



## January 2008: VOLUME 1, NUMBER 7

### *Update on Adult Immunizations*

#### In this Issue...

Immunization has been a cornerstone of pediatric preventive care for decades, with routine immunization of children leading to dramatic reductions in disease incidence, morbidity, and mortality. Over the past few years, there have been a growing number of new vaccines licensed and recommended for adults, including vaccines against human papillomavirus (HPV), pertussis, and herpes zoster. While vaccination is an ingrained concept among pediatricians, the notion of a routine immunization schedule and program for adults has not taken root, as reflected by the continued low rates of vaccination for key vaccines among the adult population.

In this issue, we review recent investigations of vaccines in the adult population, and discuss new recommendations on the immunization of adults from the Centers for Disease Control and Prevention's Advisory Committee on Immunization Practices (ACIP).

#### Program Information

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#### Length of Activity

1.0 hours Physicians

#### Expiration Date

December 26, 2009

#### Next Issue

January 31, 2008

## THIS ISSUE

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## GUEST AUTHOR OF THE MONTH



Commentary & Reviews:

### Tom Talbot, MD, MPH

Assistant Professor of  
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### Guest Faculty Disclosures

Tom Talbot, MD, MPH has disclosed that he has served as a principal investigator for Sanofi-Pasteur.

### Unlabeled/Unapproved Uses

The author has indicated that there will be no reference to unlabeled/unapproved uses of drugs or products in the presentation.

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## LEARNING OBJECTIVES

At the conclusion of this activity, participants should be able to:

- Describe the efficacy of the herpes zoster vaccine in adults age 60 years and older
- Discuss the limitations of therapeutic efficacy of human papillomavirus vaccines
- Discuss the rationale behind recommendations advising vaccination of all adults against pertussis
- Describe the role of hepatitis A vaccine for use as post-exposure prophylaxis

## JANUARY PODCAST



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In this audio interview, Dr. Tom Talbot from Vanderbilt University School of Medicine discusses some of the vaccines available for adults, specifically, herpes zoster, HPV, pertussis, hepatitis A, and influenza.

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## COMMENTARY

The institution and comprehensive implementation of routine childhood immunization against contagious pathogens can be considered one of the greatest public health achievements of the past century. In 2006, 95.8% of children aged 19-35 months had received 3 or more doses of diphtheria, tetanus toxoid, and acellular pertussis vaccine (DTaP), 92.9% had been vaccinated against polio, and 92.4%

had received at least 1 dose of the measles-mumps-rubella (MMR) vaccine.<sup>1</sup> In total, 77% of children in this age group had been fully vaccinated against diphtheria, tetanus, pertussis, polio, measles, mumps, rubella, *Haemophilus influenzae* type b (Hib), hepatitis B virus, and varicella. Routine childhood immunization has had tremendous effects upon the incidence of and morbidity due to many of these infectious diseases. Deaths due to diseases for which a vaccine was licensed or recommended prior to 1980 (diphtheria, measles, mumps, pertussis, poliomyelitis, rubella, smallpox, and tetanus) have declined to near zero, smallpox has been



eradicated worldwide, and the endemic spread of measles, polio, and rubella has been eliminated in the United States.<sup>2</sup>

The table below summarizes these data:

Vaccine-Preventable Disease	% Reduction in Cases†	% Reduction in Deaths†
Diphtheria	100%	100%
Measles	99.9%	100%
Mumps	95.9%	100%
Pertussis	92.2%	99.3%
Poliomyelitis	100%	100%
Rubella	99.9%	100%
Tetanus	92.9%	99.2%
Invasive <i>H. influenzae</i> type b	99.8%	99.5%
Varicella	85.0%	81.9%

†Defined as percent reduction in cases or deaths from pre-vaccine era estimated annual averages to data from 2004 – 2006.

It is estimated that vaccination with 7 of the 12 routinely recommended childhood vaccines (DTaP; tetanus and diphtheria toxoids; Hib conjugate; inactivated poliovirus; measles, mumps, and rubella; hepatitis B; and varicella vaccines) prevents an estimated 33,000 deaths and 14 million cases of disease in each birth cohort and saves \$9.9 billion in direct and another \$33 billion in indirect costs.<sup>3</sup> Simply put, routine childhood immunization has had a remarkable impact on the health of children in the United States.

The story of immunizations in the adult population, however, provides a striking contrast. In 2005, only 22.9% of all adults aged 50-64 years, 25.3% of adults age 18-64 years with a high-risk condition, and 8.9% of adults age 18-49 years who were household contacts of high-risk persons, received an influenza vaccination.<sup>4</sup> That same year, only 65.7% of adults 65 years and older reported receipt of pneumococcal vaccine.<sup>5</sup> In the past few years, new vaccines have been licensed for the adolescent and adult population, including vaccines against pertussis, human papillomavirus (HPV), and varicella. While traditionally targeting acute contagious infections (such as measles or polio), some of the newer adult vaccines address chronic sequelae of infectious diseases, like cervical neoplasia in the case of the HPV vaccine and neuropathy in the case of the varicella zoster vaccine.

These new vaccines impact infectious diseases that can cause substantial morbidity in adults. Reactivation of varicella zoster virus, whose primary infection results in chickenpox, causes up to a million cases of herpes zoster (shingles) in the United States annually, with risk increasing as age advances.<sup>6</sup> HPV causes 6.2 million new infections each year among persons aged 14 to 44 years of age, and 70% of cervical cancers are due to HPV types 16 and 18 (which are included in the currently licensed vaccine).<sup>7</sup> The incidence of pertussis, while markedly decreased following implementation of childhood vaccination, has climbed in recent years, with an increasing proportion of cases noted in adolescents and adults due to waning protection from pediatric vaccination.<sup>8</sup>

In addition to these novel vaccines, broader recommendations for the use of hepatitis B vaccine (ie, no longer requiring acknowledgment of a hepatitis B virus

infection risk factor for adults to receive the vaccine),<sup>9</sup> hepatitis A vaccine (ie, for post-exposure prophylaxis),<sup>10</sup> and influenza vaccine (ie, the decrease of the target age for universal vaccination of all adults from 65 to 50 years and older)<sup>11</sup> have emerged for adults in recent years. This growing number of recommended adult vaccines, combined with the historically low coverage of established adult immunizations, has created an important challenge for the medical community. Adult primary care physicians and internists must emulate the successes noted by our pediatric colleagues and integrate immunization into routine preventive adult care. Using vaccination delivery and adherence as a measure of quality of patient care has also been advocated.<sup>12</sup> In addition, a similar infrastructure to assist in the delivery these vaccines, particularly to the uninsured, must be provided to ensure complete access.

A complete summary and tables of recommendations for adult vaccination can be found on the [CDC website](#).

## References

1. Centers for Disease Control and Prevention. [National, state, and local area vaccination coverage among children aged 19-35 months--United States, 2006](#). *MMWR Morb Mortal Wkly Rep* 2007; 56:880-885.
2. Roush SW, Murphy TV. [Historical Comparisons of Morbidity and Mortality for Vaccine-Preventable Diseases in the United States](#). *JAMA* 2007; 298:2155-2163.
3. Zhou F, Santoli J, Messonnier ML, et al. [Economic evaluation of the 7-vaccine routine childhood immunization schedule in the United States, 2001](#). *Arch Pediatr Adolesc Med* 2005; 159:1136-1144.
4. Fiore AE, Shay DK, Haber P, et al. [Prevention and control of influenza. Recommendations of the Advisory Committee on Immunization Practices \(ACIP\), 2007](#). *MMWR Recomm Rep* 2007; 56:1-54.
5. Centers for Disease Control and Prevention. [Influenza and pneumococcal vaccination coverage among persons aged > or = 65 years--United States, 2004-2005](#). *MMWR Morb Mortal Wkly Rep* 2006; 55:1065-1068.
6. Kimberlin DW, Whitley RJ. [Varicella-zoster vaccine for the prevention of herpes zoster](#). *N Engl J Med* 2007; 356:1338-1343.
7. Markowitz LE, Dunne EF, Saraiya M, Lawson HW, Chesson H, Unger ER. [Quadrivalent Human Papillomavirus Vaccine: Recommendations of the Advisory Committee on Immunization Practices \(ACIP\)](#). *MMWR Recomm Rep* 2007; 56:1-24.
8. Kretsinger K, Broder KR, Cortese MM, et al. [Preventing tetanus, diphtheria, and pertussis among adults: use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine recommendations of the Advisory Committee on Immunization Practices \(ACIP\) and recommendation of ACIP, supported by the Healthcare Infection Control Practices Advisory Committee \(HICPAC\), for use of Tdap among health-care personnel](#). *MMWR Recomm Rep* 2006; 55:1-37.
9. Mast EE, Weinbaum CM, Fiore AE, et al. [A comprehensive immunization strategy to eliminate transmission of hepatitis B virus infection in the United States: recommendations of the Advisory Committee on Immunization Practices \(ACIP\) Part II: immunization of adults](#). *MMWR Recomm Rep* 2006; 55:1-33; quiz CE1-4.
10. Centers for Disease Control and Prevention. [Update: Prevention of hepatitis A after exposure to hepatitis A virus and in international travelers. Updated recommendations of the Advisory Committee on Immunization Practices \(ACIP\)](#). *MMWR Morb Mortal Wkly Rep* 2007; 56:1080-1084.
11. Bridges CB, Winquist AG, Fukuda K, Cox NJ, Singleton JA, Strikas RA. [Prevention and control of influenza: recommendations of the Advisory Committee on Immunization Practices \(ACIP\)](#). *MMWR Recomm Rep* 2000; 49:1-38; quiz CE1-7.
12. Poland GA, Schaffner W. [Adult Immunization Guidelines: A Patient Safety and Quality-of-Care Issue](#). *Ann Intern Med* 2007; 147(10):735-737. Epub 2007 Oct 18.

# THE EFFICACY OF A VACCINE AGAINST HERPES ZOSTER AND POST-HERPETIC NEURALGIA

Oxman MN, Levin MJ, Johnson GR, et al. **A vaccine to prevent herpes zoster and postherpetic neuralgia in older adults.** *N Engl J Med* 2005; 352:2271-2284.

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In June 2005, the results of one of the largest vaccine efficacy trials, the Shingles Prevention Study, were reported. In a randomized, double-blind, placebo-controlled trial of adults age 60 or older, the use of a vaccine against zoster (containing 14 times the minimum estimated potency found with its pediatric counterpart) was studied. Subjects with a history of varicella (chicken pox) or residence of at least 30 years in the continental United States were eligible for enrollment. Immunocompromised persons, those with chronic pain syndromes, and persons with a prior history of herpes zoster (shingles) were excluded. Randomized by study site and age group (age 60-69 years, and  $\geq 70$  years), subjects received either zoster vaccine or placebo. Subjects were educated regarding the signs and symptoms of herpes zoster, and were followed via monthly automated phone calls to assess for the presence of the disease. Suspected zoster rashes were evaluated using polymerase chain reaction (PCR) and culture testing of a swab from a characteristic lesion. The final determination of a case of herpes zoster was made by a physician committee blinded to the subject's treatment assignment. The primary end point for the study was the burden of illness due to herpes zoster (a measurement of pain and discomfort associated with the disease), while other end points included the incidence of post-herpetic neuralgia and the incidence of herpes zoster.

A remarkable 38,546 adult subjects enrolled in the trial, with 95.3% completing the study for a mean duration of herpes zoster surveillance of 3.13 years (no difference between study arms). Vaccination with the zoster vaccine reduced the burden of illness due to herpes zoster by 61.1% (95% confidence intervals [CI], 51.1-69.1%), the incidence of post-herpetic neuralgia by 66.5% (95% CI, 51.1-69.1%), and the incidence of herpes zoster by 51.3% (95% CI, 44.2-57.6%). The zoster vaccine led to a significantly higher rate of injection site complaints, but these were generally mild.

Spurred by the results of the Shingles Prevention Study, the ACIP recommended that all adults aged 60 years or older receive the zoster vaccine, regardless of a prior history of shingles.<sup>1</sup> Issues such as the cost-effectiveness of vaccination, reimbursement for the vaccine by third-party payors, and the timing of vaccination in persons with a recent history of shingles still must be ascertained and further defined.

## References

1. Centers for Disease control and Prevention's Advisory Committee on Immunization Practices. [ACIP Provisional Recommendations for the Use of Zoster Vaccine](#). Accessed on November 15, 2007.

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## USE OF A BIVALENT HUMAN PAPILLOMAVIRUS VACCINE IN WOMEN WITH PRE-EXISTING HPV INFECTION

Hildesheim A, Herrero R, Wacholder S, et al. **Effect of human papillomavirus 16/18 L1 viruslike particle vaccine among young women with preexisting infection: a randomized trial.** *JAMA* 2007; 298:743-753.

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While the studies examining the use of quadrivalent human papillomavirus (HPV) vaccine in HPV-naïve women were reviewed in last month's issue, this study by Hildesheim et al highlights an important issue with regards to HPV vaccines; namely, their effectiveness in women previously exposed to the HPV types included in the vaccine. In this trial (a substudy of a larger, randomized, blinded clinical trial examining the efficacy of a bivalent HPV vaccine targeting HPV types 16 and 18 in women aged 18 to 25 years in Costa Rica), the impact of vaccination on viral clearance in women already infected with HPV was examined. Eligible subjects (n=7,466) were enrolled and vaccinated with either the bivalent HPV vaccine or hepatitis A vaccine as a control at 0, 1, and 6 months. Serum samples for HPV antibody testing (against HPV-16 and HPV-18) and cervical cytology specimens for HPV DNA testing by PCR were collected at enrollment. Subjects also underwent follow-up examination at 12 months post-enrollment, where cervical cytologic evaluation for HPV DNA also occurred. Subjects with evidence of HPV DNA at enrollment were eligible for the substudy.

In the substudy, the primary endpoint was HPV clearance at the 6- and 12-month visits, defined as failure to detect (at the respective follow-up visits) an HPV type that was present before vaccination. Investigators also measured the vaccine efficacy for viral clearance (VEVC), a measurement of the percentage change in infection rates observed in the HPV vaccine arm as compared to the control arm. A total of 2,189 women were eligible and included in the substudy (1,088 in the HPV vaccine arm, 1,101 in the control arm). Rates of viral clearance and VEVC for vaccine-associated genotypes of HPV at the 6 and 12 month visits are shown in the table below:

**Viral Clearance and Vaccine Efficacy for Viral Clearance for HPV-16 and HPV-18 by Study Group at 6 and 12 Months of Follow-up**

Follow-up Time	% Cleared		Vaccine Efficacy for Viral Clearance % (95% CI)
	HPV Vaccine Group	Control Group	
<b>HPV-16</b>			
6 month visit	27.3%	27.5%	-0.2 (-13.2 to 11.3)
12 month visit	43.9%	45.9%	-3.7 (-28.2 to 16.1)
<b>HPV-18</b>			
6 month visit	46.1%	44.7%	2.4 (-30.5 to 27.0)
12 month visit	59.3%	60.7%	-3.5 (-62.0 to 33.8)
<b>HPV-16 and/or 18</b>			
6 month visit	33.4%	31.6%	2.5 (-9.8 to 13.5)
12 month visit	48.8%	49.8%	-2.0 (-24.3 to 16.3)



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Notably, there were no significant differences in viral clearance or VEVC between the HPV vaccine and control groups, indicating no therapeutic effect of the bivalent HPV vaccination in this population. These findings remained even after stratification for HPV serologic status at study entry, presence of abnormal cervical cytology on study entry, level of viral load at study entry, time since sexual initiation, contraceptive use, smoking status, and chlamydia/gonorrhea status at study entry. Unanswered questions remain regarding the use of the bivalent vaccine in persons already exposed to HPV prior to vaccination. Is there still a benefit in vaccinating women infected with HPV who have not been exposed to all genotypes of HPV included in the vaccine? Other investigations have shown protection against other HPV types with use of the quadrivalent vaccine in this population<sup>1</sup> thus, it seems likely that investigations with the bivalent version will produce similar findings.

The findings from this study reinforce those from prior investigations with the quadrivalent vaccine that showed no type-specific therapeutic efficacy of HPV vaccination in subjects with evidence of vaccine-type HPV exposure prior to vaccination.<sup>7</sup> The quadrivalent HPV vaccine is recommended by the ACIP for routine vaccination of women aged 11 to 12 years and for catch-up vaccination for women aged 13 to 26 years.<sup>7</sup> These recommendations also note that, while vaccination against HPV before sexual debut is preferred, women who may have already been exposed to HPV (eg, sexually-active, those with previously identified HPV on cytologic examination) should also be vaccinated. Testing women prior to vaccination via Papanicolaou smear or HPV DNA analysis is not recommended.

## References

1. U.S. Food and Drug Administration. [Gardasil \[Quadrivalent Human Papillomavirus \(Types 6, 11, 16, 18\) Recombinant Vaccine\] package insert](#). Accessed on November 15, 2007.
7. Markowitz LE, Dunne EF, Saraiya M, Lawson HW, Chesson H, Unger ER. [Quadrivalent Human Papillomavirus Vaccine: Recommendations of the Advisory Committee on Immunization Practices \(ACIP\)](#). *MMWR Recomm Rep* 2007; 56:1-24.

## ACELLULAR PERTUSSIS VACCINATION OF ADULTS

Ward JI, Cherry JD, Chang SJ, et al. **Efficacy of an acellular pertussis vaccine among adolescents and adults.** *N Engl J Med* 2005; 353:1555-1563.

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With the rising incidence of infection due to *Bordetella pertussis* (aka, pertussis or "whooping cough") in adolescents and adults over the past two decades, there has been a growing interest in methods to prevent such morbidity in this population.<sup>1</sup> Routine pertussis vaccination of infants has been recommended since the 1940s, with a less-reactogenic acellular vaccine first licensed for pediatric use in 1991. Vaccination of infants against pertussis has led to a marked decline in disease in this population.<sup>1</sup>

In the Adult Pertussis Trial (APERT), Ward et al examined the safety and efficacy in the adult and adolescent population of an acellular pertussis vaccine, which contained a lower concentration of pertussis antigen than found in the pediatric vaccine. Persons between 15 and 65 years of age were enrolled in this double-blind multi-center randomized trial. Subjects were randomly allocated to receive the acellular pertussis or hepatitis A vaccine and were followed for 2.5 years with twice monthly phone calls to ascertain for cough illness (defined as cough of 5 or more days' duration). Routine serology for anti-pertussis antibodies was collected periodically during follow-up. In addition, subjects reporting a cough illness underwent nasopharyngeal aspiration to collect specimens for culture and PCR testing as well as paired acute and convalescent serology analysis for IgG and IgA antibodies to four key *B. pertussis* antigens. A case of pertussis was defined as a

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cough illness with confirmatory positive culture or PCR for *B. pertussis* or a pre-defined rise in antibody titers.

A total of 2,781 subjects were enrolled in the study (1,390 receiving the acellular pertussis vaccine and 1,391 receiving the hepatitis A vaccine control). The median duration of follow-up of both study arms was 22 months. Of the 2,672 reported cough illnesses, only 10 episodes met the primary case definition for pertussis. Nine of these cases occurred in the control arm, yielding an overall vaccine efficacy of 92% (95% confidence interval, 32-99%), which is similar to that found in studies of pediatric formulations of the vaccine. Pertussis was a more likely cause of cough illness with prolonged duration of cough (occurring in 0.7% of cough illnesses lasting more than 5 days vs 5.7% of cough illnesses lasting more than 56 days). No vaccine-related serious adverse events occurred in either arm.

Prompted in part by the results of the APERT investigation, the ACIP released new recommendations regarding the use in adults of the newly licensed acellular pertussis vaccine (which includes tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis antigens and is designated as Tdap).<sup>1</sup> Specifically, all adults age 19-64 years of age should now receive Tdap in place of the tetanus diphtheria (Td) booster if the last dose of Td was  $\geq 10$  years ago (or as indicated for wound care). Intervals less than 10 years since Td may be used when determining administration of Tdap, particularly in settings where there is an increased risk of pertussis or complications due to *B. pertussis* infection. In addition, persons who have close contact with an infant younger than 1 year should receive Tdap if it has been as short as 2 years since receipt of the Td booster. Finally, because of the increased risk of exposure to persons with pertussis, the ACIP and the Healthcare Infection Control Practices Advisory Group recommended that all healthcare workers with direct patient contact receive a dose of Tdap if it has been at least 2 years since receipt of Td both to protect themselves and to reduce transmission of pertussis to their patients.

## References

1. Kretsinger K, Broder KR, Cortese MM, et al. [Preventing tetanus, diphtheria, and pertussis among adults: use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine recommendations of the Advisory Committee on Immunization Practices \(ACIP\) and recommendation of ACIP, supported by the Healthcare Infection Control Practices Advisory Committee \(HICPAC\), for use of Tdap among health-care personnel. \*MMWR Recomm Rep\* 2006; 55:1-37.](#)

## THE USE OF HEPATITIS A VACCINE FOR POST-EXPOSURE PROPHYLAXIS

Victor JC, Monto AS, Surdina TY, et al. **Hepatitis A vaccine versus immune globulin for postexposure prophylaxis.** *N Engl J Med* 2007; 357:1685-1694.

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In a randomized, double-blind, noninferiority trial based in Kazakhstan, Victor et al compared two methods of post-exposure prophylaxis (PEP) in household and day-care contacts of laboratory-confirmed symptomatic cases of hepatitis A virus (HAV) infection. The study population consisted of healthy persons aged 2 to 40 years who were exposed to index cases of HAV infection. Eligible subjects were randomized to receive either hepatitis A vaccine or weight-based immune globulin (the traditionally recommended intervention for prophylaxis) within 14 days after exposure. At randomization, contacts underwent serologic testing for HAV, and those contacts susceptible to HAV were evaluated over the next 8 weeks for evidence of incident hepatitis A infection (ie, serology for HAV and alanine aminotransferase levels in all subjects; additional PCR testing of serum and stool specimens for contacts with positive serology).

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A total of 4,524 contacts were randomized to receive one of the two PEP interventions, while 1,090 contacts were found to be susceptible to HAV and, therefore, eligible for follow-up. Symptomatic hepatitis A infection was noted in 4.4% (25/568) of contacts who received hepatitis A vaccination, while 3.3% (17/522) of contacts who received immune globulin developed hepatitis A infection (relative risk of infection of 1.35; 95% confidence interval, 0.70-2.67), which met the pre-determined criterion for noninferiority. While not showing a significant increase compared with the immune globulin arm, there were higher rates of clinical and subclinical HAV infections in subjects who received the vaccine, suggesting a potential small difference between the two interventions. Vaccination was well-tolerated, with no reports of unexpected adverse events.

Based upon this trial, the ACIP, in mid-2007, revised their recommendations for care of persons recently exposed to HAV.<sup>1</sup> Namely, for healthy persons aged 1 to 40 years, single antigen hepatitis A vaccine (not the combined hepatitis A and B vaccine, due to the reduced amount of HAV antigen in the combined vaccine) is now recommended for PEP. Immune globulin is preferred for healthy adults over age 40 years, but these contacts may be vaccinated if immune globulin is unavailable. For persons younger than 1 year, immunocompromised patients, and/or patients with chronic liver disease, immune globulin remains the preferred method of PEP. Previously, the ACIP had also recommended that international travelers headed to areas of high or intermediate HAV endemicity receive the hepatitis A vaccine. If the planned travel was less than 4 weeks from the time of vaccination, immune globulin was also recommended. Based on the results of the above trial, hepatitis A vaccine alone may be given to healthy adults age 40 or younger prior to international travel regardless of their scheduled dates for departure.<sup>1</sup>

While a long-established method of PEP, the use of immune globulin has several key concerns, including cost, the requirement for a large volume of administration, limited access and availability, inability to provide long-term immunity, and concerns about transmission of bloodborne pathogens. This study supports the use of hepatitis A vaccine as an alternative to immune globulin for PEP of select healthy contacts to an index case of hepatitis A.

## References

1. Centers for Disease Control and Prevention. [Update: Prevention of hepatitis A after exposure to hepatitis A virus and in international travelers. Updated recommendations of the Advisory Committee on Immunization Practices \(ACIP\)](#). *MMWR Morb Mortal Wkly Rep* 2007; 56:1080-1084.

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This activity has been developed for the Primary Care Physician, Internist, and Infectious Disease Specialist.

### Learning Objectives — [back to top](#)

At the conclusion of this activity, participants should be able to:

- Describe the efficacy of the herpes zoster vaccine in adults age 60 years and older
- Discuss the limitations of therapeutic efficacy of human papillomavirus vaccines
- Discuss the rationale behind recommendations advising vaccination of all adults against pertussis
- Describe the role of hepatitis A vaccine for use as post-exposure prophylaxis

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- **John G. Bartlett, MD** has disclosed that he has served on the HIV Advisory Board for GlaxoSmithKline, Abbott, Bristol-Myers Squibb, Pfizer and Tibotec. He is also on the Policy Board for Johnson & Johnson.
- **Paul G. Auwaerter, MD** has disclosed that he has served as a consultant for Novartis, Pfizer, Ortho-McNeil, Schering-Plough, and Genzyme. He is on the Speakers' Bureau for Schering-Plough and has also disclosed that he is a Stock Shareholder for Johnson & Johnson.
- **Sara E. Cosgrove, MD, MS** has disclosed that she has received grants or research support from Merck and served on the Advisory Boards for Ortho-McNeil, Cadence Pharmaceuticals, and Theravance/Astellas.

### Guest Author Disclosures

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