In compliance with continuing education requirements, all presenters must disclose any financial or other associations with the manufacturers of commercial products, suppliers of commercial services, or commercial supporters as well as any use of unlabeled product(s) or product(s) under investigational use.

CDC, our planners, content experts, and their spouses/partners wish to disclose they have no financial interests or other relationships with the manufacturers of commercial products, suppliers of commercial services, or commercial supporters.

Planning committee discussed conflict of interest with each presenter to ensure there is no bias.

Content will not include any discussion of the unlabeled use of a product or a product under investigational use with the exception of the following speakers:
Lucy McNamara of the Centers for Disease Control and Prevention will discuss use of serogroup B meningococcal vaccines in persons outside the licensed age group (10-25 years) during outbreak response.

CDC did not accept commercial support for this continuing education activity.
MANAGING MENINGOCOCCAL DISEASE OUTBREAKS IN THE UNIVERSITY SETTING:
Oregon State University and the State of Oregon Partnership and Response

Jenny Haubenreiser, MA, FACHA
Oregon State University

Aaron Dunn, MPH
Oregon Immunization Program
## Oregon State University MenB cases 2016-17

### Disease Onset to Notification Timelines

<table>
<thead>
<tr>
<th>Case</th>
<th>Disease Onset</th>
<th>Hospitalization</th>
<th>N. Meningitidis Identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>11/11/2016</td>
<td>11/13/2016</td>
<td>11/14/2016 (3 days)</td>
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<tr>
<td>Case 2</td>
<td>11/12/2016</td>
<td>11/16/2016</td>
<td>11/18/2016 (6 days)</td>
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<tr>
<td>Case 3</td>
<td>2/20/2017</td>
<td>2/22/2017</td>
<td>2/25/2017 (2 days)</td>
</tr>
<tr>
<td>Case 4</td>
<td>10/24/2017</td>
<td>10/25/2017</td>
<td>10/26/2017 (2 days)</td>
</tr>
<tr>
<td>Case 5</td>
<td>11/22/2017</td>
<td>11/24/2017</td>
<td>11/24/2017 (2 days)</td>
</tr>
<tr>
<td>Case 6</td>
<td>12/11/2017</td>
<td>12/17/2017</td>
<td>12/18/2017 (6 days)</td>
</tr>
</tbody>
</table>
OREGON STATE UNIVERSITY MENINGOCOCCAL B OUTBREAK TIMELINE

ACADEMIC YEAR 2016 - 2017

MenB vaccine widely promoted to higher-risk population (approx 7,000) students

Spring mass vaccination clinic #1 (1,865 vaccines)

Spring mini mass vaccination clinic #2 (1,008 vaccines)

ACADEMIC YEAR 2017 - 2018

9/20/17 University mandates: all incoming first-year transfer students

Fall mini vaccination clinics #3-7 (1,101 vaccines)

January mass vaccination clinics #8-12 (7,577 vaccines)

February mass vaccination clinics #13-15 (5,574 vaccines)

outbreak declared
Progressive Interventions

- **Fall 2016 - Spring 2017**
  - Monitor case response: OSU, county and Oregon Health Authority
  - Following case 3, OHA declares outbreak
  - Recommendation: Vaccinate highest-risk populations: students ≤ age 25 in congregate housing, Greek students, student athletes (N=7,500).

- **Fall 2017**
  - MenB **required** for new students (along with other required vaccines)
  - October – December: 3 new cases diagnosed

- **Winter 2018**
  - Expanded requirement: **All** students age ≤ 25, two doses MenB **required** by Feb. 15, 2018 (N=19,000)
Key challenges and barriers

- Capacity to meet ambitious goal with **no additional funding**
  - Vaccine delivery at scale needed
  - Insurance coverage
  - Maintaining regular campus medical operations

- Off-campus access to vaccine
  - Limited availability out-of-state and in parts of Oregon

- State-level data sharing (HIPAA vs FERPA)
  - Inability to match university data with state vaccine registry

- Data tracking and targeted messaging
  - Communication and compliance
Key university collaborations

**Benton County Health Dept.**
- Case investigation
- Assistance with vaccination
- Incident Command Structure w/OSU:
  - Central coordination
  - Prophylaxis
  - Vaccination
  - Communications

**Joint Collaboration**
- Letter to Oregon State University leadership

**Oregon Health Authority**
- Overall oversight and consultation
- Tactical assistance in setting up vaccine operations
- Declaration of outbreak
- Guidance on campus policy
- Vaccine registry
Sixth meningococcal case in Benton County outbreak
Key collaborations on campus

Oregon State University

- University Relations and Marketing
- Senior leadership
- Student Affairs Incident Management Team
- Campus registrar
- Academic deans
- Student Health Services
Critical actions: State and local

- House Bill 3276
- OSU-OHA data sharing agreement
- Community medical provider communication
  - Availability of vaccine, particularly over breaks
- State-wide communication and media
  - HAN Alerts
  - Outreach to neighboring states
Critical actions: Oregon State University

- Enhanced data management and communication
  - Electronic medical record & central data management system
  - Documentation entry and phone calls
- Access to vaccine for the most vulnerable students
  - Medicaid enrollment
  - Vaccine ‘vouchers’ for undocumented and uninsured
- University communication
  - Expanded FAQs (‘one-stop’ for information)
  - Targeted messaging: students, parents/families, faculty/staff
  - Ongoing media presence
MenB FAQ

Policy Questions

- What is Oregon State University's new vaccine requirement?
- Why is OSU requiring the MenB vaccine?
- Why does OSU require both the meningococcal MCV4 vaccine and the MenB vaccine?
- What happens if I do not comply with the MenB requirement?
- Is this requirement in compliance with state law?
- Do OSU faculty and staff need to be vaccinated against MenB?
- I have extenuating circumstances. How can I get

Process and Logistics Questions

- I am a new student. Do I need to be fully immunized before arriving on campus?
- Where can I receive the MenB vaccine?
- Is the MenB vaccine covered by insurance?
- Who will pay for my receiving the MenB vaccine?
- What if I do not have insurance?
- I want to enroll in the Oregon Health Plan (OHP). Can I do that at the OSU vaccination clinics?
- How do I prove that I already have received the required MenB vaccinations?
- Where should I submit documentation?

Medical Questions

- How is MenB transmitted?
- How can I avoid getting MenB?
- If I get sick, how do I know if I have Meningococcal B disease?
- Where should I go if I become ill?
- Why is my primary care provider giving me a different recommendation regarding the vaccines?
- What if I am late receiving my follow-up dose(s) of Bexsero® or Trumenba®?
- Can I get my second dose early in order to get my
Entering students ≤ 25 must complete vaccination. Reqs for students ≤ 25 announced. Mass vax clinics (5 days). All students ≤ 25 must complete vaccination.

OSU MenB vaccination rates, 2017-18 academic year:

- % students ≤ age 25 with complete vaccination status

Graph showing vaccination rates from 9/1/17 to 3/16/18, with key dates marked:
- 9/1/17: 0%
- 9/29/17: 10%
- 10/27/17: 20%
- 11/24/17: 30%
- 12/22/17: 40%
- 1/19/18: 50%
- 2/16/18: 60%
- 3/16/18: 70%

Legend:
- Grey: Vaccination complete

Note: Mass vax clinics (3 days) occurred on 12/22/17.
Vaccine Completion
(2 of 2 or 2 of 3 as of May 1)

19,300 Approximate Winter Term Enrollment ≤ age 25
18,150 Received 2 doses of Bexsero™ or 2 doses of Trumenba™
950 Still need a second dose
67 No action (not allowed to register for spring term)
31 Medical Exemptions
255 Non-medical exemptions
121 Academic Deferrals (expected to be vaccinated during spring term)

Note: Outbreak status in place through 2018 Fall Term
Contact Information

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Aaron.dunn@state.or.us

Jenny Haubenreiser
Executive Director, Student Health Services
Oregon State University
541-737-7576
Jenny.Haubenreiser@OregonState.edu
Serogroup B Meningococcal Disease Outbreaks and Public Health Responses at Universities in the United States

Lucy McNamara, PhD, MS
Epidemiologist
Meningitis and Vaccine Preventable Diseases Branch, CDC

48th National Immunization Conference
May 16th, 2018
Meningococcal Disease

- Caused by *Neisseria meningitidis*
Meningococcal Disease

- Caused by *Neisseria meningitidis*

**Meningitis**
- Fever
- Headache
- Confusion
- Stiff Neck
Meningococcal Disease

- Caused by *Neisseria meningitidis*

**Meningitis**
- Fever
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**Meningococcemia**
- Fever
- Vomiting
- Diarrhea
- Purpura

![Image of a child with meningococcal disease symptoms]
Meningococcal Disease

- Caused by *Neisseria meningitidis*

**Meningitis**
- Fever
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**Meningococcemia**
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People die despite antibiotics.
Meningococcal Disease

- Caused by *Neisseria meningitidis*

**Meningitis**
- Fever
- Headache
- Confusion
- Stiff Neck

**Meningococcemia**
- Fever
- Vomiting
- Diarrhea
- Purpura

People die despite antibiotics

People survivors left with long-term health issues
Transmission

- Spread by ill patients AND asymptomatic carriers
Meningococcal disease among adolescents and young adults by serogroup, 2014-2016

Source: National Notifiable Diseases Surveillance System (NNDSS) data with additional serogroup data from Active Bacterial Core surveillance (ABCs) and state health departments
Unknown serogroup and other serogroups excluded
Meningococcal Disease in Persons aged 18–24 years, United States, 2014–2016

- College students: N = 70 cases
- Non-college students: N = 57 cases

Annual incidence (per 100,000)
Meningococcal Disease in Persons aged 18–24 years, United States, 2014–2016

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Non-college students
N = 57 cases
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<tr>
<th></th>
<th>Annual incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>College students</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0.18</td>
</tr>
<tr>
<td>C/W/Y</td>
<td>0.02</td>
</tr>
<tr>
<td>Non-college students</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0.14 (C/W/Y)</td>
</tr>
<tr>
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<td></td>
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  - College students: N = 70 cases
  - Non-college students: N = 57 cases

32% associated with outbreaks
Meningococcal Disease Outbreaks

- Outbreaks classified by population at risk:
Meningococcal Disease Outbreaks

- Outbreaks classified by population at risk:
Meningococcal Disease Outbreaks

- Outbreaks classified by population at risk:
  - Organization
  - Community
Meningococcal Disease Outbreaks

- Outbreaks classified by population at risk:

  - November, 2017: Updated outbreak guidance:
Meningococcal Disease Outbreaks

- Outbreaks classified by population at risk:
  - Recently updated outbreak guidance:
    - Organization-based: 2-3 outbreak-associated cases in 3-month period

Organization

Community
Meningococcal Disease Outbreaks

- Outbreaks classified by population at risk:
  - Organization-based: 2-3 outbreak-associated cases in 3-month period
  - Community-based: Incidence above expected for 3-month period

- Recently updated outbreak guidance:
Outbreak-associated cases

- All cases of the same serogroup UNLESS molecular typing indicates not related to predominant outbreak strain
- Probable cases may be included if in well-defined risk group
Outbreak Definition

An outbreak occurs when multiple cases of the same serogroup (types) happen in a population over a short time period. Outbreaks can occur in communities, schools, colleges, prisons, and other populations. Depending on the population size and specific circumstances, health officials may declare an outbreak after just two cases.

Outbreak Control Measures

State and local health departments lead outbreak investigations and implement control measures to reduce spread of the disease. They often work closely with CDC, which has [guidance](https://www.cdc.gov/meningococcal/outbreaks/index.html) to assist with this. In the setting of an outbreak, such recommendations often include:

- Vaccinating people identified as being at increased risk
- Making sure all close contacts of a patient receive antibiotics to prevent them from getting the disease; this is known as prophylaxis

CDC supports state and local health departments in identifying a response that best protects their residents’ health. Contact the state or local health department, or institution, for information about a specific outbreak and their specific recommendations.

Vaccination

CDC recommends vaccinating people identified as being at increased risk during a meningococcal outbreak. Which vaccine they should receive depends on the serogroup causing the outbreak.

Outbreaks caused by serogroup A, C, W, or Y

CDC recommends vaccination with a meningococcal conjugate vaccine for anyone 2 months or older identified as being at increased risk.
Meningococcal Disease in Other Countries

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State and local health departments lead outbreak investigations and implement control measures to reduce spread of the disease. They often work closely with CDC, which has guidance [20 pages] to assist with this. In the setting of an outbreak, such recommendations often include:

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CDC Issues News Meningococcal Disease Outbreak Guidance

View updated CDC guidance [20 pages] for the evaluation and public health management of suspected outbreaks of meningococcal disease in the United States.
12 University Based Serogroup B Clusters/Outbreaks†, 2008–2018

†Where CDC consulted
12 University Based Serogroup B Clusters/Outbreaks†, 2008–2018

Total cases

- OH 2008
- PA 2009
- PA 2011
- NJ 2013
- CA 2013
- RI 2015
- OR 2015
- CA 2016
- NJ 2016
- WI 2016
- OR 2016
- MA 2017

†Where CDC consulted
12 University Based Serogroup B Clusters/Outbreaks†, 2008–2018

Outbreak duration (months)

- OH 2008
- PA 2009
- PA 2011
- NJ 2013
- CA 2013
- RI 2015
- OR 2015
- CA 2016
- NJ 2016
- WI 2016
- OR 2016
- MA 2017

†Where CDC consulted
12 University Based Serogroup B Clusters/Outbreaks†, 2008–2018

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Total undergraduates at university

<table>
<thead>
<tr>
<th>Outbreak</th>
<th>Total undergraduates at university</th>
</tr>
</thead>
<tbody>
<tr>
<td>OH 2008</td>
<td>20,000</td>
</tr>
<tr>
<td>PA 2009</td>
<td>10,000</td>
</tr>
<tr>
<td>PA 2011</td>
<td>5,000</td>
</tr>
<tr>
<td>NJ 2013</td>
<td>2,500</td>
</tr>
<tr>
<td>CA 2013</td>
<td>15,000</td>
</tr>
<tr>
<td>RI 2015</td>
<td>10,000</td>
</tr>
<tr>
<td>OR 2015</td>
<td>10,000</td>
</tr>
<tr>
<td>CA 2016</td>
<td>10,000</td>
</tr>
<tr>
<td>NJ 2016</td>
<td>30,000</td>
</tr>
<tr>
<td>WI 2016</td>
<td>25,000</td>
</tr>
<tr>
<td>OR 2016</td>
<td>25,000</td>
</tr>
<tr>
<td>MA 2017</td>
<td>30,000</td>
</tr>
</tbody>
</table>
Who is Affected in University Serogroup B Outbreaks?
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- BUT in recent outbreaks we’ve seen numerous cases in students with none of these risk factors
Responses to Serogroup B Clusters/Outbreaks†

Where CDC consulted

<table>
<thead>
<tr>
<th>Outbreak</th>
<th>N cases</th>
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<td>2</td>
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<td>PA 2011</td>
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<tr>
<td>NJ 2013</td>
<td>12</td>
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<td>CA 2013</td>
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<tr>
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<td>MA 2017</td>
<td></td>
</tr>
</tbody>
</table>
Serogroup B Vaccination: Targeted Groups
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All undergraduates
Serogroup B Vaccination: Targeted Groups

- All undergraduates
- Graduate students in dormitories
Serogroup B Vaccination: Targeted Groups

- All undergraduates
- Graduate students in dormitories
- Anyone with high risk conditions
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Graduate students in dormitories

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Spouses / care-givers
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- All undergraduates
- Graduate students in dormitories
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- Significant others
Serogroup B Vaccination: Targeted Groups

- All undergraduates
- Graduate students in dormitories
- Anyone with high risk conditions
- Spouses / care-givers
- Significant others
- Staff/grad students ≤25y
Outbreak Response – Serogroup B Vaccination
Outbreak Response – Serogroup B Vaccination
Outbreak Response – Serogroup B Vaccination

25–95% coverage
Serogroup B First Dose Vaccination Coverage
Serogroup B First Dose Vaccination Coverage

# Undergraduates at University

1st Dose Vaccination Coverage
Serogroup B First Dose Vaccination Coverage

Oregon State
Target vaccination coverage?

- What vaccination coverage is good enough?
Target vaccination coverage?

- What vaccination coverage is good enough?
Target vaccination coverage?

- What vaccination coverage is good enough?
- US meningococcal vaccines protect against disease
  - May not prevent transmission
Target vaccination coverage?

- What vaccination coverage is good enough?

- US meningococcal vaccines protect against disease
  - May not prevent transmission

- Maximize coverage to protect individuals
Vaccination campaigns – strategies to potentially increase attendance

- Evening hours
- Schedule dorms/groups specific times to attend
- Required attendance & opt-out forms
- Keep wait times short
- Clear cost information
- Involve students in promoting vaccination
Vaccination campaigns – strategies to potentially increase attendance

- Evening hours
- Schedule dorms/groups specific times to attend
- Required attendance & opt-out forms
- Keep wait times short
- Clear cost information
- Involve students in promoting vaccination
Getting the word out
Surveys conducted at 2 schools\textsuperscript{1,2} showed that
\begin{itemize}
\item Email was how overwhelming majority of students learned about vaccination campaigns
\end{itemize}
\textsuperscript{1}Breakwell et al. 2016, J Adolesc Health 59(4):457-64; \textsuperscript{2}CDC/Oregon Health Authority unpublished data
Surveys conducted at 2 schools\(^1\)\(^2\) showed that

- Email was how overwhelming majority of students learned about vaccination campaigns
- Email was also how students **preferred** to hear about vaccination campaigns

\(^1\)Breakwell et al. 2016, J Adolesc Health 59(4):457-64; \(^2\)CDC/Oregon Health Authority unpublished data
What motivates students to get vaccinated?¹

- Meningitis is a serious disease
- University says it's important
- Best way to protect myself
- My parents told me to

¹Breakwell et al. 2016, J Adolesc Health 59(4):457-64
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<table>
<thead>
<tr>
<th>Motivation</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Meningitis is a serious disease</td>
<td>100%</td>
</tr>
<tr>
<td>University says it's important</td>
<td>90%</td>
</tr>
<tr>
<td>Best way to protect myself</td>
<td>80%</td>
</tr>
<tr>
<td>My parents told me to</td>
<td>70%</td>
</tr>
</tbody>
</table>

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What motivates students to get vaccinated?\(^1\)

1. Meningitis is a serious disease
2. University says it's important
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¹Breakwell et al. 2016, J Adolesc Health 59(4):457-64
Why do students NOT get vaccinated?¹

1. I think I am unlikely to get meningitis

2. I know signs/symptoms and will seek treatment instead

3. Concerned about side effects from the vaccine

4. Do not live in Greek housing

¹Breakwell et al. 2016, J Adolesc Health 59(4):457-64
Why do students NOT get vaccinated?¹

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Why do students NOT get vaccinated?¹

I think I am unlikely to get meningitis

I know signs/symptoms and will seek treatment instead

Concerned about side effects from the vaccine

Do not live in Greek housing

Only 1 of 4 cases in sorority/fraternity resident

¹Breakwell et al. 2016, J Adolesc Health 59(4):457-64
Choice of Serogroup B Vaccines
Choice of Serogroup B Vaccines

- 2 dose series (0, ≥1 months)
Choice of Serogroup B Vaccines

- 2 dose series (0, ≥1 months)
- 3 dose series (0, 1–2, and 6 months) recommended for outbreak response
Choice of Serogroup B Meningococcal Vaccine

- Based on outer membrane proteins that have multiple alleles and variable expression

Choice of Serogroup B Meningococcal Vaccine

- Based on outer membrane proteins that have multiple alleles and variable expression
- Each MenB vaccine may not protect against all serogroup B strains

Choice of Serogroup B Meningococcal Vaccine

- CDC can perform molecular typing on strain to see if vaccine antigens are present and if sequences match vaccines
Choice of Serogroup B Meningococcal Vaccine

- CDC can perform molecular typing on strain to see if vaccine antigens are present and if sequences match vaccines
- HOWEVER...we don’t know how this information correlates with protection
Expanded chemoprophylaxis

- Administration of antibiotics beyond close contacts of cases
  - Goal: reduce carriage / transmission of outbreak strain
Expanded chemoprophylaxis

- Not usually recommended as a standalone measure
- May be considered as an *interim measure* in some outbreaks
Considerations for use of expanded chemoprophylaxis

- Size of target population
- Cost and logistics
- Potential adverse reactions and antibiotic resistance
- Degree of mixing with surrounding population
Considerations for use of expanded chemoprophylaxis

- Size of target population
- Cost and logistics
- Potential adverse reactions and antibiotic resistance
- Degree of mixing with surrounding population

- Drawbacks often outweigh potential benefits
Considerations for use of expanded chemoprophylaxis

- Size of target population
- Cost and logistics
- Potential adverse reactions and antibiotic resistance
- Degree of mixing with surrounding population

- **Drawbacks often outweigh potential benefits**
- **Expanded chemoprophylaxis should never delay vaccination**
MVPDB is here to help!

- Consultation / advice
- Isolate / clinical specimens testing, serogroup confirmation, typing
- Connect with others who have responded to these outbreaks
- Communications assistance – examples from previous outbreaks

**meningnet@cdc.gov**
Contact: meningnet@cdc.gov

Updated outbreak guidance:
https://www.cdc.gov/meningococcal/outbreaks/index.html

For more information, contact CDC
1-800-CDC-INFO (232-4636)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.