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## Information on Meningococcal Invasive Disease for Medical Staff

**Close (household, sharing oral secretions) contacts of meningococcal invasive disease should receive chemoprophylaxis. OVER-prescribing prophylaxis to other contacts does more harm than good. See reasons below**

### Meningococcal invasive disease

Invasive infection usually results in meningococcemia, meningitis, or both. Invasive meningococcal infections can be complicated by arthritis, myocarditis, pericarditis, endophthalmitis and pneumonia. Less common manifestations include pneumonia, occult febrile bacteremia, conjunctivitis and chronic meningococcemia.

### Causative agent

The causative agent is *Neisseria meningitidis*, a gram-negative diplococcus with serogroups based on capsular polysaccharides. Strains belonging to groups A, B, C, Y and W-135 are implicated most frequently in systemic disease. Serogroups B, C and Y each account for approximately 30% of reported cases in Louisiana. Group A has been associated frequently with epidemics elsewhere in the world, primarily in sub-Saharan Africa.

### Colonization & Disease

**Asymptomatic colonization** of the upper respiratory tract provides the focus from which the organism is spread. Two percent to ten percent of healthy persons are carriers of meningococci. High carriage rates are also observed in crowded, close contact, low socio-economic conditions. Rates of acquisition of carriage vary according to the situation; rates of 0.3% /month were noted in the US.

**Disease** is rare with incidence rates varying from one to two per 100,000 population per year in Louisiana and the US. Disease usually develops within a few days of acquiring colonization. Those who are carriers for a long time seemed to be partially immune to disease due to the strain they are carrying. Patients with deficiency of a terminal complement component (C5-9), properdin deficiencies, or anatomic or functional asplenia are at increased risk for invasive and recurrent meningococcal disease.

### Transmission

Transmission occurs from person to person through **droplets of respiratory tract secretions**. Transmission does not occur through droplet nuclei therefore negative pressure rooms, N95 (or TB) masks are not required.

Patients are considered capable of transmitting the organism for up to 24 hours after initiation of effective treatment.

The **incubation period** is from one to ten days, most commonly less than four days.

**Close contacts of patients with meningococcal disease** are at an increased risk for developing disease. Outbreaks have occurred in semi-closed communities, including child care centers, schools, colleges and military recruit camps.

### Diagnostic Tests

Cultures of blood and cerebrospinal fluid (CSF) are indicated in all patients with suspected invasive meningococcal disease. Cultures of petechial scraping, synovial fluid, sputum and other body fluids are positive in some patients. A Gram stain of a petechial scraping, CSF and buffy coat smear of blood can be helpful on occasion. Since *N. meningitidis* can be part of the nasopharyngeal flora, isolation of *N. meningitidis* from this site is not helpful. Bacterial antigen detection tests, such as by latex agglutination, may be of value for rapid diagnosis. Antigen detection in CSF supports the diagnosis of a probable case if the clinical illness. Rapid antigen tests for group B *N. meningitidis* may be unreliable.

### Susceptibility Testing

Since some *N. meningitidis* strains with resistance to penicillin have been identified sporadically from several regions of the United States and have been reported widely from Spain, Italy and parts of Africa, susceptibility testing of meningococcal isolates should be performed as indicated by the patient's clinical course. Most reported isolates are moderately susceptible, with a MIC to penicillin of  $\geq 0.12$   $\mu\text{g}/\text{mL}$  or  $\leq 1.0$   $\mu\text{g}/\text{mL}$ .

Treatment with high-dose penicillin is effective against moderately susceptible strains. Cefotaxime and ceftriaxone show a high degree of activity against moderately susceptible meningococci.

### Isolation of the Hospitalized Patient

In addition to standard precautions, **droplet precautions** are recommended until 24 hours after initiation of effective therapy.

## Control Measures

### Careful observation of exposed persons

Exposed household, school, or child care contacts must be observed carefully. Exposed persons in whom a febrile illness develops should receive prompt medical evaluation and, if indicated, antimicrobial therapy appropriate for invasive meningococcal infections.

### Chemoprophylaxis

The risk of contracting invasive meningococcal disease among close contacts of cases is about 800-fold higher than rates in the general population. **Close contacts of all persons with invasive disease, whether sporadic or in an outbreak, are at high risk and should receive prophylaxis within 24 hours of diagnosis of the primary case.**

Throat and nasopharyngeal cultures are of no value for deciding who should receive prophylaxis.

### Household, child care center and nursery school contacts

Household, child care and nursery school contacts are at high risk and are considered close contacts. The attack rate for these populations is more than 300 times higher than rates in the general population.

### Other contacts

Prophylaxis is warranted for persons who have had **contact with the patient's oral secretions through kissing or sharing of toothbrushes or eating utensils, markers of close social contact, during the 7 days before onset of disease in the index case**. In addition, persons who frequently eat or sleep in the same dwelling within this period should receive chemoprophylaxis.

Prophylaxis is **not recommended routinely for health care personnel who are considered to be at low risk** unless they have had **intimate exposure, such as occurs with unprotected mouth-to-mouth resuscitation, intubation, or suctioning, before antibiotic therapy was initiated.**

### Antibiotic regimens for prophylaxis

Rifampin, ceftriaxone and ciprofloxacin are appropriate antibiotics for chemoprophylaxis in adults.

Drug	Age Group	Dosage	Duration
Rifampin	Children <1mo	5mg/kg q12hr	2 days
	Children ≥1 mo	10mg/kg q12hr	2 days
	Adults	600mg q12hrs	2 days
Cipro	Adults	500mg	Stat
Ceftriaxone	Children <15 yr	125mg	Stat IM
	Adults	250mg	Stat IM

Systemic antimicrobial therapy of meningococcal disease with agents other than ceftriaxone or other third-generation cephalosporins may not reliably eradicate nasopharyngeal carriage of *N. meningitidis*. If other agents have been used for treatment, the index patient should receive chemoprophylactic antibiotics for eradication of nasopharyngeal carriage before being discharged from the hospital.

**Ceftriaxone** given in a single intramuscular dose has been demonstrated to be **more effective** than oral rifampin in eradicating pharyngeal carriage of group A meningococci. The efficacy of ceftriaxone has been confirmed only for group A strains, but its effect is likely to be similar for other serogroups. Ceftriaxone has the advantages of easier dosage and administration and **safety in pregnancy**.

**Ciprofloxacin** given to adults in a single oral dose also is effective in eradicating meningococcal carriage. At present, ciprofloxacin is not recommended for persons younger than 18 years of age or for pregnant women.

**The index case also should receive chemoprophylaxis** before hospital discharge unless the infection was treated with ceftriaxone or cefotaxime.

#### Chemoprophylaxis has its limitations, DON'T OVERDO it

- Chemoprophylaxis eliminate the carriage, therefore reduce the risk of developing invasive disease

BUT

- Chemoprophylaxis does NOT cure incubating disease hence the recommendation to observe carefully exposed persons
- Chemoprophylaxis decreases the normal flora of other contacts and makes them more susceptible to recolonization. Experience showed that those who were prophylactically treated were rapidly recolonized. Hence do not overprescribe for low risk contacts.
- Between 10% to 25% of contacts treated with rifampin will eventually become recolonized with rifampin-resistant strains. Repeated and unjustified use of rifampin among medical personnel would result in increasing in-hospital circulation of rifampin-resistant meningococci. The same considerations may be true with ciprofloxacin and ceftriaxone.

#### Vaccine

Because secondary cases can occur several weeks or more after onset of disease in the index case, meningococcal vaccine is a possible adjunct to chemoprophylaxis when an outbreak is caused by a serogroup contained in the vaccine.

#### Meningococcal Vaccine

A serogroup-specific quadrivalent meningococcal vaccine against groups A, C, Y and W-135 *N meningitidis* is approved in the United States for use in children two years of age and older. The vaccine is administered subcutaneously as a single 0.5-mL dose and can be given concurrently with other vaccines but at a different site.

The vaccine has the following limitations:

- No vaccine is available for the prevention of group B disease.

- When the quadrivalent vaccine is given to infants response to B and C meningococcal group polysaccharides usually is poor. The serogroup C polysaccharide does not induce an antibody response before 24 months of age.
- Routine immunization of children with meningococcal polysaccharide vaccine is not recommended because the infection rate is low, response is poor in young children, immunity is relatively short-lived, and the response to subsequent vaccine doses may be impaired.

#### Indications

However, immunization is recommended for

- children 2 years of age and older including those with
  - functional or anatomic asplenia
  - terminal complement component or properdin deficiencies
- Immunization of **college students** is recommended by the American College Health Association. Physicians should inform and educate students and parents about the risk of meningococcal disease and the existence of a safe and effective vaccine and immunize students at their request or if educational institutions require it for admission.
- Immunization may be beneficial for **travelers** to countries recognized to have hyperendemic or epidemic meningococcal disease caused by a vaccine-preventable serogroup.

Serum meningococcal antibody in immunized adults seems to persist for as long as five years, but in children, three years may be the longest protection afforded.

Infrequent and mild adverse reactions occur, the most common of which is localized erythema for one to two days. Studies suggest that altering meningococcal immunization recommendations during pregnancy is unnecessary.

#### Reporting

All confirmed, presumptive, and probable cases of invasive meningococcal disease must be reported to the public health department. Timely reporting can facilitate early recognition of clusters of cases and outbreaks so that appropriate prevention programs can be implemented rapidly.

The Office of Public Health (OPH) laboratory carries **pulsed field gel electrophoresis (PFGE)** on all meningococcal cultures submitted. The lab has identified some strains that seems to be more virulent and issues health alerts when one of these strains is identified. For example, in 2001 a particularly aggressive strain of group *C. meningococcus* was identified in the greater New Orleans and Alexandria area causing eight cases including four deaths and two vaccine failures.

#### Submit a culture to the lab for PFGE testing