 years
  - 2-6% of people infected after age 5 years
Hepatitis B Symptoms

- Incubation 6 weeks to 6 months
- Most people do not have any symptoms unless acute or very advanced chronic disease
- Tiredness
- Loss of appetite
- Fever
- Stomach-ache
- Dark urine
- Light colored stools
- Jaundice
- Swelling of abdomen
Is Hepatitis B infection Preventable?
Hep B Prevention Strategies

- Vaccinate susceptible individuals
- Avoid sharing toothbrushes, razors, or other personal care articles that might have blood on them
- Wear gloves if you have to touch anyone’s blood or open sores
- Practice safer sex
Transmission of Hep B Infection

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Hepatitis B Vaccine

- Available in the U.S. since 1981
- Usually given as 3 shots over a 4-6 month period
  - There is also a 2-shot schedule for 11-15 year olds
- Safe and effective
  - Does not contain any live virus
  - Protection will last for at least 15 years
- Recommended for:
  - all infants
  - all children and adolescents
  - adults at increased risk (includes health care workers, those who are from high prevalence countries)
Strategies to Eliminate Hep B Transmission in the United States

- Prevent perinatal Hep B transmission
- Universal infant vaccination (early 1990’s)
- Screening and Vaccination of adults in high-risk groups
- Catch up Vaccination:
  - all children and adolescents but focus on 11-12 year olds

Source: Advisory Committee on Immunization Practices

HBsAg discovered, linked to liver cancer

Vaccine licensed

HBsAg screening of pregnant women

OSHA Rule enacted

Infant Immunization

Adolescent Immunization

Source: NNDSS
"Catch-up" Vaccinations Are Needed!

- **Early 1990s:** Universal infant vaccination was initiated and Hep B vaccinations were later recommended for all children, ages 0-18.

- **Late 1990s:** In 1997, California instituted Hep B vaccination requirements for kindergarten entry and for seventh grade entry in 1999.

- **Vaccination rates are low in certain groups.** For example, vaccination rates in Vietnamese and Hmong population ranges 4%-26%. (McPhee et al., 2003; Butler & Chen, 2003 pilot data; Euler, 2001).
**Adult Hep B Vaccine Coverage, 2002**

1999: Vaccination of 0-18 y.o. recommended

**Source:** CDC, National Health Interview Survey
Geographic Prevalence of Chronic Hepatitis B May Be Impacted by Migration

Immigration numbers summed by continent from 1996-2002

- ~2 million Asians
- ~930,000 Africans
- ~350,000 Africans
- ~400,000 South Americans

HBsAg Prevalence
- High
- Intermediate
- Low

Slide from Hepatitis B & Infectious Disease Training Program, 2007, Liver Research Consortium, LLC
Groups who should be tested prior to vaccination

- **Individuals from prevalent regions**
  - South Asia (except Sri Lanka)
  - Africa
  - South Pacific Islands
  - Middle East (except Cyprus)
  - European Mediterranean
  - The Arctic (indigenous populations)
  - **South America**: Argentina, Bolivia, Brazil, Ecuador, Guyana, Suriname, Venezuela, Amazon region of Colombia and Peru
  - **Independent states of former Soviet Union**
  - Eastern Europe, including Russia, except Hungary
  - **Caribbean**: Antigua, Barbuda, Dominica, Dominican Republic, Granada, Haiti, Jamaica, Puerto Rico, St, Stkts and Nevis, Stl Lucia, St. Vincent and Grenadines, Trinidad and Tobago, Turks and Caicos
Groups who should be tested prior to vaccination

- **Other high risk groups**
  - Household and sexual contacts of Hep B carriers
  - History of IV drug use
  - Men who have sex with men
  - Inmates of correctional facilities
  - Individuals with elevated liver enzymes (AST/ALT)
  - Individuals with HIV or Hep C
  - Patients undergoing hemodialysis
  - All pregnant women
Rationale for testing in high risk groups

- Blood test will inform a person of the Hep B status
- Vaccine is not effective for those already exposed to the virus
  - Give false sense of security
  - Not cost-effective for high risk groups
- Vaccination does not allow for early detection of liver cancer
- Carriers should be counseled for prevention of transmission
- Carriers should be medically managed
Hepatitis B Testing

- Outcomes of testing:
  - Immune
  - Chronically infected
  - Never been infected (test negative)
Test Negative Individuals

- Susceptible to getting infected
- May seek protection through
  - Vaccination
  - Other prevention strategies (safe sex, wear gloves when touching blood, etc.)
Medical Management

- Acute infections
  - Supportive treatment

- Chronic infections
  - Medications may be effective in 25%-50% of cases.
  - Avoid additional insults to the liver
  - Ongoing lifelong medical evaluations
## Approved Treatments for Hepatitis B

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Manufacturer</th>
<th>Year Approved for Hepatitis B</th>
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<tbody>
<tr>
<td>Interferon alfa-2b</td>
<td>Schering Corporation</td>
<td>1992</td>
</tr>
<tr>
<td>Lamivudine</td>
<td>GlaxoSmithKline</td>
<td>1998</td>
</tr>
<tr>
<td>Adefovir dipivoxil</td>
<td>Gilead Sciences</td>
<td>2002</td>
</tr>
<tr>
<td>Entecavir</td>
<td>Bristol-Myers Squibb</td>
<td>2005</td>
</tr>
<tr>
<td>Peginterferon alfa-2a</td>
<td>Hoffmann La-Roche</td>
<td>2005</td>
</tr>
<tr>
<td>Telbivudine</td>
<td>Idenix</td>
<td>2006</td>
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Investigational Treatment for Hepatitis B: Nucleoside Analogues

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<thead>
<tr>
<th>Drug</th>
<th>Common Alternate Name</th>
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<tbody>
<tr>
<td>Valtorcitabine</td>
<td>val-LdC</td>
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<tr>
<td>Emtricitabine</td>
<td>FTC</td>
</tr>
<tr>
<td>Clevudine</td>
<td>L-FMAU</td>
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<tr>
<td>Tenofovir</td>
<td>--</td>
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<tr>
<td>Elvucitabine</td>
<td>ACH-126, 443; beta-LFd4C</td>
</tr>
<tr>
<td>Amdoxivir</td>
<td>DAPD</td>
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Summary

- Hepatitis B is an important public health concern
- Hepatitis B can be prevented
- Testing is needed prior to vaccination in high risk populations
- Focused strategies may be needed to screen and vaccinate high risk populations
- Safe and effective medications are available and more are being developed
- Those with chronic infection should avoid additional insults to the liver and be closely monitored by a physician