Learning Objectives

After reading this publication, the reader should be able to:
► describe what immunizations are recommended for dental healthcare workers;
► describe the importance of being tested for antibody response after receiving hepatitis B immunization;
► describe the current recommendations for managing the office activities of dental healthcare workers who are carriers of the hepatitis B virus.

Plotting a Course to Infection Prevention Through Immunization

Prevention of infectious diseases involves two major approaches:

1. eliminate exposure to the disease agent or,
2. immunize against the disease agent.

Since it’s not always possible to prevent exposure to disease agents, immunization (when available) is the best approach. As a dental healthcare worker you are exposed to a variety of microbes as you interact with patients. So it’s important for you to receive appropriate immunizations to protect yourself, your co-workers, your patients and your family members against vaccine-preventable diseases.

While innate immunity (born with) and naturally acquired immunity (as a result of having an infectious disease) are very important, this issue will address artificially acquired immunity (as a result of being exposed to a vaccine – immunogen).*

Unfortunately, vaccines are not available against all infectious diseases, and not everyone responds to a given vaccine that is available. Nevertheless, the Centers for Disease Control and Prevention (CDC) and the Advisory Committee on Immunization Practices (ACIP) have recommended that dental healthcare workers demonstrate immunity to or receive immunizations against hepatitis B; influenza; measles, mumps and rubella; chickenpox; tetanus, diphtheria and pertussis; and meningococcal disease as described in the chart on page 4.†

Other vaccines are available (e.g., against hepatitis A, HPV†, Hib‡, pneumococcal pneumonia, shingles, anthrax, typhoid fever, yellow fever, rabies, polio§); are based on a person’s medical condition, age or travel plans; and should be discussed with one’s personal physician.

* Note: See the Glossary for further information about the immune response.
† Human papillomavirus;
‡ Haemophilus influenza type b
§ Poliovirus

Infection prevention and safety is a discipline that requires constant attention. We need to chart a course to success by steering around obstacles and pitfalls, managing changes in regulations and recommendations and evaluating new products and procedures. So this year Infection Control in Practice is helping you navigate a course to infection prevention and safety by presenting issues titled “Set Your Course for Safe Dental Care”, “Continuing Your Journey to Safe Dental Care”, “Microbes That Challenge the Journey to Safe Dental Care”, “Plotting a Course Around Infection Prevention Pitfalls”, “Plotting a Course to Infection Prevention Through Immunization” and “Steering Toward Patient Safety”.

Contents

1. Prevention of infectious diseases involves two major approaches
2. Scenario
3. Scenario (continued)
   Table 1-CDC classification of exposure prone patient care procedures
4. Scenario (continued)
   Chart -Vaccines for Dental Healthcare Workers
5. What Can OSAP Do for You?
   What's Wrong With This Picture?
   Valued Newsletter Sponsors
6. Explore and Learn at OSAP
   OSAP Membership
   Glossary
   Links to Resources
7. Continuing Education
8. What’s It All About?
Scenario

The Incident

Violet had been working in Dr. Ramin’s office ever since graduating from the dental assisting program seven years ago at the local community college. She just received her first contaminated sharps injury when trying to remove an uncapped needle from the anesthetic syringe. Dr. R immediately sent Violet and the source patient (with consent) to the local hospital emergency room for evaluation. All of the required information was sent to the hospital including paperwork documenting that Violet had received the hepatitis B vaccination series while in school.

Violet told the evaluating physician that this was her first exposure, and showed the physician proof of her hepatitis B vaccination. The physician asked Violet if she was tested after her hepatitis B immunization. Violet said: “I think so but I’m not sure”. So the physician tested Violet for antibodies to the hepatitis B virus (anti-HBs) along with antibody tests for human immunodeficiency virus (HIV) and hepatitis C virus.** The source patient also was tested for HIV and hepatitis C antibodies as well as hepatitis B surface antigen (HBsAg).

The HIV and hepatitis tests were negative, and so was Violet’s test for anti-HBs.

Since Violet did not have a post-vaccination titer to demonstrate immunity to hepatitis B, the physician chose to do an HBsAg test at the time to avoid a second phlebotomy if the antibody titer result was not positive. The source patient was negative, but Violet was positive for both HBsAg and anti-HBc.

Potential Consequences

Since the source patient was negative for HBsAg and anti-HBc, and Violet was positive for HBsAg and anti-HBc and negative for anti-HBs, it was clear that Violet had already been infected with the hepatitis B virus before her exposure in Dr. R’s office. Her physician performed laboratory tests for liver function and found no symptoms of hepatitis, thus she was an asymptomatic carrier of the hepatitis B virus. She must have become infected with hepatitis B virus before she received the hepatitis B vaccine while in school. The reason she did not respond to the vaccine (did not develop anti-HBs) is likely because she was already a carrier of the virus. Hepatitis B carriers do not respond to the vaccine.

An estimated 800,000–1.4 million persons in the United States have chronic HBV infection like Violet. Chronic infection is an even greater problem globally, affecting approximately 350 million persons. An estimated 620,000 persons worldwide die from HBV-related liver disease each year.

By contrast, approximately 95% of adults recover completely from an acute HBV infection and do not become chronically infected. Approximately 25% of those who become chronically infected during childhood and 15% of those who become chronically infected after childhood die prematurely from cirrhosis or liver cancer, and the majority remain asymptomatic until onset of cirrhosis or end-stage liver disease. In the United States, chronic HBV infection results in an estimated 2,000–4,000 deaths per year.

Concern for dental personnel-to-patient spread:

Since Violet was likely an unknown asymptomatic hepatitis B carrier while in school and while working in Dr. R’s office, there may be a concern of her spreading the virus to patients. Although spread of hepatitis B from a dental worker to a patient is rare, it has happened. There is only one published report of a medical healthcare provider-to-patient transmission of HBV during exposure-prone procedures (Table 1) in the United States since 1994. In that case, an orthopedic surgeon who was unaware of his HBV status, and who had a very high level of HBV DNA, transmitted HBV to between two and eight patients during August 2008–May 2009.

According to the CDC, “In addition to the rarity of surgery-related transmission of HBV since 1994, the most recent case of HBV transmission from a U.S. dental healthcare provider to patients was reported in 1987. Since this event, certain infection control measures are thought to have contributed to the absence of detected transmissions; such measures include widespread vaccination of dental healthcare professionals, universal glove use, and adherence to the tenets of the 1991 Occupational Safety and Health Administration (OSHA) Bloodborne Pathogens Standard.”

Since 1991, no provider-to-patient transmission of HBV has been reported in the United States or other developed countries from primary care providers, clinicians, medical or dental students, residents, nurses, other healthcare providers, or any others who would not normally perform exposure-prone procedures.

Prevention and Related Recommendations

Most exposures in dentistry are preventable. First of all, Violet should have safely recapped the needle before removing it from the anesthetic syringe.

Violet’s local community college should have instituted follow-up testing after the dental assisting students received the three doses of hepatitis B vaccine. The CDC recommends testing dental healthcare workers for anti-HBs one to two months after completion of the three-dose hepatitis B vaccination series. Dr. Rarin should have attempted to confirm Violet’s hepatitis B status when she was hired. This would have given him a chance to further emphasize aspects of preventing hepatitis B transmission and the importance of adhering to infection control procedures as described in Standard Precautions.

Providers, residents, and medical and dental students with active HBV infection (i.e., those who are HBsAg-positive) who do not perform exposure-prone procedures but who practice non- or minimally invasive procedures (e.g., dental procedures other than major oral or maxillofacial surgery) should not be subject to

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Table 1. CDC classification of exposure-prone patient care procedures

<table>
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<tr>
<th>Category I: Procedures known or likely to pose an increased risk of percutaneous injury to a healthcare provider that have resulted in provider-to-patient transmission of hepatitis B virus (HBV)</th>
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<tr>
<td>These procedures are limited to major abdominal, cardiothoracic, and orthopedic surgery, repair of major traumatic injuries, abdominal and vaginal hysterectomy, caesarean section, vaginal deliveries, and major oral or maxillofacial surgery (e.g., fracture reductions). Techniques that have been demonstrated to increase the risk for healthcare provider percutaneous injury and provider-to-patient blood exposure include:</td>
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<td>✦ digital palpation of a needle tip in a body cavity and/or</td>
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<td>✦ the simultaneous presence of a healthcare provider’s fingers and a needle or other sharp instrument or object (e.g., bone spicule) in a poorly visualized or highly confined anatomic site.</td>
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<td>Category I procedures, especially those that have been implicated in HBV transmission, are not ordinarily performed by students fulfilling the essential functions of a medical or dental school education.</td>
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<tr>
<th>Category II: All other invasive and noninvasive procedures</th>
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<td>These and similar procedures are not included in Category I as they pose low or no risk for percutaneous injury to a healthcare provider or, if a percutaneous injury occurs, it usually happens outside a patient’s body and generally does not pose a risk for provider-to-patient blood exposure. These include:</td>
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<td>✦ surgical and obstetrical/gynecologic procedures that do not involve the techniques listed for Category I;</td>
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<td>✦ the use of needles or other sharp devices when the healthcare provider’s hands are outside a body cavity (e.g., phlebotomy, placing and maintaining peripheral and central intravascular lines, administering medication by injection, performing needle biopsies, or lumbar puncture);</td>
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<tr>
<td>✦ dental procedures other than major oral or maxillofacial surgery;</td>
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<tr>
<td>✦ insertion of tubes (e.g., nasogastric, endotracheal, rectal, or urinary catheters);</td>
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<td>✦ endoscopic or bronchoscopic procedures;</td>
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<tr>
<td>✦ internal examination with a gloved hand that does not involve the use of sharp devices (e.g., vaginal, oral, and rectal examination; and</td>
</tr>
<tr>
<td>✦ procedures that involve external physical touch (e.g., general physical or eye examinations or blood pressure checks).</td>
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Copied from reference #6
any restrictions of their activities or study. They do not need to achieve low or undetectable levels of circulating HBV DNA, hepatitis soluble antigen (HBeAg) negativity, or have review and oversight by an expert review panel, as recommended for those performing exposure-prone procedures. However, they should receive medical care for their condition by clinicians, which might be in the setting of student or occupational health.

Surgeons, including oral surgeons, obstetrician/gynecologists, surgical residents, and others who perform exposure-prone procedures\(^6\), should fulfill the following criteria:

- Consistent with the 1991 recommendations and ACIP recommendations, their procedures should be guided by review of a duly constituted expert review panel with a balanced perspective (i.e., providers' and students' personal, occupational or student health physicians, infectious disease specialists, epidemiologists, ethicists and others as indicated above) regarding the procedures that they can perform and prospective oversight of their practice. Confidentiality of the health-care provider’s or student’s HBV serologic status should be maintained.

- HBV-infected providers can conduct exposure-prone procedures if a low or undetectable viral load is documented by regular testing at least every six months unless higher levels require more frequent testing; for example, as drug therapy is added or modified or testing is repeated to determine if elevations above a threshold are transient.

- CDC recommends that an HBV level of 1,000 IU/ml (5,000 GE/ml) or its equivalent is an appropriate threshold for a review panel to adopt. Monitoring should be conducted with an assay that can detect as low as 10–30 IU/ml, especially if the individual institutional expert review panel wishes to adopt a lower threshold.

- Spontaneous fluctuations (blips) of HBV DNA levels and treatment failures might both present as higher-than-threshold (1,000 IU/ml; 5,000 GE/ml) values. This will require the HBV-infected provider to abstain from performing exposure-prone procedures, while subsequent restesting occurs, and if needed, modifications or additions to the health-care provider’s drug therapy and other reasonable steps are taken.

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### Vaccines for Dental Healthcare Workers\(^1\)

(Copied from reference #1: Additional information is available\(^2\))

#### Hepatitis B Vaccine

- If you don’t have documented evidence of a complete hepatitis B vaccine series, or if you don’t have an up-to-date blood test that shows you are immune to hepatitis B (i.e., no serologic evidence of immunity or prior vaccination) then you should:
  - Get the three-dose series (the first dose now, the second dose in one month, the third dose approximately five months after the second dose).
  - Get anti-HBs serologic tested one-two months after dose number three.

#### Influenza Vaccine

- Get one dose of influenza vaccine annually.
- Influenza can be a serious disease that can lead to hospitalization and sometimes even death. Anyone can get sick from the flu.*
- You can get the flu from anyone, including patients and coworkers who are sick with the flu.*
- If you get the flu, you can spread it to others even if you don’t feel sick.*
- By getting vaccinated, you can help protect yourself, your family at home, and also your patients at work from getting the flu.*


#### Measles, Mumps and Rubella Vaccine (MMR) (1957 is key!)

- If you were born in 1957 or later and have not had the MMR vaccine, or if you don’t have a blood test that shows you are immune to measles, mumps, and rubella (i.e., no serologic evidence of immunity or prior vaccination), get two doses of MMR, four weeks apart.
- Although birth before 1957 is considered acceptable evidence of measles, rubella, and mumps immunity, healthcare facilities should consider offering the vaccine to unvaccinated personnel born before 1957 who do not have laboratory evidence of measles, rubella, and mumps immunity; laboratory confirmation of disease; or vaccination with two appropriately spaced doses of MMR vaccine for measles and mumps and one dose of MMR vaccine for rubella. Vaccination recommendations during outbreaks differ from routine recommendations for this group.
- During an outbreak of measles or mumps, healthcare facilities should recommend two doses of MMR vaccine at the appropriate interval for unvaccinated health-care personnel regardless of birth year who lack laboratory evidence of measles or mumps immunity or laboratory confirmation of disease. Similarly, during outbreaks of rubella, health-care facilities should recommend one dose of MMR vaccine for unvaccinated personnel regardless of birth year who lack laboratory evidence of rubella immunity or laboratory confirmation of infection or disease.\(^4\)

#### Varicella (Chickenpox) Vaccine

- If you have not had chickenpox (varicella), if you haven’t had varicella vaccine, or if you don’t have an up-to-date blood test that shows you are immune to varicella (i.e., no serologic evidence of immunity or prior vaccination) get two doses of varicella vaccine, four weeks apart.

#### Tetanus, Diphtheria, and Pertussis (Tdap) Vaccine

- Get a one-time dose of Tdap as soon as possible if you have not received Tdap previously (regardless of when previous dose of Tetanus-Diphtheria (Td) vaccine was received). There has been an important increase in pertussis cases in some areas of the country.
- Get Td boosters every ten years thereafter.
- Pregnant HCWs need to get a dose of Tdap during each pregnancy.

#### Meningococcal Vaccine

- If you are routinely exposed to isolates of Neisseria meningitidis, get one dose. See additional information in references.\(^3\)
What Can OSAP Do for You

As the OSHA officer in our dental office, I was in search of a resource that I could depend on to provide me with the most current and accurate information on OSHA related topics, especially for our required yearly training sessions. I love OSAP because it is a single resource that consolidates the latest safety and infectious disease information from several different organizations i.e., the CDC, OSHA, FDA, EPA.

I frequently use the training manuals; I also use the OSAP website to access direct links to various organizations’ websites for more information on relevant topics. I have come to rely on OSAP as a source of continuing education credits and appreciate the frequent email updates on safety and infection prevention topics. The Infection Control in Practice newsletter carries relevant news and topics to share with employees.

I recommend OSAP membership to dental professionals; it is a well organized, easily accessible, concise and an extremely economical resource that I can rely on to provide the entire dental team with the most current information on all safety and infection control related topics.

Johna D. Zitnay DDS
Private Practice General Dentistry
Stratford, CT

What’s Wrong With This Picture?

Can you identify any breach in infection prevention and safety procedures in this photo? Check your answers below.

Answer: The dentist is not wearing protective eyewear with proper side shields and the patient has not been provided with protective eyewear.

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Check out the Bookstore Section of the OSAP store for an interesting read, *Man and Microbes: Disease and Plagues in History and Modern Times*. Author Arno Karlen provides a look at the coevolution of humans and microorganisms, origins of historical plagues and the emergence of scourges such as hemorrhagic fever (Ebola and its cousins), Lyme disease, Legionnaires’ disease, and even the deep mysteries of retroviruses such as HIV.

OSAP Membership

If you know someone who can benefit from OSAP membership please encourage them to visit OSAP.org to learn more about the benefits of membership. OSAP offers ways to stay current, informed and connected through several membership categories: Individual; Professional Practice; Academic; Associate; Web-only; and Student. Corporate memberships are always welcome; please contact OSAP for information.

Contact us at www.osap.org, or by phone: 1-800-298-OSAP (6727) within the U.S. or 1-410-571-0003 outside the U.S.

Glossary

**Antibodies:** A protein produced by special lymphocytes of the immune system in response to the presence of a specific immunogen (that is foreign to the body); they help the body fight infection.

**Immune response:** Immunogen-activation of special cells (lymphocytes) that produce antibodies or lymphokines, destroy virus-infected host cells and cancer cells, and regulate antibody production.

**Immunity:** The state of being resistant to the harmful effects of specific microbes.

**Immunogen:** A substance (e.g., a bacterium, virus or substance not normally present in the body) that causes the body to undergo an immune response, sometimes referred to as an antigen.

**Hepatitis B core antibody (anti-HBc):** Appears at the onset of symptoms in acute hepatitis B and persists for life. The presence of anti-HBc indicates previous or ongoing infection with HBV in an undefined time frame.

**Hepatitis B surface antibody (anti-HBs):** The presence of anti-HBs is generally interpreted as indicating recovery and immunity from HBV infection. Anti-HBs also develops in a person who has been successfully vaccinated against hepatitis B.

**Hepatitis B surface antigen (HBsAg):** A protein on the surfaces of HBV; it can be detected in high levels in serum during acute or chronic HBV infection. The presence of HBsAg indicates that the person is infectious. The body normally produces antibodies to HBsAg as part of the normal immune response to infection. HBsAg is the antigen used to make the hepatitis B vaccine.

**Hepatitis B soluble antigen (HBeAg):** Its appearance correlates with HBV replication, high titer of the virus in serum and high infectivity of the serum.

**Lymphokines:** Chemicals secreted by lymphocytes that can influence the activities of some cells and that can help mediate the immune response.

**Neisseria meningitidis:** A bacterium that can cause meningitis. It is carried in the nasopharynx of about 5-15% of adults. Also referred to as meningococcus.

Links to Resources

If you wish to obtain one (1) hour of continuing education (CE) credit, complete the following test by selecting the best answer and fax or mail it to the OSAP Central Office for grading. Please include a check or credit card to cover the handling charges. Pending satisfactory results (at least seven out of ten), you will be issued a letter for one (1) CE credit hour. Educational Method: Self-Instruction. OSAP is recognized by the American Dental Association as a CERP Provider.*

For each item, select the best answer.

1. What birth year is key in determining past immunity to measles, mumps and rubella?
   a. 1943  b. 1957  c. 1969  d. 1995

2. According to the CDC how often should a dental healthcare worker get a tetanus diphtheria (Td) booster after the initial Tdap vaccination?
   a. Every year  b. Every five years  c. Every ten years  d. Every 20 years

3. How often should a dental healthcare worker receive the influenza vaccine?
   a. Only once  b. Every year  c. Every five years  d. Every ten years

4. Hepatitis B vaccination of a hepatitis B carrier will result in:
   a. elimination of the hepatitis B carrier state.  b. immunity to all hepatitis viruses.
   c. increased symptoms of the hepatitis B infection.  d. no immunity to hepatitis B.

5. The most recent case of hepatitis B virus transmission from a dental healthcare worker to patients was reported in:

6. When should a dental healthcare worker be tested for immunity after receiving the three-dose hepatitis B vaccination series?
   a. One to two days  b. One to two weeks  c. One to two months  d. One to two years

7. According to the CDC, dental assistants who are hepatitis B carriers should be subject to what restriction of their patient treatment activities?
   a. Provide patient treatment only in the presence of a non-hepatitis B carrier dental healthcare worker
   b. Inform each patient of their hepatitis B carrier state
   c. Have no patient contact until their hepatitis B virus load is undetectable
   d. None

8. What is used to make the hepatitis B vaccine?
   a. HBsAg  b. HBeAg  c. anti-HBs  d. anti-HBc

9. Vaccination against what disease would be the least important for a dental healthcare worker?

10. What infection prevention measure is thought to have contributed most to the recent absence of hepatitis B virus transmission to dental healthcare workers?
    a. Wearing face masks with all patients
    b. Instrument sterilization
    c. Universal gloving
    d. Cleaning and disinfecting operatory surfaces

*ADA CERP is a service of the American Dental Association to assist dental professionals in identifying quality providers of continuing dental education. ADA CERP does not approve or endorse individual courses or instructors, nor does it imply acceptance of credit hours by boards of dentistry. Concerns or complaints about a CE provider may be directed to the CE provider or to ADA CERP at ADA.org/goto/cerp. Please email the OSAP central office at office@osap.org or call 410-571-0003 if you wish to be in contact with the course author/creator(s) with any questions or for clarification of course concepts. All participants assume individual responsibility for providing evidence of contact hours of continuing education to the appropriate authorities and for the maintenance of their individual records. Publication date: October, 2013. Expiry date: October, 2016.

Please mail or fax completed test with the appropriate payment to receive one (1) hour of continuing education credit.

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After completing the information above:
mail to: OSAP CE, P.O. Box 6297, Annapolis, MD 21401, USA  or fax to: 1-410-571-0028
What’s It All About?
This issue describes the importance of immunizations for dental healthcare workers.

Do you know what immunizations are recommended for dental healthcare workers?

Do you know what happens if a carrier of the hepatitis B virus receives the hepatitis B vaccination series?

Do you know why it is important to be tested for immunity after receiving the three-dose hepatitis B vaccination series?

Read On!