



## *Meningococcal Disease*

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**M**eningococcal disease is a very serious infection caused by the bacterium *Neisseria meningitidis*. Meningococcus is now the second most common cause of bacterial meningitis among children and the third leading cause among adults. Despite advances in antibiotics, the overall mortality in the USA is 13%.

Meningococcus has a particular affinity for the bloodstream and the lining around the brain, called the meninges. The severity of infection ranges from a transient fever with bacteremia to severe life-threatening illness. Infrequently, meningococcal infection causes pneumonia or conjunctivitis.

The clinical syndrome of meningococcal infection is similar to other types of meningitis. Symptoms may first appear as a respiratory tract illness, often followed by the abrupt onset of fever, headache, stiff neck, and vomiting. Changes in mental status may ensue, including confusion, drowsiness, stupor, and even coma. Infants may have fever with irritability, poor feeding, vomiting, or a high-pitched cry.

A specific feature in the presentation of meningococcal disease is the appearance of tiny hemorrhages, called petechiae. These are usually found on the trunk and lower extremities. Petechiae are present in 75% of patients with meningococcal infection.

Meningococcal infection is associated with high rates of morbidity and mortality. Even with optimal medical care and appropriate treatment, almost one in ten patients die from this disease, while as many as 20% are left with hearing loss, neurological impairment, or loss of a limb. In rare cases, meningococcal

infection follows a fulminant course, known as Waterhouse-Friedrichsen Syndrome. This rapidly progressive disease, marked by hemorrhages into the skin, joints, and internal organs, can lead to septic shock and death even when appropriate antibiotics are started immediately.

A positive outcome of meningococcal disease depends on prompt diagnosis, early referral, and rapid treatment with antibiotics.

### **Prevalence and Distribution**

Endemic disease is most common in children under the age of 5, particularly within the 6-12 month age group. Outbreaks are common among school age children and young adults in group settings, such as day care centers, military camps, and colleges. Freshman college students living in dormitories are at particular risk. This infection appears to be seasonal, with the majority of cases occurring in winter and early spring.

### **Transmission**

*Neisseria meningitidis* spreads when carriers cough or sneeze infected secretions into the air that others inhale. The disease also spreads through infected nose and throat secretions that come into contact with the mucous membranes of others.

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*Waterhouse-Friedrichsen Syndrome. This rapidly progressive form of meningococcal disease is marked by hemorrhages into the skin and joints. Septic shock and death can result, even with appropriate antibiotics. Photo courtesy of the Meningitis Trust*

The onset of disease usually occurs within 10 days (commonly 3-4 days), although longer intervals are possible.

Meningococcus inhabits the upper respiratory tract of a significant proportion of individuals without causing illness. It is not known why some who carry invasive strains of the bacteria become ill while others do not. Some speculate that a concurrent viral infection or exposure to passive or active cigarette smoke may diminish a person's resistance to *Neisseria meningitidis* that has colonized a person's upper respiratory tract, thus allowing illness to develop in someone who has been carrying the organism. Persons with certain immune deficiencies and persons without a spleen may be at increased risk for infection.

### Diagnosis

Anyone suspected of meningococcal disease should have blood cultures and a lumbar puncture without delay. The organism may also be cultured from synovial, pleural, or pericardial fluid.

### Treatment

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Persons suspected of having meningococcal disease require intravenous antibiotic therapy and close supervision in a hospital setting. The disease calls for strict respiratory isolation for at least 24 hours after the beginning of antibiotic therapy. A third generation cephalosporin such as ceftriaxone (Rocephin™) in high doses is usually used initially to treat the infection. High doses of penicillin G or chloramphenicol for 1 to 2 weeks have also successfully treated this infection.

#### *Colonization*

Antibiotics other than ceftriaxone usually used to treat meningococcal infection do not reliably reach high enough concentrations in upper respira-

tory tract fluids to destroy the organism at the site of colonization in the nasopharynx. To eradicate the organism completely, patients treated with these antibiotics should also be treated with an antibiotic that is known to clear the nasopharynx of organisms, namely ciprofloxacin, ceftriaxone, or rifampin. Ciprofloxacin (Cipro™) 500 mg in a single oral dose can be given to adults but is not recommended for children under age 18 unless there is no alternative therapy. It is not recommended for pregnant or lactating women.

Ceftriaxone (Rocephin™) in a one-time dose at 125 mg for children less than age 15 and 250 mg for those ages 15 and above is an alternative course of therapy.

Rifampin (Rimactane™, Rifadin™) is a drug that has long been used to eradicate meningococcal colonization. Dosing is 5 mg/kg every 12 hours for 2 days in infants less than 1 month old, 10 mg/kg of body weight with a maximum of 600 mg every 12 hours for two days in all persons older than one month. For infants, the liquid form of rifampin is easier to administer. If liquid rifampin is unavailable, the contents of the capsules can be mixed with applesauce. Rifampin cannot be given to pregnant women or those with active liver disease.

Urine, stool, sweat, tears, and semen may turn orange-red when taking rifampin. Soft contact lenses can be permanently stained, so glasses should be worn while taking the medication. Rifampin may also diminish the effects of methadone and the effectiveness of birth control pills. Patients should use a barrier form of contraception (condoms, diaphragm) for the duration of the entire birth control pill cycle in which rifampin therapy occurs.

### Prevention and Control

All persons who have been in close contact with a person with meningococcal disease should receive antibiotic prophylaxis with ciprofloxacin, rifampin, or ceftriaxone. The risk of developing disease from such contact varies with the duration and closeness of exposure. In general, persons with less than 20 hours of contact in the week prior to illness are likely to be at less risk than those with a longer duration of contact. However, persons with direct mucous membrane exposure to secretions from an infected person's nose or throat are at higher risk. Such types of exposure include:

- mouth-to-mouth resuscitation;
- kissing;
- mouthing toys;
- sharing food, glasses, bottles, or cigarettes.

Rash from Meningococcus. A characteristic feature is the appearance of tiny hemorrhages on the skin, called petechiae. When glass is pressed against the skin, the petechiae do not blanch or lose their color. Photo courtesy of the Meningitis Trust



Identified close contacts should be evaluated for rifampin, ciprofloxacin, or ceftriaxone prophylaxis within 24 hours of exposure. Refer to the treatment section above for dosages. If antibiotics cannot be initiated within 10 days of exposure, the efficacy is diminished.

Due to the emergence of resistant strains of *Neisseria meningitidis* and possible non-adherence with recommended antibiotic prophylaxis, caregivers should monitor all close contacts for at least 2 weeks following the diagnosis of the initial case. We recommend that smaller shelters, where families or adults live for weeks or months, hold any new admissions until all identified persons at risk within the shelter have received prophylaxis with ciprofloxacin, rifampin, or ceftriaxone. If compliance with therapy cannot be assured, then admissions should further be held until 2 weeks following the diagnosis of the last case of meningococcal disease. Any close contact who develops a febrile illness should go to an acute care facility immediately for evaluation. Staff or caregivers should notify the facility ahead of time to ensure that precautions are taken to lessen the risk of exposure to others.

A vaccine is available for certain strains of *Neisseria meningitidis* (namely A, C, Y, and W-135) but is not routinely given to the general population. The vaccine is recommended solely for control of outbreaks involving certain serogroups. The vaccine is not effective in children under the age of 2 years.

Massachusetts and most other states require that confirmed cases of meningococcal illness be reported to the local board of health immediately.

### Summary

Meningococcal disease is a serious bacterial infection that most commonly causes varying degrees of infection in the blood or meninges (the

linings covering the brain). This illness can be life threatening and occurs most commonly in infants and young adults.

Initial symptoms can be similar to an upper respiratory tract illness, followed by the abrupt onset of fever, headaches, stiff neck, vomiting, and occasionally a change in behavior. Infants may have a fever, appear irritable, have a high-pitched cry, and feed poorly. Petechiae, or tiny hemorrhages into the skin, may appear on the trunk or legs in both adults and children.

The spread of meningococcal disease occurs when infected individuals cough or sneeze into air that is then inhaled by others. Direct exposure to an infected person's saliva will also spread this infection.

Those suspected of having meningococcal disease must be evaluated as soon as possible in an acute care setting. Respiratory isolation, antibiotic therapy, and close monitoring are required.

Persons likely to be at greatest risk from exposure include those who have spent 20 or more hours with the infected person in the week preceding the illness, and those who have contact with the infected person's nose and throat secretions through activities such as sharing toys, food, glasses, or bottles. These "close contacts" should be evaluated as soon as possible for antibiotic therapy (ciprofloxacin, rifampin, or ceftriaxone) to prevent this illness.

If a suspected or confirmed case of meningococcal disease occurs in a shelter, the local board of health must be notified immediately. This agency can help the shelter in identifying people at risk and instituting measures to control the spread of this potentially fatal disease. ■■

Generic	Brand Name	Cost
ceftriaxone	Rocephin	\$\$\$\$\$
chloramphenicol	Chloromycetin	\$\$\$\$\$
ciprofloxacin	Cipro	\$\$\$
penicillin G		\$\$\$
rifampin	Rifadin, Rimactane	\$\$\$

## **References**

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