



# IMPORTANT NOTICE

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| Route to:   |
| <input type="checkbox"/> Office Manager           |
| <input type="checkbox"/> Medical Staff            |
| <input type="checkbox"/> Nursing Staff            |
| <input type="checkbox"/> Immunization Coordinator |

An Immunization Update from the Idaho Immunization Program (IIP)

## IMMUNIZATION REMINDER INFORMATION SYSTEM (IRIS )

### Upgrade

IRIS will be down from 10:00 AM – 1:00 PM on Sunday, January 9, 2011 for a system upgrade. The following key changes will be upgraded in IRIS:

#### *Exporting:*

- If your site electronically submits data to IRIS through the DTT formatting, your inventory should now decrement. Please view your import log. An additional file has been created which will allow inventory to decrement properly. No action is required from your facility unless you do not find a second file, if you see that there is NOT a second file, please notify the IRIS Help Desk by email [iris@dhw.idaho.gov](mailto:iris@dhw.idaho.gov) or call 208-334-5995.

**REMINDER FOR ALL EXPORTING PROVIDERS:** IRIS does not accept the CPT codes for "Vaccine Administration". Import files will error out if the CPT codes for vaccine administration are included. Continue to use the correct CPT code for each vaccine given.

#### *Forecasting:*

- IRIS forecasting has been updated to follow the most current ACIP guidelines. Please contact the IRIS Help Desk if you have questions.

#### *Reminder/Recall:*

The reminder/recall module has been significantly reconfigured for ease of use. Please refer to the Reminder/Recall training module found on the IIP website for help.

- Date range is no longer required.
- The reminder/recall is now a permission setting. If you are not able to access the reminder/recall, please contact the IRIS Help Desk.

#### *Vaccine Management:*

- Alerts now show vaccine inventory to expire within 90 days instead of 30 days.
- Certain vaccine brand names will now be viewable to assist providers.

### Hint

- When entering twins into IRIS, the multiple birth field on the patient demographic record denotes birth order and each child must have a unique number. For example: Twin A is 1 of 2; Twin B would be 2 of 2. This same holds for triplets, quadruplets, etc.

January 7, 2011



# IMPORTANT NOTICE

An Immunization Update from the Idaho Immunization Program (IIP)

## VACCINE

### Tdap

In October 2010, ACIP voted on the following new recommendations for the use of Tdap vaccine affecting children through 18 years of age:

- Tdap can be given regardless of the interval since the last Td was given. There is NO need to wait 2-5 years to administer Tdap following a dose of Td.
- Adolescents should receive a one-time dose of Tdap (instead of Td) between 11 and 12 years of age.
- Adolescents who have not received a dose of Tdap, or for whom vaccine status is unknown, should be immunized as soon as feasible. (As stated above, Tdap can be administered regardless of interval since the previous Td dose.)
- Children ages 7-10 years who are not fully immunized against pertussis (i.e., did not complete a series of pertussis-containing vaccine before their seventh birthday) should receive a one-time dose of Tdap.

### Meningococcal (MCV4)

In October 2010, ACIP voted to recommend that providers administer initial doses of meningococcal (MCV4) to all adolescents at age 11-12 years with a booster dose at age 16 years.

### Rotavirus Vaccine Information Statement (VIS)

The VIS for rotavirus vaccine was updated on December 6, 2010. The update includes information about possible increased risk of intussusceptions amount vaccine recipients and revised working on porcine circovirus, along with several minor changes.

The updated VIS refers to a potential adverse event not mentioned in the previous edition. Begin using the updated edition immediately. Your office should discard all previous versions of the rotavirus VIS in your office.

### Kinrix

Kinrix (DTaP/IPV) is now available to order in both syringes and vials.

## EDUCATION

Shot Smarts speakers for 2011 will include Ari Brown, MD, FAAP and Michael Smith, MD, FAAP. Registration will begin in February 2011. Save the date!

2011		
Tuesday <b>April 26</b> <i>Idaho Falls</i>	Wednesday <b>April 27</b> <i>Boise</i>	Friday Thurs? <b>April 29<sup>th</sup></b> <i>Coeur d'Alene</i>

January 7, 2011

## Updated Recommendations for Use of Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis (Tdap) Vaccine from the Advisory Committee on Immunization Practices, 2010

Despite sustained high coverage for childhood pertussis vaccination, pertussis remains poorly controlled in the United States. A total of 16,858 pertussis cases and 12 infant deaths were reported in 2009 (1; CDC, unpublished data, 2009). Although 2005 recommendations by the Advisory Committee on Immunization Practices (ACIP) called for vaccination with tetanus toxoid, reduced diphtheria toxoid and acellular pertussis (Tdap) for adolescents and adults to improve immunity against pertussis, Tdap coverage is 56% among adolescents and <6% among adults (2,3). In October 2010, ACIP recommended expanded use of Tdap. This report provides the updated recommendations, summarizes the safety and effectiveness data considered by ACIP, and provides guidance for implementing the recommendations.

ACIP recommends a single Tdap dose for persons aged 11 through 18 years who have completed the recommended childhood diphtheria and tetanus toxoids and pertussis/diphtheria and tetanus toxoids and acellular pertussis (DTP/DTaP) vaccination series and for adults aged 19 through 64 years (4,5). Two Tdap vaccines are available in the United States. Boostrix (GlaxoSmithKline Biologicals, Rixensart, Belgium) is licensed for use in persons aged 10 through 64 years, and Adacel (Sanofi Pasteur, Toronto, Canada) is licensed for use in persons aged 11 through 64 years. Both Tdap products are licensed for use at an interval of at least 5 years between the tetanus and diphtheria toxoids (Td) and Tdap dose. On October 27, 2010, ACIP approved the following additional recommendations: 1) use of Tdap regardless of interval since the last tetanus- or diphtheria-toxoid containing vaccine, 2) use of Tdap in certain adults aged 65 years and older, and 3) use of Tdap in undervaccinated children aged 7 through 10 years.

The Pertussis Vaccines Working Group of ACIP reviewed published and unpublished Tdap immunogenicity and safety data from clinical trials and observational studies on use of Tdap. The Working Group also considered the epidemiology of pertussis, provider and program feedback, and data on the barriers to receipt of Tdap. The Working Group then presented policy options for consideration to the full ACIP. These additional recommendations are intended to remove identified barriers and programmatic gaps that contribute to suboptimal vaccination coverage. An important barrier that limited vaccination of persons with Tdap was unknown history of Td booster. Programmatic gaps included lack of a licensed Tdap vaccine for children aged 7 through 10 years and adults aged 65 years and older. In light of the recent increase of pertussis in

the United States, the additional recommendations are made to facilitate use of Tdap to reduce the burden of disease and risk for transmission to infants (Box).

### Timing of Tdap Following Td

**Safety.** When Tdap was licensed in 2005, the safety of administering a booster dose of Tdap at intervals <5 years after Td or pediatric DTP/DTaP had not been studied in adults. However, evaluations in children and adolescents suggested that the safety of intervals as short as 18 months was acceptable (6). Rates of local and systemic reactions after Tdap vaccination in adults were lower than or comparable to rates in adolescents during U.S. prelicensure trials; therefore, the safety of using intervals as short as 2 years between Td and Tdap in adults was inferred (4).

Additional data on the safety of administering Tdap <5 years after Td are now available. Two studies were conducted with 387 persons aged 18 through 76 years who received a Tdap or combined Tdap-inactivated polio vaccine (Tdap-IPV) vaccination either within 21 days, or <2 years following a previous Td-containing vaccine (7,8). Tdap-IPV vaccine is not licensed in the United States. In both studies, immediate or short-term adverse events (e.g., 30 minutes to 2 weeks) after receipt of Tdap or Tdap-IPV were examined. The majority of these events were limited to local reactions, including pain (68%–83%), erythema (20%–25%), and swelling (19%–38%) (7,8). Serious adverse events related to the receipt of Tdap or Tdap-IPV shortly after Td or Td-IPV vaccinations did not occur. However, the number of subjects in these studies was small and does not exclude the potential for rare, but serious, adverse events.

**Guidance for use.** ACIP recommends that pertussis vaccination, when indicated, should not be delayed and that Tdap should be administered regardless of interval since the last tetanus or diphtheria toxoid-containing vaccine. ACIP concluded that while longer intervals between Td and Tdap vaccination could decrease the occurrence of local reactions, the benefits of protection against pertussis outweigh the potential risk for adverse events.

### Adults Aged 65 Years and Older

Unpublished data from trials for Adacel (N = 1,170) and Boostrix (N = 1,104) on the safety and immunogenicity of Tdap in adults aged 65 years and older who received vaccine were provided to ACIP by Sanofi Pasteur and GlaxoSmithKline.

**BOX. Summary of updated recommendations for use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis (Tdap) vaccine — Advisory Committee on Immunization Practices, 2010**

**General Recommendations**

For routine use, adolescents aged 11 through 18 years who have completed the recommended childhood diphtheria and tetanus toxoids and pertussis/diphtheria and tetanus toxoids and acellular pertussis (DTP/DTaP) vaccination series and adults aged 19 through 64 years should receive a single dose of Tdap. Adolescents should preferably receive Tdap at the 11 to 12 year-old preventive health-care visit.

**Timing of Tdap**

- Can be administered regardless of interval since the last tetanus- or diphtheria-toxoid containing vaccine.

**Adults Aged 65 years and Older**

- Those who have or anticipate having close contact with an infant aged less than 12 months should receive a single dose of Tdap.
- Other adults ages 65 years and older may be given a single dose of Tdap.

**Children Aged 7 Through 10 Years**

- Those not fully vaccinated against pertussis\* and for whom no contraindication to pertussis vaccine exists should receive a single dose of Tdap.
- Those never vaccinated against tetanus, diphtheria, or pertussis or who have unknown vaccination status should receive a series of three vaccinations containing tetanus and diphtheria toxoids. The first of these three doses should be Tdap.

\* Fully vaccinated is defined as 5 doses of DTaP or 4 doses of DTaP if the fourth dose was administered on or after the fourth birthday.

**Safety.** For both Tdap vaccines, the frequency and severity of adverse events in persons aged 65 years and older were comparable to those in persons aged less than 65 years. No increase in local or generalized reactions in Tdap recipients was observed, compared with persons who received Td. No serious adverse events were considered related to vaccination.

ACIP reviewed data on vaccine-related adverse events from the Vaccine Adverse Event Reporting System (VAERS). VAERS is a passive surveillance system jointly administered by CDC and the Food and Drug Administration that accepts reports from vaccine manufacturers, health-care providers, and vaccine recipients for vaccine safety. VAERS can be prone to overreporting or underreporting and inconsistency in the quality and completeness of reports. During September 2005–September 2010, a total of 243 VAERS reports were received regarding

adults aged 65 years and older administered Tdap, out of 10,981 total VAERS reports on Tdap among recipients of all ages (CDC, unpublished data, 2010). Of the 243 reports regarding adults aged 65 years and older, 232 (96%) were nonserious. The most frequent adverse events after Tdap were local reactions, comprising 37% of all events. Eleven serious events were reported, including two deaths among persons with multiple underlying conditions. Although VAERS cannot assess causality, after review of data, it is unlikely the deaths were related to vaccine receipt. Postmarketing VAERS data also suggest that Tdap vaccine safety in adults aged 65 years and older is comparable to that of Td vaccine. Because Tdap is not licensed for use in this age group, comparisons between these reports and other reports need to be interpreted with caution.

**Immunogenicity.** Both Tdap vaccines showed that immune responses to diphtheria and tetanus toxoids were noninferior to responses produced by Td. In both Tdap vaccines, immune responses were observed to the pertussis antigens. For Boostrix, immune responses to pertussis antigens (pertussis toxin [PT], filamentous hemagglutinin [FHA], and pertactin [PRN]) were noninferior to those observed following a 3-dose primary pertussis vaccination series, as defined by the Vaccines and Related Biological Products Advisory Committee (VRBPAC) (9). For Adacel, immune responses to all pertussis antigens (PT, FHA, PRN, and fimbriae [FIM]) occurred (4.1 to 15.1-fold geometric mean concentration increases). ACIP concluded that both Tdap vaccines would provide pertussis protection in persons aged 65 years and older.

**Guidance for use.** ACIP recommends that adults aged 65 years and older (e.g., grandparents, child-care providers, and health-care practitioners) who have or who anticipate having close contact with an infant less than 12 months of age and who previously have not received Tdap should receive a single dose of Tdap to protect against pertussis and reduce the likelihood of transmission. For other adults aged 65 years and older, a single dose of Tdap vaccine may be given instead of Td vaccine, in persons who have not previously received Tdap. Tdap can be administered regardless of interval since the last tetanus- or diphtheria-toxoid containing vaccine. After receipt of Tdap, persons should continue to receive Td for routine booster immunization against tetanus and diphtheria, according to previously published guidelines (4). Either Tdap vaccine product may be used. Further recommendations on the use of both Tdap vaccines in adults aged 65 years and older will be forthcoming should one or more Tdap products be licensed for use in this age group.

**Undervaccinated Children Aged 7 through 10 Years**

No data have been published regarding the safety or immunogenicity of Tdap in children aged 7 through 10 years who

have never received pertussis-containing vaccines. One published study assessed the use of Tdap-IPV vaccine as the fifth dose of acellular pertussis vaccine in children aged 4 through 8 years (10). A subanalysis of the study data comparing safety and immunogenicity results among children aged 4 through 6 years (n = 703) and 7 through 8 years (n = 118) was provided to ACIP by GlaxoSmithKline. Three additional published studies have assessed use of Tdap in lieu of the fifth DTaP dose in children aged 4 through 6 years who had received 4 previous doses of DTaP (11–13). These three studies enrolled 609 subjects who received either Tdap or Tdap-IPV in lieu of the fifth DTaP dose.

**Safety.** In each study, no increase in risk of severe local reactions or systemic adverse events was observed. The most commonly reported adverse events within 15 days after receipt of Tdap were pain (40%–56%), erythema (34%–53%), and swelling (24%–45%). Fewer local reactions were observed or reported among Tdap or Tdap-IPV recipients compared with those who received DTaP or DTaP-IPV, but the differences were not statistically significant. No differences were noted when children aged 4 through 6 and 7 through 8 years were compared with respect to solicited or unsolicited adverse reactions following vaccination with Tdap-IPV. ACIP concluded that the overall safety of Tdap and frequency of local reactions in undervaccinated children likely would be similar to those observed in children who received 4 doses of DTaP.

**Immunogenicity.** Immune response to Tdap-IPV was comparable between children aged 4 through 6 and those aged 7 through 8 years, according to the GlaxoSmithKline subanalysis. In both age groups, at least 99.9% of Tdap-IPV recipients had seroprotective levels of antibodies for diphtheria and tetanus, and responses to pertussis antigens were comparable to those observed following a 3-dose primary pertussis vaccination series as defined by VRBPAC.

In children aged 4 through 6 years, the immune response following receipt of Tdap (Boostrix or Adacel) was comparable to DTaP or DTaP-IPV (11, 12). All subjects had seroprotective antibody levels for diphtheria and tetanus 4 to 6 weeks after vaccination. For pertussis antigens, one study observed no significant difference between Boostrix and DTaP recipients in response rates to any of three pertussis antigens in the vaccines, with similar effects on cell-mediated immune responses 3.5 years after vaccination (12). Another study demonstrated a fourfold increase in four pertussis antibodies in the majority of children receiving Adacel or DTaP-IPV (11).

**Guidance for use.** ACIP recommends that children aged 7 through 10 years who are not fully vaccinated\* against pertussis and for whom no contraindication to pertussis vaccine exists should receive a single dose of Tdap to provide protection

against pertussis. If additional doses of tetanus and diphtheria toxoid-containing vaccines are needed, then children aged 7 through 10 years should be vaccinated according to catch-up guidance, with Tdap preferred as the first dose (5). Tdap is recommended in this age group because of its reduced antigen content compared with DTaP, resulting in reduced reactogenicity. Currently, Tdap is recommended only for a single dose across all age groups. Further guidance will be forthcoming on timing of revaccination in persons who have received Tdap previously.

References

1. CDC. Final 2009 reports of nationally notifiable diseases. MMWR 2010;59:1025,1027–39.
2. CDC. National, state, and local area vaccination coverage among adolescents aged 13–17 years—United States, 2009. MMWR 2010;59:1018–23.
3. CDC. Tetanus and pertussis vaccination coverage among adults aged ≥18 years—United States, 1999 and 2008. MMWR 2010;59:1302–6.
4. CDC. 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 2006;55(No. RR-17).
5. CDC. Preventing tetanus, diphtheria, and pertussis among adolescents: 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 2006;55(No. RR-17).

\*G/mz/wbdj obuf ejt'ef g of l't 6leptf t'pgE UbQps5'leptf t'pgE UbQjgu f'gvsu ! eptf lx tt'ben jojtuf s'el'pols'bgfslu f'gvsu !cjsu ebtz

## Updated Recommendations for Use of Meningococcal Conjugate Vaccines — Advisory Committee on Immunization Practices (ACIP), 2010

On October 27, 2010, the Advisory Committee on Immunization Practices (ACIP) approved updated recommendations for the use of quadrivalent (serogroups A, C, Y, and W-135) meningococcal conjugate vaccines (Menveo, Novartis; and Menactra, Sanofi Pasteur) in adolescents and persons at high risk for meningococcal disease. These recommendations supplement the previous ACIP recommendations for meningococcal vaccination (1,2). The Meningococcal Vaccines Work Group of ACIP reviewed available data on immunogenicity in high-risk groups, bactericidal antibody persistence after immunization, current epidemiology, vaccine effectiveness (VE), and cost-effectiveness of different strategies for vaccination of adolescents. The Work Group then presented policy options for consideration by the full ACIP. This report summarizes two new recommendations approved by ACIP: 1) routine vaccination of adolescents, preferably at age 11 or 12 years, with a booster dose at age 16 years and 2) a 2-dose primary series administered 2 months apart for persons aged 2 through 54 years with persistent complement component deficiency (e.g., C5–C9, properidin, factor H, or factor D) and functional or anatomic asplenia, and for adolescents with human immunodeficiency virus (HIV) infection. CDC guidance for vaccine providers regarding these updated recommendations also is included.

### Rationale for Adding a Booster Dose to the Adolescent Schedule

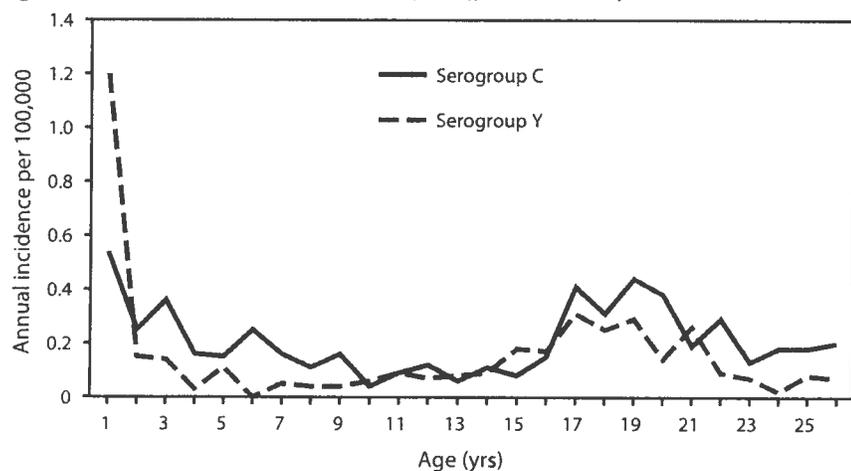
The goal of the 2005 ACIP meningococcal immunization recommendations was to protect persons aged 16 through 21 years, when meningococcal disease rates peak. At that time, vaccination was recommended at age 11 or 12 years rather than at age 14 or 15 years because 1) more persons have preventive-care visits at age 11 or 12 years, 2) adding this vaccine at the 11 or 12 year-old visit would strengthen the pre-adolescent vaccination platform, and 3) the vaccine was expected to protect adolescents through the entire period of increased risk. Meningococcal conjugate vaccines were licensed in 2005 based on immunogenicity (because a surrogate of protection had been defined) and safety data. After licensure, additional data on bactericidal antibody persistence, trends in meningococcal disease epidemiology in the United States, and VE have indicated many adolescents might not be protected for more than 5 years. Therefore, persons immunized at age 11 or 12 years might have decreased protective immunity by ages 16 through 21 years, when their risk for disease is greatest.

Meningococcal disease incidence has decreased since 2000, and incidence for serogroups C and Y, which represent the majority of cases of vaccine-preventable meningococcal disease, are at historic lows. However, the peak in disease among persons aged 18 years (Figure) has persisted, even after routine vaccination was recommended in 2005. In the 2009 National Immunization Survey-Teen, 53.6% of adolescents aged 13 through 17 years had received a dose of meningococcal vaccine (3). From 2000–2004 to 2005–2009, the estimated annual number of cases of serogroups C and Y meningococcal disease decreased 74% among persons aged 11 through 14 years but only 27% among persons aged 15 through 18 years. Cases of meningococcal disease caused by serogroups C and Y among persons who were vaccinated with meningococcal conjugate vaccine have been reported. An early VE analysis that modeled expected cases of disease in vaccinated persons estimated a VE of 80%–85% up to 3 years after vaccination (4). In 2010, CDC received 12 reports of serogroup C or Y meningococcal disease among persons who had received a meningococcal conjugate vaccine. The mean age of these persons was 18.2 years (range: 16 through 22 years). The mean time since vaccination was 3.25 years (range: 1.5–4.6 years). Five of these 12 persons had an underlying condition that might have increased their risk for meningococcal disease (CDC, unpublished data, 2010).

A case-control study evaluating the VE of meningococcal conjugate vaccine was begun in January 2006 (ACIP meeting, October 2010). Because Menactra was the only licensed vaccine until February 2010, the preliminary results are estimates for Menactra only; no data are available regarding the effectiveness of Menveo. As of October 1, 2010, 108 case-patients and 158 controls were enrolled in the effectiveness study. The overall VE estimate in persons vaccinated 0–5 years earlier was 78.0% (95% confidence interval [CI] = 29%–93%). VE for persons vaccinated less than 1 year earlier was 95% (CI = 10%–100%), VE for persons vaccinated 1 year earlier was 91% (CI = 10%–101%), and VE for persons vaccinated 2 through 5 years earlier was 58% (CI = -72%–89%). Although the CIs around the point estimates are wide, the ACIP Work Group concluded that VE wanes.

The ACIP Work Group also concluded that serologic data are consistent with waning immunity. Three characteristics of conjugate vaccines are believed to be important for establishing long-term protection against a bacterial pathogen: memory response, herd immunity, and circulating antibody (5). Recent data from the United Kingdom indicate that

**FIGURE. Annual incidence of meningococcal disease (serogroup C and serogroup Y), by age — Active Bacterial Core surveillance (ABCs), United States, 1999–2008**



although vaccination primes the immune system, the memory response after exposure might not be rapid enough to protect against meningococcal disease. After initial priming with a serogroup C meningococcal conjugate vaccine (MenC), a memory response after a booster dose was not measurable until 5–7 days later (6). The incubation period for meningococcal disease usually is less than 3 days. Although herd immunity has been an important component associated with long-term protection with MenC vaccine in the United Kingdom and other countries, immunization coverage has increased slowly in the United States, and to date no evidence of herd immunity has been observed (ACIP meeting, October 2010). Therefore, the Work Group concluded that circulating bactericidal antibody is critical for protection against meningococcal disease. The Work Group took into consideration the proportion of subjects with bactericidal antibody levels above thresholds considered protective, depending on the assay used, evaluating antibody persistence in five studies (Table 1). Although each study tested a small number of vaccine recipients, the Work Group concluded that the studies found sufficient evidence to indicate that approximately 50% of persons vaccinated 5 years earlier had bactericidal antibody levels protective against meningococcal disease. Therefore, more than 50% of persons immunized at age 11 or 12 years might not be protected when they are at higher risk at ages 16 through 21 years.

Two studies evaluated the response after a booster dose of Menactra at 3 and 5 years after the primary vaccination (7; ACIP meeting, June 2009). At both 3 and 5 years after the first dose, the booster dose elicited substantially higher geometric mean antibody titers (GMT), compared with the titers elicited by a primary dose. Using a complement serum bactericidal activity (SBA) assay and baby rabbit complement (brSBA) as

a measure of immune response, a booster dose administered 5 years after the first dose elicited a GMT for serogroup C of 23,613, compared with 9,045 among subjects administered a primary dose (ACIP meeting, October 2010). As expected with conjugate vaccines, the first dose primes the immune system to have a strong response to the booster dose. Local and systemic reactions to the booster were comparable to those in persons receiving a first dose. The duration of protective antibody after the booster dose is not known but is expected to last through age 21 years for booster doses administered at ages 16 through 18 years.

#### Optimizing meningococcal vaccination.

Despite the current low burden of meningococcal disease, the ACIP Work Group agreed that because of mounting evidence of waning immunity by 5 years postvaccination, vaccinating adolescents with a single dose at age 11 or 12 years is not the best strategy for protection through age 21 years. The Work Group considered two other options for optimizing protection: moving the dose from age 11 or 12 years to age 14 or 15 years or vaccinating at age 11 or 12 years and providing a booster dose at age 16 years. Although a single dose at age 14 or 15 years likely would protect most adolescents through the higher risk period at ages 16 through 21 years, the opportunities to administer vaccine at age 14 or 15 years might be more limited. Data indicate that as adolescents grow older, they are less likely to visit a health-care provider for preventive care (8). Adding a booster dose to the recommended schedule would provide more opportunities to increase vaccination coverage, while persons aged 11 through 13 years would continue to be protected. An economic analysis comparing the three adolescent vaccination strategies concluded that administering a booster dose has a cost per quality-adjusted life year similar to that of a single dose at age 11 years or age 15 years but is estimated to prevent twice the number of cases and deaths (CDC, unpublished data, 2010).

#### Rationale for 2-Dose Primary Series for Persons with a Reduced Response to a Single Dose

Evidence supporting the need for a 2-dose primary meningococcal vaccine series for the small number of persons at increased risk for meningococcal disease was reviewed. Data indicated that SBA could be increased with 2 doses, 2 months apart. For persons who are asplenic or have HIV infection, a 2-dose primary series improves the initial immune response to vaccination. A 2-dose primary series in patients with persistent complement component deficiency will help achieve the high

**TABLE 1. Summary of serogroup C bactericidal antibody persistence as determined by serum bactericidal activity (SBA) 2–5 years after vaccination with Menveo and/or Menactra**

Age group (yrs) at vaccination	Years postvaccination	Serogroup C SBA	Vaccine	No. of vaccine recipients in study	% of recipients with protective antibody levels
11 through 18*	2	% hSBA $\geq$ 1:8	Menveo	273	62
			Menactra	185	58
11 through 18†	3	% hSBA $\geq$ 1:4	Menactra	52	35
			MPSV4	48	35
11 through 18 <sup>§</sup>	3	% brSBA $\geq$ 1:128	Menactra	71	75
			MPSV4	72	60
2 through 10 <sup>§</sup>	5	% brSBA $\geq$ 1:128	Menactra	108	55
			MPSV4	207	42
11 through 18 <sup>§</sup>	5	% brSBA $\geq$ 1:128	Menactra	16	56
			MPSV4	10	60

**Abbreviations:** hSBA = SBA using human complement; brSBA = SBA using baby rabbit complement; MPSV4 = quadrivalent meningococcal polysaccharide vaccine.

\* Source: Gill C, Baxter R, Anemona A, Ciavarró G, Dull P. Persistence of immune responses after a single dose of Novartis meningococcal serogroup A, C, W-135 and Y CRM-197 conjugate vaccine (Menveo) or Menactra among healthy adolescents. *Human Vaccines* 2010;6:881–7.

† Source: Vu DM, Welsh JA, Zuno-Mitchell P, Dela Cruz JV, Granoff DM. Antibody persistence 3 years after immunization of adolescents with quadrivalent meningococcal conjugate vaccine. *J Infect Dis* 2006;193:821–8.

§ Source: Proceedings of the Advisory Committee on Immunization Practices (ACIP) meeting, June 2009.

levels of SBA activity needed to confer protection in the absence of effective opsonization.

The complement pathway is important to preventing meningococcal disease, and *Neisseria meningitidis* is the primary bacterial pathogen affecting persons with late component complement (LCCD) or properdin deficiency. Although persons with LCCD are able to mount an overall antibody response equal to or greater than complement-sufficient persons after vaccination with quadrivalent meningococcal polysaccharide vaccine (MPSV4), antibody titers wane more rapidly in persons with complement component deficiency, and higher antibody levels are needed for other clearance mechanisms such as opsonophagocytosis to function (9,10). Asplenic persons are at increased risk for invasive infection caused by many encapsulated bacteria, including *N. meningitidis*. Moreover, the mortality rate is 40%–70% among these persons when they become infected with *N. meningitidis*. Asplenic persons achieve significantly lower geometric mean SBA titers than healthy persons after vaccination with meningococcal C conjugate vaccine, with 20% not achieving brSBA titers  $\geq$ 1:8. This proportion was reduced to 7% when a second dose of vaccine was administered to nonresponders 2 months later, suggesting a booster might be effective in achieving higher circulating antibody levels and improving immunologic memory (11).

Patients with HIV infection likely are at increased risk for meningococcal disease, although not to the extent that they are at risk for invasive *Streptococcus pneumoniae* infection. The

risk to persons with HIV infection also is not as great as to persons with complement component deficiency or asplenia. One study has investigated the response rates to a single dose of meningococcal conjugate vaccine among HIV-infected adolescents. Response to vaccination measured by brSBA titers  $\geq$ 1:128 was 86%, 55%, 73%, and 72% for serogroups A, C, Y, and W-135, respectively. Response rates were significantly lower among patients with a CD4+ T-lymphocyte percentage of <15% or viral loads >10,000 copies/mL (12).

The immunogenicity and safety of a 2-dose primary series has not been studied in older children and adults. However, Menactra and Menveo have been studied following administration as a 2-dose primary series in infants and young children. Infants vaccinated with a 2-dose primary series of Menactra at ages 9 months and 12 through 15 months achieved high antibody titers after the second dose. Administration of 2 doses of Menveo 2 months apart to children aged 2 through 5 years was associated with a similar rate of adverse events as a single dose (13).

### Recommendation for Routine Vaccination of Persons Aged 11 Through 18 Years

ACIP recommends routine vaccination of persons with quadrivalent meningococcal conjugate vaccine at age 11 or 12 years, with a booster dose at age 16 years. After a booster dose of meningococcal conjugate vaccine, antibody titers are higher than after the first dose and are expected to protect adolescents through the period of increased risk through age 21 years. For adolescents who receive the first dose at age 13 through 15 years, a one-time booster dose should be administered, preferably at age 16 through 18 years, before the peak in increased risk. Persons who receive their first dose of meningococcal conjugate vaccine at or after age 16 years do not need a booster dose. Routine vaccination of healthy persons who are not at increased risk for exposure to *N. meningitidis* is not recommended after age 21 years.

### Recommendation for Persons Aged 2 Through 54 Years with Reduced Immune Response

Data indicate that the immune response to a single dose of meningococcal conjugate vaccine is not sufficient in persons with certain medical conditions. Persons with persistent

complement component deficiencies (e.g., C5–C9, properdin, factor H, or factor D) or asplenia should receive a 2-dose primary series administered 2 months apart and then receive a booster dose every 5 years. Adolescents aged 11 through 18 years with HIV infection should be routinely vaccinated with a 2-dose primary series. Other persons with HIV who are vaccinated should receive a 2-dose primary series administered 2 months apart. All other persons at increased risk for meningococcal disease (e.g., microbiologists or travelers to an epidemic or highly endemic country) should receive a single dose.

### CDC Guidance for Transition to an Adolescent Booster Dose

Some schools, colleges, and universities have policies requiring vaccination against meningococcal disease as a condition of enrollment. For ease of program implementation, persons aged 21 years or younger should have documentation of receipt of a dose of meningococcal conjugate vaccine not more than 5 years before enrollment. If the primary dose was administered before the 16th birthday, a booster dose should be administered before enrollment in college. The booster dose can be administered anytime after the 16th birthday to ensure that the booster is provided. The minimum interval between doses of meningococcal conjugate vaccine is 8 weeks.

No data are available on the interchangeability of vaccine products. Whenever feasible, the same brand of vaccine should be used for all doses of the vaccination series. If vaccination providers do not know or have available the type of vaccine product previously administered, any product should be used

to continue or complete the series. Persons with complement component deficiency, asplenia, or HIV infection who have previously received a single dose of meningococcal conjugate vaccine should receive their booster dose at the earliest opportunity.

These updated meningococcal conjugate vaccine recommendations from ACIP have been summarized (Table 2). Additionally, a meningococcal conjugate vaccine information statement is available at <http://www.cdc.gov/vaccines/pubs/vis/default.htm>, and details regarding the routine meningococcal conjugate vaccination schedule are available at <http://www.cdc.gov/vaccines/recs/schedules/default.htm#child>. Adverse events after receipt of any vaccine should be reported to the Vaccine Adverse Event Reporting System at <http://vaers.hhs.gov>.

### References

1. CDC. Prevention and control of meningococcal disease: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 2005;54(No. RR-7).
2. CDC. Updated recommendation from the Advisory Committee on Immunization Practices (ACIP) for revaccination of persons at prolonged increased risk for meningococcal disease. *MMWR* 2009;58:1042–3.
3. CDC. National, state, and local area vaccination coverage among adolescents aged 13–17 years—United States, 2009. *MMWR* 2010; 59:1018–23.
4. MacNeil JR, Cohn AC, Zell ER, et al. Early estimate of the effectiveness of quadrivalent meningococcal conjugate vaccine. *Pediatr Infect Dis J* 2011. Epub January 4, 2011.
5. Pollard A, Perrett K, Beverley P. Maintaining protection against invasive bacteria with protein–polysaccharide conjugate vaccines. *Nat Rev Immunol* 2009;9:213–20.

**TABLE 2. Summary of meningococcal conjugate vaccine recommendations, by risk group — Advisory Committee on Immunization Practices (ACIP), 2010**

Risk group	Primary series	Booster dose
Persons aged 11 through 18 years	1 dose, preferably at age 11 or 12 years	At age 16 years if primary dose at age 11 or 12 years At age 16 through 18 years if primary dose at age 13 through 15 years No booster needed if primary dose on or after age 16 years
HIV-infected persons in this age group	2 doses, 2 months apart	At age 16 years if primary dose at age 11 or 12 years At age 16 through 18 years if primary dose at age 13 through 15 years No booster needed if primary dose on or after age 16 years
Persons aged 2 through 55 years with persistent complement component deficiency* or functional or anatomical asplenia	2 doses, 2 months apart	Every 5 years At the earliest opportunity if a 1-dose primary series administered, then every 5 years
Persons aged 2 through 55 years with prolonged increased risk for exposure†	1 dose	Persons aged 2 through 6 years: after 3 years Persons aged 7 years or older: after 5 years‡

Abbreviation: HIV = human immunodeficiency virus.

\* Such as C5–C9, properdin, or factor D.

† Microbiologists routinely working with *Neisseria meningitidis* and travelers to or residents of countries where meningococcal disease is hyperendemic or epidemic.

‡ If the person remains at increased risk.