

## Meningococcal Disease

- *Meningococcal bacteria cause bacterial meningitis and sepsis, both serious and life-threatening conditions<sup>1,2</sup>*
- *Four of the five most common strains of meningococcal bacteria are vaccine preventable in the US (A, C, Y, W-135)<sup>2</sup>*
- *Infants younger than 7 months old are the most vulnerable age group to meningococcal disease in the US. In their first year of life, infants are about seven times more likely to contract the disease than 14 to 24 year olds<sup>3</sup>*

Meningococcal disease, although rare, is a sudden, life-threatening illness that manifests as bacterial meningitis – an infection of the membrane around the brain and spine – and sepsis – a bloodstream infection<sup>1,2</sup>. Caused by the bacterium *Neisseria meningitidis* (*N. meningitidis*), meningococcal disease progresses rapidly and can lead to death within 24 hours of the first symptoms<sup>2,4</sup>.

Though rates of meningococcal disease are unpredictable and vary from year to year. The incidence of this disease in the US has ranged from 900 to 3,000 people each year<sup>5</sup>

### Signs and Symptoms

The initial symptoms of meningococcal disease are often unspecific and flu-like, and it can be difficult for even a healthcare professional to diagnose the disease in the early stages<sup>7</sup>. Classic symptoms, such as neck stiffness and petechial (small purplish) rash, do not appear until relatively late in the illness, which can delay lifesaving treatment<sup>8</sup>.

Despite treatment, the case mortality rate from meningococcal disease is 10-20%<sup>6</sup>

Meningitis Symptoms <sup>7</sup>	Sepsis Symptoms <sup>1</sup>
– Fever	– Fever
– Constant crying	– Vomiting
– Poor eating and drinking	– Limb, joint, or muscle pain
– Vomiting & nausea	– Cold hands and feet
– Severe headache	– Shivering
– Painfully stiff neck	– Pale or mottled skin
– Sensitivity to light	– Breathing fast or breathless
– Inactivity, sluggishness	– Small flat or raised fine rash of red or purple spots that progresses to larger red patches or purple lesions
– Sleepiness	– Sleepiness
– Confusion	– Confusion
– Rash (not present in all cases)	
– Seizures	

Distinct symptoms of meningococcal meningitis typically do not manifest until 13-22 hours after the first symptoms appear<sup>8</sup>

### Transmission

Most cases of meningococcal disease occur in previously healthy people without any warning<sup>9</sup>. Meningococcal bacteria can be passed between people through coughing, sneezing and direct contact, such as kissing<sup>4</sup>.

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Common adolescent and young adult lifestyles such as going out to crowded night clubs, living in a dormitory or military barracks, smoking, kissing and sharing food and drink can increase the likelihood of contracting the disease in these age groups<sup>2</sup>.

In addition, traveling to certain areas overseas where meningococcal disease is common can increase the likelihood of a person contracting the disease or becoming a carrier of meningococcal bacteria<sup>2,11</sup>.

Infants may be more likely to become infected through close contact with their family members who may carry the bacteria in the back of their noses and throats without symptoms themselves<sup>4,10</sup>.

While the meningococcal bacteria can cause deadly disease, some people can harbor and spread the bacteria to others, without necessarily becoming ill themselves<sup>10</sup>. In fact, close household contact with an infected individual can increase the risk of acquiring the bacteria by 800 fold<sup>12</sup>.

### Risk Groups

Infants and adolescents are particularly susceptible to meningococcal disease<sup>3</sup>.

Infants may be particularly susceptible to meningococcal disease in part because their immune systems have not fully developed<sup>12,13</sup>. However, the majority of infants impacted by the disease were previously healthy. Infants younger than 7 months old are the most vulnerable age group to meningococcal disease in the US. In their first year of life, infants are about seven times more likely to contract the disease than 14 to 24 year olds<sup>3</sup>.

Adolescents and young adults are also at an increased risk of contracting meningococcal disease, which is associated with changes in behavior and lifestyle<sup>3,14,15</sup>. These age groups also have an unusually high case fatality rate from meningococcal disease<sup>3,14</sup>. Further, adolescents and young adults are more likely to be carriers of the bacteria than other age groups and can transmit the bacteria to family and friends<sup>16</sup>.

### Epidemiology

*N. meningitidis*, the bacteria that cause meningococcal disease, can

At any given time, it is believed that 10-20% of people worldwide can carry *N. meningitidis*, the bacteria that causes meningococcal disease, in the back of their nose and throat without showing any symptoms<sup>4,10</sup>

In their first year of life, infants are more than seven times more likely to contract the disease than 14 to 24 year olds<sup>3</sup>

Currently in the US, four of

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be divided into groups, called serogroups. Five main groups cause the majority of all meningococcal disease – A, B, C, Y and W-135 – four of which are vaccine preventable (A, C, Y and W-135) in the US<sup>2</sup>.

the five most common serogroups of meningococcal disease are vaccine preventable (A, C, Y and W-135)<sup>2</sup>

Though rates of meningococcal disease are unpredictable and vary from year to year, the incidence of bacterial meningitis in the US ranges from 900 to 3,000 each year<sup>5</sup>. It should be noted that the dominant groups of meningococcal disease vary by country and region, and can change over time, making it an even more unpredictable disease, and a significant public health threat for many countries, in particular Africa and the Middle East<sup>4,17</sup>. Meningococcal disease can be endemic, causing sporadic cases or small outbreaks within communities and institutions, or epidemic, spreading quickly throughout large populations<sup>4,18</sup>.

### Treatment

Meningococcal disease can be treated with antibiotics, though it is important that treatment be started quickly<sup>2</sup>. Despite appropriate treatment, there remains a high case mortality rate (10%). Up to 20% of those affected will suffer with long term consequences even with appropriate treatment<sup>4</sup>.

### Meningococcal Disease Prevention

Meningococcal disease is a cause of preventable death and disability in both industrialized and developing countries<sup>6</sup>.

According to the US Centers for Disease Control (CDC), the most effective way to protect against certain types of bacterial meningitis is to complete the recommended vaccine schedule<sup>10</sup>.

The US Advisory Committee on Immunization Practices (ACIP) currently recommends routine immunization with a quadrivalent meningococcal conjugate vaccine for adolescents aged 11 through 18 years (a single dose administered at 11 or 12 years, with a booster dose at age 16 years for persons who receive the first dose before age 16 years), and infants aged 2 months or older who are at increased risk for meningococcal disease. ACIP defines high-risk infants as those affected by anatomical or functional asplenia or complement component deficiency (dosing schedule and interval for booster dose varies by age at time of previous vaccination)<sup>19</sup>.

Vaccination campaigns against two other leading causes of

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bacterial meningitis and sepsis – Haemophilus influenzae type B (Hib) and Streptococcus pneumoniae (pneumococcus) – have been extremely effective in reducing disease incidence and death caused by these illnesses<sup>20</sup>. Meningococcal disease is the third and final leading form of bacterial meningitis to be addressed by vaccines<sup>21</sup>. There are vaccines available in the US to help prevent four of the five most common strains of meningococcal disease bacteria (A, C, Y and W-135)<sup>2</sup>.

### References

1. Centers for Disease Control and Prevention. Meningococcal Disease: Signs and Symptoms. March 2012 Update. Available at: <http://www.cdc.gov/meningococcal/about/symptoms.html>. Accessed on July 18, 2013.
2. Centers for Disease Control and Prevention. Epidemiology and Prevention of Vaccine-Preventable Diseases (The Pink Book: Course Textbook). 12th Edition, 2nd printing. May 2012 update. Available at: <http://www.cdc.gov/vaccines/pubs/pinkbook/mening.html>. Accessed on July 18, 2013.
3. Cohn, A. et al. Changes in Neisseria meningitidis Disease Epidemiology in the United States, 1998-2007: Implications for Prevention of Meningococcal Disease. Clinical Infectious Diseases 2010:50. Available at <http://cid.oxfordjournals.org/content/50/2/184.full.pdf+html>. Accessed on July 18, 2013.
4. World Health Organization. Meningococcal Meningitis. December 2011. Available at: <http://www.who.int/mediacentre/factsheets/fs141/en/index.html>. Accessed on July 18, 2013.
5. National Meningitis Association. Available at: <http://www.nmaus.org/meningitis>. Accessed on July 18, 2013.
6. Stephens DS. Conquering the Meningococcus. FEMS Microbiol Rev. 2007;31(1):3-14. Available at <http://onlinelibrary.wiley.com/doi/10.1111/j.1574-6976.2006.00051.x/pdf>. Accessed on July 18, 2013.
7. Mayo Foundation for Medical Education and Research. Meningitis. April 2011. Available at: <http://www.mayoclinic.com/health/meningitis/DS00118/DSECTION=symptoms>. Accessed on July 18, 2013.
8. Thompson, M.J. et al. (2006). Clinical recognition of meningococcal disease in children and adolescents. Lancet, 367(9508), 397-403. Available at: [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(06\)67932-4/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(06)67932-4/fulltext). Accessed on July 18, 2013.
9. Poland, GA. Prevention of Meningococcal Disease: Current Use of Polysaccharide and Conjugate Vaccines. Clinical Infectious Diseases 2010:50 (Suppl 2):S45-S53. Available at: [http://cid.oxfordjournals.org/content/50/Supplement\\_2/S45.full.pdf](http://cid.oxfordjournals.org/content/50/Supplement_2/S45.full.pdf). Accessed on July 18, 2013.
10. Centers for Disease Control and Prevention. Bacterial Meningitis. Updated March 2012. Available at <http://www.cdc.gov/meningitis/bacterial.html>. Accessed July 18 2013.
11. Centers for Disease Control and Prevention. Meningococcal Disease: Risk Factors. March 2012 Update. Available at: <http://www.cdc.gov/meningococcal/about/risk-factors.html>. Accessed on July 18, 2013.
12. Rosenstein, Nancy. Et al. 2001. Meningococcal Disease. New England

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- Journal of Medicine 2001: 344 (18), 1378-1388. Available at: <http://www.nejm.org/doi/full/10.1056/NEJM200105033441807>. Accessed on July 18, 2013.
13. Harrison, L. Prospects for Vaccine Prevention of Meningococcal Infection. *Clinical Microbiology Reviews* 2006: 19 (1), 142-164. Available at <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1360272/pdf/0024-05.pdf>. Accessed on July 18, 2013.
  14. Harrison, L. et al. 2001. Invasive meningococcal disease in adolescents and young adults. *Journal of the American Medical Association* 2001: 286(6), 694-699. Available at: <http://jama.jamanetwork.com/article.aspx?articleid=194084>. Accessed on July 18, 2013.
  15. Harrison L, A New Era in Adolescent Immunization. *Medscape.com*. Available at: <http://www.medscape.com/infosite/nfid/article-1>. Accessed on July 18, 2013.
  16. National Advisory Committee on Immunization. 2009. Update on the invasive meningococcal disease and meningococcal vaccine conjugate recommendations. *Canada Communicable Disease Report*, April 2009, Vol. 36. Available at: <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09pdf/acs-dcc-3.pdf>. Accessed on July 18, 2013.
  17. Ceyhan, Mehmet et al. Meningococcal disease in the Middle East and North Africa: an important public health consideration that requires further attention. *International Society for Infectious Diseases*. 2012. Available at: <http://www.sciencedirect.com/science/article/pii/S1201971212001269>. Accessed July 2013.
  18. World Health Organization. Meningococcal Position Paper. *Weekly Epidemiological Record* No. 44, 2002, 77, 329-340. Available at: [http://www.who.int/immunization/wer7740meningococcal\\_Oct02\\_position\\_paper.pdf](http://www.who.int/immunization/wer7740meningococcal_Oct02_position_paper.pdf). Accessed on July 18, 2013.
  19. Centers for Disease Control and Prevention. Prevention and Control of Meningococcal Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *Morbidity and Mortality Weekly Report (MMWR)*. March 22, 2013. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6202a1.htm#Box2>. Accessed July 2013.
  20. Centers for Disease Control and Prevention. Prevention and Control of Meningococcal Disease – Recommendations of the Advisory Committee on Immunization Practices. *MMWR* 2005; 54 (RR07): 1-21. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5407a1.htm>. Accessed on July 18, 2013.
  21. Stoddard, J. and Dougherty, N. (2009). Commentary: Universal immunization of infants against *Neisseria meningitidis*: Addressing the remaining unmet medical need in the prevention of meningitis and septicemia. (*Human Vaccines* 6:2, 1-5; February 2010). Available at: <http://www.landesbioscience.com/journals/vaccines/StoddardHV6-2.pdf>. Accessed on July 2013.