

vScience Bites Radio
*small bites you can remember
to bite them in the behind*

Date: August 8, 2019

Meningitis and the Meningitis Vaccines, Part 1

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1. The Illness:

Meningitis is an acute inflammation of the protective membranes covering the brain and spinal cord, known collectively as the meninges. The inflammation may be caused by infection with viruses, bacteria, or other microorganisms, and less commonly by certain drugs.

The most common symptoms are fever, headache, an inability to tolerate light or loud noises and neck stiffness. Other symptoms can include confusion or altered consciousness. If a rash is present, it may indicate a particular form of meningitis being caused by *Neisseria meningitidis*.

A lumbar puncture, commonly called a spinal tap, is performed to collect a few drops of cerebrospinal fluid (CSF) to diagnose or exclude meningitis. Treatment includes antibiotics and sometimes, antiviral drugs, and corticosteroids to reduce brain inflammation. Meningitis can result in long-term consequences such as deafness, epilepsy, hydrocephalus, or cognitive deficits, especially if not treated quickly. Invasive meningococcal disease can be fatal; however, with antibiotic treatment, the case **fatality rate is about 10%**.

Meningitis can be caused by several pathogens for which there are vaccines: pneumococcus – (Pevnar 13), - H. Influenza B (HiB), rare meningitis caused by mumps (MMR) and meningococcus (Menactra). For this month's vScienceBites discussion, we're going to focus on the most serious form of meningitis: ***Neisseria meningitidis***.

2. The incidence of the infection –

In the United States, between **1,400 and 2,800 cases of meningococcal disease occur each year** – it is a RARE infection....and yet, we're vaccinating millions of US children with this vaccine every year.

The antibody levels decline rapidly over 2--3 years. To make matters worse, **as of 2010, there has been limited evidence that any of the current conjugate meningitis vaccines offer any protection beyond three years.**

N. meningitidis is part of the normal flora in the nose and throats of 20% of the population. Here's the key: >98% of cases of meningococcal disease are sporadic.

REFERENCE: MMWR. Control of Meningococcal Disease May 27, 2005/54(RR07);1-21
<https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5407a1.htm>

From all that I have read, there are very few risk factors that could lead to the normal flora causing an acute infection: persons without a spleen; persons with HIV, those who smoke.

In 2015, they pushed through a meningitis requirement for Ohio – even though we still are hanging on to our philosophical exemption by a thread. At that time, I requested stats from the Ohio Department of Health for the number of cases of meningitis in Ohio in 2013 and 2014.

There were **only 22 cases over a 24 month period; only TWO cases were in children aged 5 to 19, both in 2013.** Serotype B was confirmed in 5 out of 22 (23%) cases; the meningitis vaccines do not cover serotype B. We will talk about the meningitis B vaccines in our next vScienceBites.

3. History of the vaccine

“After dramatic reductions in the incidence of Streptococcus pneumoniae (Prevnar) and Haemophilus influenzae type b infections (HiB), *Neisseria meningitidis* has become the leading cause of bacterial meningitis in children and young adults.”

MMWR. Control of Meningococcal Disease May 27, 2005 / 54(RR07);1-21
<https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5407a1.htm>

1981: **Menomune**, first polysaccharide vaccine approved. Contained thimerosal.

2005: **Menactra**: first conjugated vaccine licensed/approved for persons 2 to 55 yrs.

2010: **Menevo**: second conjugated vaccine licensed/approved for persons 11 to 55yr.

All three of these vaccines have A/C/Y/WI-135. No serotype B - Trumenba (2014) and Bexsero (2015) - we'll be discussing these vaccines in detail on the next vScienceBites.

4. The push for College Students:

- **1991-1992:** College Survey: 43 cases of meningitis were reported over two years with a total enrollment of **4,393,744 students**,
- **1992-1997:** Maryland survey. Incidence in college students was about the same as those not going to college. (14 cases per 1,000,000 students). This was promoted as college students living in dorms had a three times greater risk of

developing meningitis than those living off campus. The actual numbers? 3.2/100,000 vs .96/100,000 – so essentially 3 to 1

- **1998-1999:** 90 cases reported to CDC (population >300M). 40 occurred among 2.27M college freshman.

U.S. surveillance data from the 1998-1999 school year suggested that the overall rate of meningococcal disease among undergraduate college students **is lower than the rate** among persons aged 18-23 years who are **not enrolled in college**.

Nonetheless,

2005: The overall incidence among college students usually **is similar to or somewhat lower** than that observed among persons in the general population of similar age.

REFERENCE: May 27, 2005 / 54(RR07);1-21

<https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5407a1.htm>

Vaccination does not eliminate risk because a) the vaccine confers no protection against serogroup B disease and b) although the vaccine is highly effective against serogroups C, Y, W-135, and A, efficacy is <100%.

Table 1

Table 1. Studies of the risk for meningococcal disease among college students

	Study A*	Study B†	Study C‡	Study D§	Study E¶
Are college students at higher risk than the general population of similar age?	no	no	no	N/A	yes
Among college students, are freshmen at higher risk?	N/A	no	yes	no	N/A
Among college students, are students living in dormitories/ catered halls at higher risk?	yes	yes	yes	no	yes
Among college students, are freshmen living in dormitories at higher risk?	N/A	N/A	yes	yes	N/A

3.23/100,000 vs 0.96/100,000 promoted as 3 times greater risk

* Froeschle J. Meningococcal disease in college students. Clin Infect Dis 1999;29:215-6.

† Harrison LH, Dwyer DM, Maples CT, Billmann L. Risk of meningococcal infection in college students. JAMA 1999;281:1906-10.

‡ Bruce M, Rosenstein NE, Capparella J, Perkins BA, Collins MJ. Meningococcal disease in college students. In: Abstracts of the 39th Annual Meeting of the Infectious Diseases Society of America, Philadelphia, PA, November 18-21, 1999:63.

¶ Neal KR, Nguyen-Van-Tam J, Monk P, O'Brien SJ, Stuart J, Ramsay M. Invasive meningococcal disease among university undergraduates: association with universities providing relatively large amounts of catered hall accommodations. Epidemiol Infect 1999;122:351-7.

N/A= not applicable.