


Centers for Disease Control and Prevention
National Center for Immunization and Respiratory Diseases



Meningococcal Disease and Meningococcal Vaccine

Chapter 14

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Neisseria meningitidis

- Aerobic gram-negative bacteria
- At least 13 serogroups based polysaccharide capsule
- Most invasive disease caused by serogroups A, B, C, Y, and W
- Relative importance of serogroups depends on geographic location and other factors (e.g., age)

Meningococcal Disease Pathogenesis

- Organism colonizes nasopharynx
- In some persons organism enters the bloodstream and causes infection at distant site
- Antecedent URI may be a contributing factor

Neisseria meningitidis

Clinical Features

- Incubation period 3-4 days (range 2-10 days)

- Abrupt onset of fever, meningeal symptoms, hypotension, and rash

- Fatality rate 10%-15%, up to 40% in meningococemia

Meningococcal Meningitis

- Most common presentation of invasive disease

- Results from hematogenous dissemination

- Clinical findings
 - fever
 - headache
 - stiff neck

Meningococemia

- Meningococemia
- Bloodstream infection
- May occur with or without meningitis
- Clinical findings
 - fever
 - petechial or purpuric rash
 - hypotension
 - shock
 - acute adrenal hemorrhage
 - multi-organ failure

Meningococcal Disease



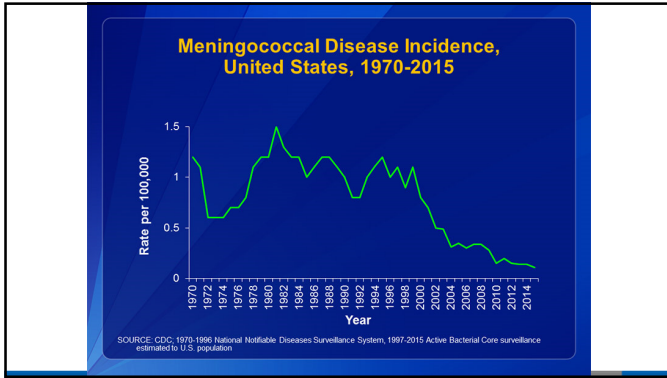
Neisseria meningitidis Risk Factors for Invasive Disease

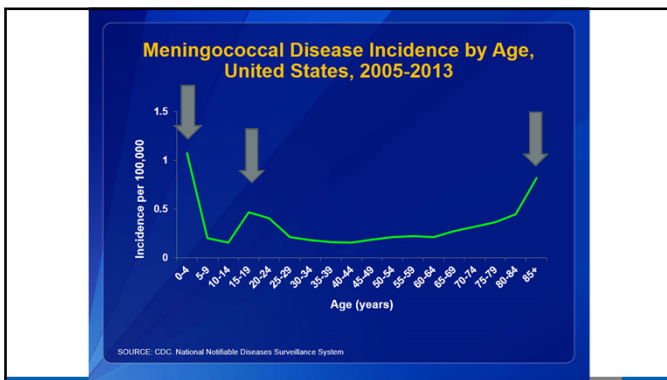
- Host Factors
 - Deficiencies in the terminal common complement pathways
 - Functional or anatomic asplenia
 - Chronic underlying disease
 - Certain genetic factors (altered genes: mannose-binding lectin and tumor necrosis factor)
- Environmental factors
 - Household crowding
 - Active and passive smoking
 - Antecedent viral infection
- Occupational (microbiologists)

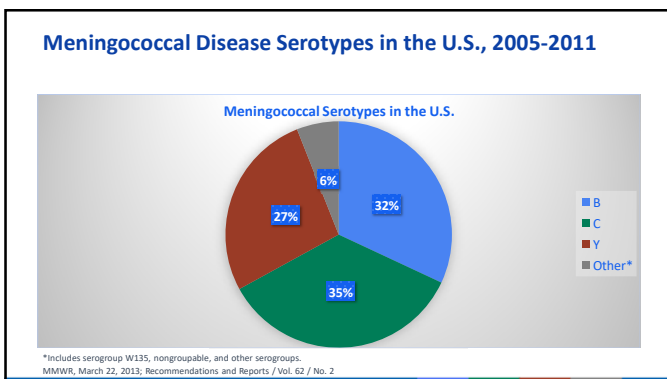
Neisseria meningitidis Risk Factors for Invasive Disease

- College Students
 - Studies in 1990s – overall incidence similar to or lower than their counterparts in general population*
 - Case control study of 50 cases and other studies in the 1990s#
 - First-year college students living in residence halls at higher risk

*JAMA 1999;281:1906-10
#Abstracts of the 39th Meeting of the IDSA, Philadelphia, PA: IDSA; 1999:276
Epidemiol Infect 1999;122:351-7. Clin Infect Dis 1999;29:215-6.







Meningococcal Outbreaks in the United States

- Outbreaks account for 2%-3% of reported cases
- Most recent outbreaks caused by serogroup C and B

MMWR March 22, 2013 Recommendations and Reports / Vol. 62 / No. 2, at <http://www.cdc.gov/mmwr/pdf/rr/rr6202.pdf>, and <http://www.cdc.gov/meningococcal/outbreaks/index.html>

Meningococcal Vaccines

Meningococcal Conjugate Vaccines

- Meningococcal polysaccharide conjugated to protein carrier
- Elicit both T- and B-cell immunity (T-cell dependent immunity)
- 3 brands currently licensed in the United States
 - Menactra (Sanofi Pasteur)
 - Menveo (Novartis)

Menactra MenACWY Vaccine

- Licensed by FDA in January 2005
- Quadrivalent polysaccharide vaccine conjugated to diphtheria toxoid (MenACWY-D)
- Approved for persons 9 months through 55 years of age
- Intramuscular injection
- Single dose vials

Menveo MenACWY Vaccine

- Licensed by FDA in February 2010
- Lyophilized serogroup A vaccine reconstituted with liquid containing serogroups C, Y, and W135 (MenACWY-CRM)
- May be used for any person 2 months through 55 years of age for whom MCV4 is indicated, including revaccination
- Intermuscular injection
- Single dose vials

Interchangeability of Conjugate Vaccine Brands

- Limited data suggest that different conjugate vaccine products can be used interchangeably.
- 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

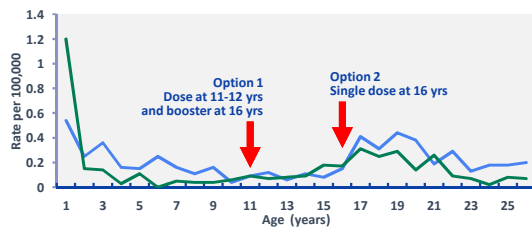
MMWR 2013;62(NR-2):10-11

Meningococcal Conjugate (MenACWY) Revaccination

- In its 2005 recommendations for MenACWY, ACIP made no recommendation about revaccination pending the availability of additional data
- Serologic data are now available from the manufacturer that show significant decline in antibody 3-5 years after vaccination, although few breakthrough cases have been reported

MMWR 2009;58(No. 37):1042-3

Rates of Meningococcal Disease (C and Y) by Age, 1999-2008



Active Bacterial Core surveillance (ABCs), 1998-2008

MenACWY Adolescent Vaccination Recommendations

- A booster dose is not recommended for healthy persons if the first dose is administered at or after 16 years of age
- A booster dose is not recommended for healthy persons after 21 years of age who are not at increased risk of exposure
 - A booster dose is not recommended for healthy persons 22 years of age and older even if the first dose was administered at 11-15 years of age

MenACWY Vaccine Recommendations for Persons at Increased Risk for Meningococcal Disease

High-risk Groups: Functional or Anatomic Asplenia or HIV Infection*

- Younger than 19 months
 - Infant series at 2, 4, 6, and 12-15 months with MenACWY-CRM
- 19-23 months who have not received a complete series
 - 2-dose primary series of MenACWY-CRM 12 weeks**
- 24 months or older who have not received a complete series
 - 2-dose primary series of either MenACWY 8-12 weeks apart

*Including sickle-cell disease
** Doses valid if 8 weeks apart

High-risk Groups: Persistent Complement Component Deficiency*

- Children 2-18 months
 - Infant series at 2, 4, 6, and 12-15 months with MenACWY-CRM; *QR*
 - 2-dose primary series of MenACWY-D starting at 9 months at least 12 weeks apart**
- 19-23 months without complete series of either MenACWY
 - 2-dose primary series of either MenACWY at least 12 weeks apart**
- 24 months or older who have not received a complete series of either MenACWY
 - 2-dose primary series of either MenACWY at least 12 weeks apart**

* Including persons taking Soliris (eculizumab)
** Doses valid if 8 weeks apart

Meningococcal Vaccine Recommendations for Persons 2 through 55 years at High Risk

- Persons who:
 - Are first-year college students aged ≤21 years living in residential housing
 - Travel to, or are residents of, countries where meningococcal disease is hyperendemic or epidemic
 - Are microbiologists routinely exposed to isolates of *Neisseria meningitidis*
 - Military recruits

- Administer: 1 dose of MenACWY

Meningococcal Vaccine Use in Outbreaks

- MenACWY recommended for use in control of outbreaks caused by A, C, W, and Y

- Outbreak definition:
 - at least 3 confirmed or probable primary cases of the same serogroup
 - period of 3 months or less
 - primary attack rate of more than 10 cases per 100,000 population

Meningococcal Vaccine Booster Doses

- Children who receive primary immunization and remain at increased risk should receive booster doses
 - if primary immunization complete by 7 years of age first booster should be 3 years after primary immunization and every 5 years thereafter if at continued risk

- If primary immunization complete on or after 7 years of age
 - first booster should be 5 years after primary immunization and every 5 years thereafter if at continued risk

MenACWY Revaccination Recommendations

- Other high-risk persons recommended for boosters:
 - Microbiologists with prolonged exposure to *Neisseria meningitidis*
 - Frequent travelers to or persons living in areas with high rates of meningococcal disease (see next slide)

- Revaccinate every **5 years** as long as the person remains at increased risk
 - MenACWY for persons 2 through 55 years of age
 - MenACWY for persons 56 years and older also (off-label recommendation) if repeated vaccination anticipated

International Travelers and Revaccination*

- International travelers should receive a booster dose of MenACWY if the last dose was administered 5 or more years previously
 - Vaccination in the 3 years before the date of travel is required by the government of Saudi Arabia for all travelers to Mecca during the annual Hajj

*CDC Travelers Health website at <http://www.cdc.gov/travel>

Meningococcal Vaccines Adverse Reactions

	MenACWY
Local reactions for 1-2 days	11%-59%
Low-grade fever	5%-17%
Systemic reactions (headache, malaise, fatigue)	4%-54%

MenB Vaccine Recommendations

Meningococcal B Vaccines

Product Name/ACIP abbreviation	FDA Age Indications	Dosage/Route/Schedule
Trumenba [®] MenB-FHbp	10 through 25 years of age	<ul style="list-style-type: none"> • 3 doses – 0.5 mL each • IM injection • 0, 1-2, and 6-month; <i>OR</i> • 0, 6 month
Bexsero [®] MenB-4C	10 through 25 years of age	<ul style="list-style-type: none"> • 2 doses – 0.5 mL each • IM injection • 0, 1–6 month

- ### ACIP MenB Recommendations
- MenB should be administered as either a 2-dose series of MenB-4C or a 3-dose series of MenB-FHbp
 - The same vaccine product should be used for all doses
 - MenB-4C and MenB-FHbp may be administered concomitantly with other vaccines indicated for this age, but at a different anatomic site, if feasible
 - No product preference to be stated

Meningococcal B Recommendations

- Recommendation for use in individuals ≥10 years of age at increased risk of disease
- Recommendation for use in adolescents and young adults not at increased risk for disease

ACIP MenB Recommendations

- Certain persons aged ≥10 years* who are at increased risk for meningococcal disease should receive MenB vaccine. These persons include:
 - Persons with persistent complement component deficiencies
 - Persons with anatomic or functional asplenia**
 - Microbiologists routinely exposed to isolates of Neisseria meningitidis
 - Persons identified as at increased risk because of a serogroup B meningococcal disease outbreak

*ACIP off-label recommendation
 **Including sickle cell disease
http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6422a3.htm?_cid=mm6422a3_w

ACIP MenB Recommendations

- Certain other groups included in MenACWY (MCV4) recommendations for persons at increased risk, are not in this recommendation
- MenB – NOT currently recommended for:
 - Children aged 2 months – 9 years of age
 - Persons who travel to or reside in countries where meningococcal disease is hyperendemic or epidemic because risk is generally not caused by serogroup B
 - Routine use in first-year college students living in residence halls, military recruits, or all adolescents

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6422a3.htm?_cid=mm6422a3_w

**Use of 2- and 3-Dose Schedules of MenB-FHbp (Trumenba)
Meningococcal Serogroup B Vaccine**

- For persons at increased risk for meningococcal disease and for use during serogroup B outbreaks, 3 doses of MenB-FHbp should be administered at 0, 1-2, 6 months
- When given to healthy adolescents who are not at increased risk for meningococcal disease, 2 doses of MenB-FHbp should be administered at 0 and 6 months

MenB for Adolescents and Young Adults

- A MenB vaccine series may be administered to adolescents and young adults aged 16–23 years to provide short-term protection against most strains of serogroup B meningococcal disease*
- The preferred age for MenB vaccination is 16–18 years

* Permissive recommendation (Category B)
MMWR October 23, 2015 / 64(41):1171-6

**Meningococcal Vaccine
Contraindications and Precautions**

- Severe allergic reaction to vaccine component or following prior dose
- Moderate or severe acute illness

Meningococcal Resources

- ACIP's Meningococcal Recommendations web page
www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mening.html
- CDC's Meningococcal Infection web page
www.cdc.gov/meningococcal/index.html
- CDC's Meningococcal Vaccination web page
www.cdc.gov/vaccines/vpd-vac/mening/default.htm
- Immunization Action Coalition Meningococcal web page
www.immunize.org/meningococcal/
- Children's Hospital of Philadelphia Vaccine Education Center Meningococcal web page
<http://www.chop.edu/centers-programs/vaccine-education-center/vaccine-details/meningococcal-vaccine>
