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Bacterial Meningitis: A Collegiate Concern?

This unit is designed to increase your understanding of a highly dangerous infection, and help you protect your student athletes from its potentially fatal consequences.

List of Objectives:

1. Participants will be able to identify predisposing factors and modes of transmission.
2. Participants will be able to recognize signs, symptoms and combinations thereof, specific to bacterial meningitis.
3. Participants will be able to identify populations in which the disease may occur and with whom vaccination may be warranted.

Meningitis is a viral or bacterial infection of the meninges, the lining of the brain and the subarachnoid space. The disease is a devastating illness that often occurs in the prime of life and can be fatal. A thorough understanding of this entity is of utmost importance, as it may appear with "typical" symptoms associated with influenza or the common cold. These symptoms, in fact, may be important factors in an often grave illness. Recent recommendations by the Advisory Committee on Immunization Practices have called for a greater awareness of the disease, its symptoms and preventative measures for health care professionals providing care to college students.

Although the emphasis of this manuscript is on bacterial meningitis, it is important to understand all aspects of the disease. Viral, or aseptic, meningitis is more common and generally occurs in summer to early autumn. This form is rarely life threatening. It has a similar mode of transmission to the bacterial type. Often, abdominal discomfort, chest pain, or a rash will be present. Most cases of viral meningitis run an uneventful course. Since this is a virus (similar to the common cold), it cannot be treated with antibiotics.² Recovery is normally complete, but headaches and drowsiness may be persistent.

Bacterial meningitis, although less common than viral, has recently become a greater health concern in the United States. It is a greater health risk than viral, and can be fatal. What makes bacterial meningitis a particularly dangerous disease is the fact that it is relatively rare (1 to 3 people per 100,000 annually)² and that it can be deceptive in its often inconsistent symptomatic presentation. This presentation can be easily confused with the common cold before it progresses to severe, even fatal, meningitis. Its early symptoms are often difficult to recognize and can progress very rapidly.

Predisposing factors to bacterial meningitis include pre-existing diabetes mellitus, otitis media, pneumonia, sinusitis and alcohol abuse.⁶ Bacteria may spread by close contact between individuals, but these bacteria do not live outside of the body for long. Temporary nasopharyngeal carriage is characteristic of meningococcal, pneumococcal and Type B meningitis.¹⁵ Today, *Neisseria Meningitidis* and *Streptococcus Pneumoniae* are the leading causes of bacterial meningitis and its outbreak. Infection caused by *Neisseria Meningitidis* is known as meningococcal meningitis. Meningitis caused by *Streptococcus pneumoniae* is known as pneumococcal meningitis. *Haemophilus influenzae*, or Type B (Hib), does not cause epidemics, but poses an increased risk for unvaccinated individuals, especially infants. Hib was normally the leading cause of bacterial meningitis, but newer vaccines have greatly reduced its occurrence in recent years.^{4,15} None of these bacteria are considered highly contagious.

All types of the disease can be transmitted by direct contact between individuals through saliva and nasal secretions. Incidence is highest in the winter months, due to the greater frequency of upper respiratory tract infections, closer personal contacts, and lack of indoor ventilation.⁵ The literature reports that between five and twenty percent of the general population carry the meningococcal bacteria in the nose and throat in a relatively harmless state.^{5,10,14} This means 500 million out of six billion people of the world are "carriers". The rate is highest in adolescents and young adults.¹⁷ These carriers may harbor the bacteria for days or months, yet may never develop the disease. Carriage can aid in immunity in some individuals. In certain instances, however, the bacteria break through the body's immune defenses and travel to the fluid around the brain, the blood stream, or both. They enter the bloodstream and travel to the meninges, inflaming them and causing meningitis or multiply uncontrollably in the bloodstream, releasing toxins causing blood poisoning or septicaemia. The fatality rate in this form of the disease is two to four percent, while it reaches twenty percent with septicaemia.⁵ The speed of the progression of blood poisoning can be frightening, which explains the higher fatality rate. During epidemics of bacterial meningitis, the carrier rate may reach 95%, yet less than 1% may ever develop the disease. The bacteria is not transmitted through casual contact from water supplies, swimming pools, restrooms, or bars where an infected individual, has been present. Intimate or direct, close personal contact with an infected individual within seven days can place an individual at risk for contracting bacterial meningitis. It can also be transmitted through the air via droplets of respiratory secretions from an infected person.¹ Common modes of transmission include close contact through:

- Coughing
- Sneezing
- Kissing
- Sharing water bottles, drinking glasses or eating utensils
- Sharing cigarettes
- Poor or improper hygiene

Recognizing the acute symptoms is of utmost importance for health care providers, and can be the difference between life and death. Meningitis is not easy to identify acutely, because many of the symptoms are similar to those of the flu or the common cold. The progression of this disease and its symptoms vary from a few hours to a few days.⁷ The classic clinical presentation of acute bacterial meningitis in adults is the triad of fever (greater than 101 degrees), neck stiffness, and an altered mental state, such as confusion or agitation.² The absence of all three of these symptoms effectively eliminates bacterial meningitis. However, less than two-thirds of patients will have all three symptoms.⁶ Other symptoms may also include chills, vomiting, severe headaches, photophobia, drowsiness, joint pain, rash and septicaemia. Rashes are variable, but may appear on the soles of the feet, palms of the hands, or on areas where pressure may be applied (e.g.- under garments). Rashes may have an appearance of red to purple spots, or bruising, as a result of septicaemia.⁷ This sign may be difficult to identify in darker skinned individuals. This is a very serious sign and requires immediate referral. If two or more of any of these signs are present, consult a physician immediately, as the disease progresses quickly. Culturing the individual's spinal fluid and identifying the bacteria responsible for infection completes diagnosis.

Initially, the infection will be systemic and will generate nonspecific symptoms such as fever and rash. Once the infection worsens, an inflammatory response occurs within the cerebrospinal fluid resulting in meningeal inflammation, which can elevate intracranial pressure. As these responses occur, neck stiffness, headaches and altered mental status can ensue.

The majority of people who develop the meningococcal form of the disease make a full recovery. Up to twenty-five percent of patients who recover, however, may have chronic damage to the nervous system.¹⁴ Complications can occur and range from recurring headaches, tiredness, depression, and mood swings to epilepsy, deafness, brain damage, and amputations from septicaemia. Deafness, to varying degrees, is the most common complication.⁵

The use of prophylactic antibiotics such as Rifampin and Ciprofloxacin is effective in most cases.^{12,14,16} A reasonably early diagnosis with antibiotic treatment will generally result in a complete recovery. In rare cases,

meningococcal infection is overwhelming, defying medical treatment, and can be fatal. Antibiotics are also recommended for individuals who have come in close contact with infected individuals.

Bacterial meningitis has traditionally been the concern of overseas travelers, especially in areas where an epidemic has arisen. It has been known for some time that bringing together large groups of young adults and adolescents, such as military recruits, has been associated with outbreaks of meningococcal meningitis.⁸ Military recruits are routinely vaccinated. Although clusters of cases are rare in the United States, the incidence of meningococcal meningitis has increased in the past few years on college campuses, particularly among students living in college housing. It is estimated that 100 to 125 cases of this form of the disease occur annually on college campuses across the country, with five to fifteen students dying each year as a result.^{1,4} In a recent five-year study, Harrison et al. compared the incidence of meningococcal meningitis in Maryland college students to a similar age group in the general population. The average annual incidence was 1.74 per 100,000 among students enrolled in four-year schools vs. 1.44 in the general population of the same age. They also found a 3.24 per 100,000 incidence in students who were on-campus residents vs. a .96 per 100,000 in students living off-campus. A similar study by Neal et al. found higher rates of the disease in colleges which provided dining hall facilities to greater than 10% of their student population. It appears that college students residing in on-campus housing are at higher risk. A recent American College Health Association recommendation suggests meningitis vaccinations be given to reduce the risk to college students. Harrison et al. state that it is reasonable for physicians to be proactive and provide college students, especially those in on-campus housing, with the vaccine. At present, many colleges' and universities' student health registration forms recommend meningococcal disease vaccinations, but none are known to require vaccination for admission.¹

Traditionally, vaccinations for adults were able to protect from two strains of meningococcal bacteria. They have only been recommended for areas experiencing epidemic or for travel to areas of the world where high rates of the disease are known to occur. Vaccines can now protect an individual from strains of Hib, some strains of meningococcal bacteria and many strains of pneumococcal bacteria. This pre-exposure vaccination protects from four strains of meningococcal disease, which are responsible for approximately 70% of the disease. Development of immunity after vaccination takes between seven and ten days.¹ Its duration is three to five years with an efficacy rate of about 80-90%.

As of October 20, 1999, the Advisory Committee on Immunization Practices (ACIP) of the Centers for Disease Control and Prevention (CDC) recommends that individuals who provide medical care to college freshman, particularly those living in or planning to live in college dormitories, should provide information about meningococcal disease and the benefits of vaccination to these students and their parents. ACIP also recommends that immunization be made readily available to those students wishing to reduce their risk and who choose to be vaccinated. Information should be made readily available to college freshman and students living in dormitories.¹

These recent recommendations make it the responsibility of all Health Care Professionals who provide acute or preventative care to college students to increase their knowledge of bacterial meningitis. They must also disseminate that information, and make preventative measures available to these students, especially those living in college housing. As with any changes regarding the prevention of disease, it will take much effort in understanding the rationale for these changes in attempting to achieve compliance.

For further information on the use of vaccines and bacterial meningitis, visit the Centers for Disease Control at www.cdc.gov or the American College Health Association at www.acha.org. -Andy Smith, M.S., A.T., C.

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Bacterial Meningitis: A Collegiate Concern?

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Record answers below. Clearly circle ONE answer per line.

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13. A B C D E
14. A B C D E

Mark Answers Above.

Bacterial Meningitis: A Collegiate Concern?

1. Which statement about carriers of meningococcal meningitis is not true:

- A Carriers will pass on the bacteria through nasal secretions, most likely in the winter months
- B Carriers will typically harbor these bacteria for an entire lifetime
- C Carriers may become immune to the bacteria
- D Up to 20% of carriers harbor the bacteria in a relatively harmless state
- E The rate may reach 95% in epidemics

2. What is/are the most common forms of bacterial meningitis of concern to the college population in America?

- A Meningococcal
- B Aseptic
- C Pneumococcal
- D Type B
- E Both A & C

3. The most common complication in survivors of bacterial meningitis is:

- A Deafness/ Hearing loss
- B Amputations
- C Brain damage
- D Epilepsy
- E Mood swings

4. Antibiotic treatment should be utilized in:

- A All diagnosed cases of meningitis
- B All diagnosed cases of bacterial meningitis
- C All known close contact exposures with infected individuals
- D Both A & C
- E Both B & C

5. A close contact exposure to an infected individual two days after vaccination will not protect the vaccinated individual who would need antibiotic treatment as well, because:

- A The individual is not protected from all strains
- B Vaccination protects against only 70% of the disease
- C Development of immunity takes 7-10 days post-vaccination
- D All aseptic meningitis cases should be treated with antibiotics
- E New strains of the disease have been recently developing in the United States and are only resistant to antibiotics

6. Which statement best describes viral meningitis:

- A It is relatively rare
- B Carriage can aid in immunity in some individuals
- C Its clinical presentation in adults is the triad of fever ,neck stiffness and an altered mental state.
- D It is more common than bacterial and occurs in the summer months
- E It is more common than bacterial and occurs in the winter months

7. Septicaemia is:

- A Often difficult to recognize in dark skinned individuals
- B Is a sign of serious meningococcal infection due to the release of toxins into the blood stream
- C Can spread at a high rate and is responsible for a higher fatality rate
- D Both A & B
- E All

8. The average annual incidence of meningococcal meningitis among on-campus, four year college resident students in the United States is:

- A 1.74 per 100,000
- B .96 per 100,000
- C 3.24 per 100,000
- D 5.14 per 100,000
- E 1.44 per 100,000

9. Which statement best describes the ACIP recommendation on meningococcal vaccination?

- A All individuals who live in college housing should consider meningococcal vaccination
- B College health care providers must provide vaccinations to all students wishing to reduce the risk of meningococcal infection
- C Individuals who provide medical care to college freshman, particularly those living in or plan to live in college dormitories, should provide information about meningococcal disease and the benefits of vaccination
- D Individuals who provide medical care to college freshman should provide information about meningococcal disease and the benefits of vaccination
- E College health care providers should require meningococcal vaccination for college freshman admissions, particularly those living in or plan to live in college dormitories

10. Vaccinations have decreased which particular strain of bacterial meningitis in adults?

- A Type B
- B Streptococcus
- C Neisseria
- D Aseptic
- E Pneumococcal

11. Bacteria carrying meningitis:

- A Can harbor in the nasopharyngeal cavity of individuals for months, yet never cause infection
- B In certain strains can multiply uncontrollably in the blood stream
- C Can cause fatalities in up to 20% of individuals who develop meningococcal meningitis
- D Both A & B
- E All

12. Which statement is false regarding college resident students appearing to be at higher risk for meningococcal infection:

- A This age group has the highest rate of carriers
- B Recent studies have shown a higher risk in this specific group
- C Casual contact causing infection is likely occur in this specific group
- D The modes of transmission are more likely to cause infection in these living accommodations
- E The symptoms are similar to those of the flu or the common cold and are difficult to diagnose

13. Immunity from meningococcal bacteria can:

- A Last 7-10 years after vaccinations
- B Be aided in some carriers
- C Occur in 7-10 days with vaccinations
- D Both B & C
- E All

14. Diagnosis of meningitis can be effectively be ruled out if the following are not present:

- A Fever, neck stiffness, headache and photophobia
- B Fever, rash, altered mental state, and septicaemia
- C Fever, neck stiffness, rash, and headache
- D Fever, neck stiffness, headache and an altered mental state
- E Fever, neck stiffness, rash and chills

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