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Meningococcal Disease in College Students, Virginia, December 1999 - April 2000

Ten students who attended Virginia colleges became ill with meningococcal disease between December 9, 1999 and April 22, 2000. Seven students were diagnosed with meningitis and three with meningococcemia. Their ages ranged from 18 to 22 years. Eight of the ill were male and eight were white (race was not reported for two persons). All but three of the ill students were freshmen; one case occurred in a sophomore, one in a junior, and one in a graduate student. The freshmen and sophomore lived in dormitories, while the older students lived in off-campus apartments. All were hospitalized and several were very critically ill, but no deaths occurred. Six cases occurred during outbreaks at two colleges and the others were sporadic cases at four different colleges.

The two outbreaks had very different disease transmission patterns. During the first outbreak, students became ill over a two-month period. The first case occurred on December 9, 1999. Roommates and close contacts who could have transmitted the organism to the case were given chemoprophylaxis, generally a single dose of ciprofloxacin, to eradicate the organism from their noses and throats. On February 7, 2000, a student who lived on the same dormitory floor developed meningitis. The two students were reportedly not friends, although it was later learned that they had some acquaintances in common. Close contacts and students living in the dormitory were given ciprofloxacin. In addition, because both cases had been identified as having serogroup C disease (for which vaccine is available), and because there was evidence of ongoing circulation of the organism in the student population over a period of months (including an ill sibling of a roommate of one of the cases), the Virginia Department of Health (VDH) recommended that vaccine be offered to students living on campus. On February 10, a special clinic was established and 1560 students were vaccinated. Four days after the onset of the second case, a third case occurred in a student who lived in a different dormitory. Vaccine was offered again on February 14. A total of 2406 (~85%) students were vaccinated and about 1650 doses of ciprofloxacin were given.

The second outbreak occurred over a three-day period in April. Three students developed illness on three consecutive dates, suggesting the possibility of co-primary infection from one asymptomatic carrier. Despite extensive interviews with the students and their friends, a link between the cases could not be established. The students lived in three separate dormitories; one spent extensive time in the same dormitory as another case but they were not friends, although they knew each other. The three students did not appear to have activities or close friends in common. Close contacts were identified and given ciprofloxacin to reduce the carriage rate among asymptomatic persons. Serogroup C also was responsible for this outbreak and once the serogroup was identified, VDH recommended vaccine for all freshmen living on campus since they appeared to be the population at risk. Another factor that influenced the decision to recommend vaccine for freshmen only rather than for all the students was that the end of school was less than three weeks away. Once the students left campus, their risk of disease acquisition would be no greater than that of the general public.

Of interest, all the students involved in the outbreaks were freshmen living in dormitories. Freshmen living in dormitories have been found to be at greater risk than the general population or other students for developing meningococcal disease.[1] All were male and at least four had attended parties during their incubation period. Bar patronage, alcohol consumption, and exposure to cigarette smoke have also been identified as risk factors for acquiring meningococcal disease.[2,3]

The Advisory Committee on Immunization Practices has recently recommended that practitioners who provide medical care to college freshmen dormitory residents should inform students and parents about meningococcal disease and the benefits of vaccination, and provide access to the vaccine for those who wish to reduce their risk of disease.

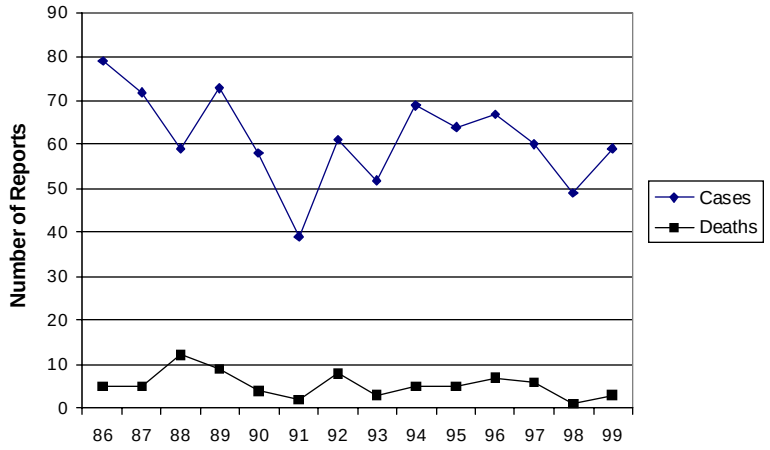
The four sporadic cases occurred at four different colleges and universities. One student had been vaccinated about four weeks prior to becoming ill. He had a protracted onset of illness, very different from the abrupt onset usually seen. Only one of the sporadic cases was a freshman. All had a history of attending parties or bars prior to developing illness.

continued on page 3

The Epidemiology of Meningococcal Disease in Virginia, 1986-1999

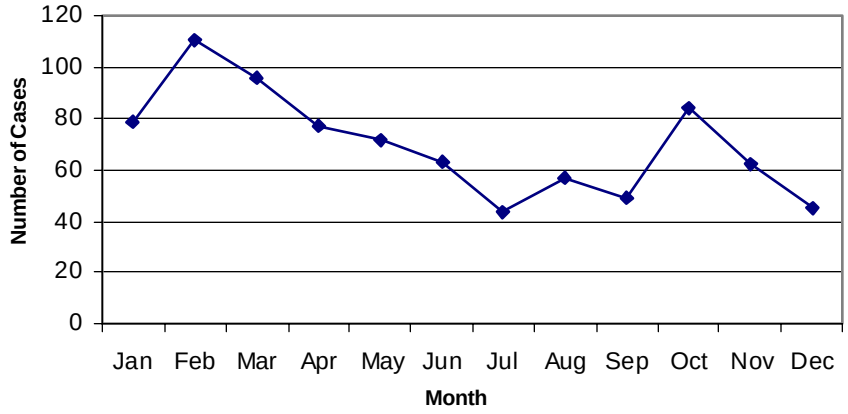
From 1986 through 1999, 861 cases of meningococcal disease were reported in Virginia. The number of cases per year ranged from 39 to 79 and averaged 61.5. The annual incidence rate for the 14-year period was 1.0 case per 100,000 population, with a range of 0.6 to 1.4 per 100,000 per year. A total of 75 (8.7%) persons died, with the number of deaths per year ranging from 1 to 12. The trend in number of cases and deaths is shown in Figure 1.

Figure 1. Trend in Meningococcal Infections and Deaths, Virginia, 1986-1999



The distribution of disease onset was bimodal, with peaks occurring in February and October (Figure 2). One-third of all cases occurred in the first quarter of the year. This is based on the fourteen years of data combined. No differences were observed in the incidence rates for males and females. An analysis of incidence rates by race group illustrated few differences, although the rates in non-whites tended to be somewhat higher than those in the white population. More specific categorization of racial groups was not possible with available data.

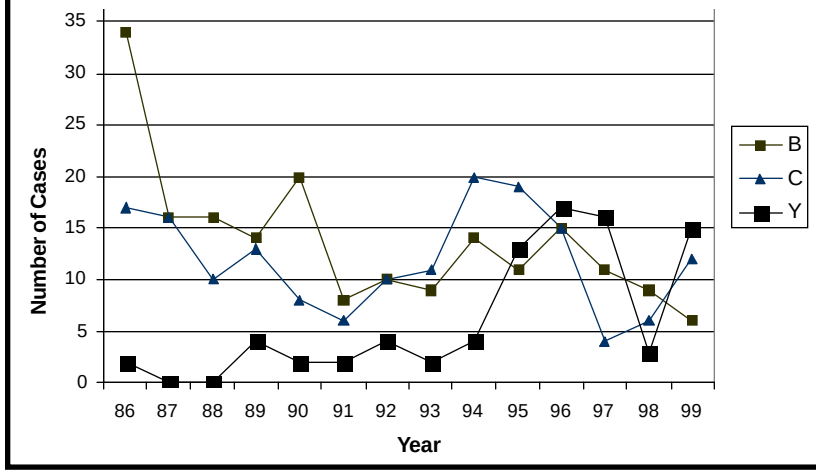
Figure 2. Month of Onset, Meningococcal Infections, Virginia, 1986-1999



Over the years, the average age of cases has increased from 15.7 years in 1986 to 25.1 years of age in 1999. Incidence rates were highest for young children (from birth through 4 years of age). During 1986-1999, from 18 to 33 cases of meningococcal disease were reported in young children each year. The incidence rate in this group was 4.1 cases per 100,000 population per year for 1997, 1998, and 1999.

Another age group whose meningococcal disease rates were higher than the rates for the total population was persons 15-24 years of age. Six to 22 cases per year were reported in this age group during 1986-1999. The annual incidence rate for this group of adolescents and young adults was 2.2 per 100,000 in 1995. In the four years since then, the rate has ranged from 1.2 to 1.6 cases per 100,000 population in 15-24 year olds.

Figure 3. Meningococcal Serogroup, Virginia, 1986-1999



A larger proportion of adult cases died. Six percent of children aged 0-4 years who had meningococcal disease from 1986-1999 died, compared to 7% of those aged 5-14 years, 10% of those aged 15-24, 13.5% of those aged 25-59, and 12.0% of those 60 years of age or older. Of interest, no deaths were reported among cases aged 15-24 years in 1986-1991. The 19 deaths reported for that group all occurred between 1992 and 1999.

It was difficult to assess trends in serogroup because it was determined for only 54% of cases. For those cases in which serogroup of the organism was identified, a general decrease in serogroup B meningococcal disease has been observed, as shown in Figure 3. The occurrence of serogroup C disease has vacillated markedly in the 1990's. Serogroup Y was virtually unseen until 1995, and has been steadily responsible for 13-17 cases per year since then, with the exception of 1998, when it caused only 3 cases. These data on serogroup may not be reliable, however, due to the large number of cases for which the bacterial culture was never forwarded to the state laboratory for serogroup confirmation.

A larger percentage of 0-4 year olds had serogroup B meningococcal disease compared to 15-24 year olds, while more of the latter age group had serogroup C disease. That is, among 0-4 year olds, 30.1% of cases were serogroup B, 16.5% were serogroup C, and 6.1% were serogroup Y. In contrast, for 15-24 year olds, 20.3% of cases were serogroup B, 24.0% were serogroup C, and 11.5% were serogroup Y. Again, these data are difficult to interpret because of the

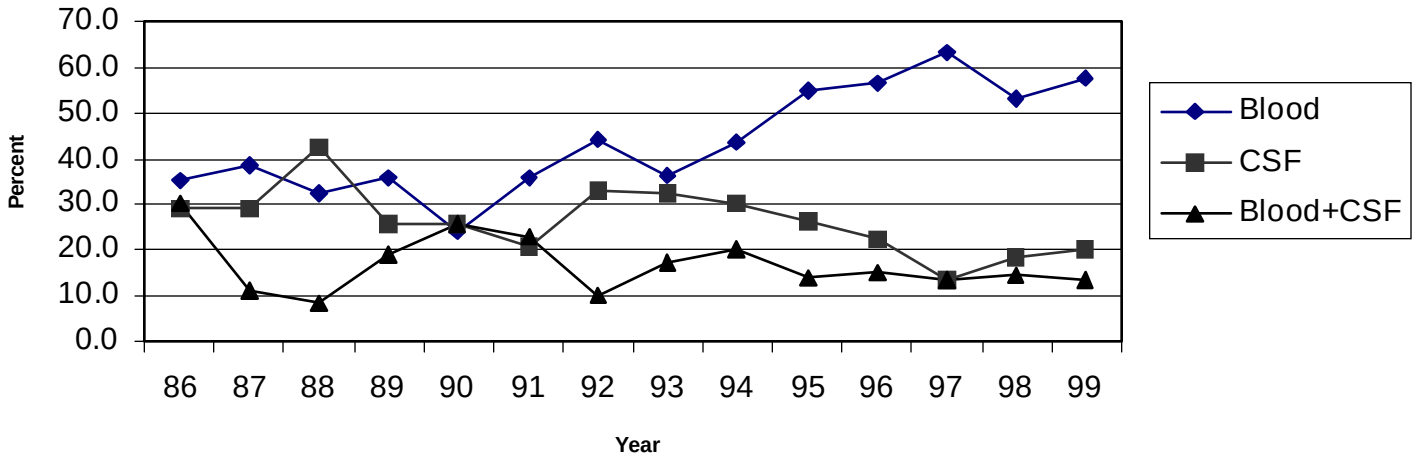
large number of cases for which serogroup was not determined.

Of the 75 deaths, 18 (24%) were serogroup C, 14 (18.7%) were serogroup B, and 6 were serogroup Y (8.0%). However, 44% had unknown serogroup. A larger percentage of cases that were confirmed to be serogroup C died compared to serogroups B and Y. That is, 10.8% of serogroup C cases died compared to 7.3% of serogroup B and 7.1% of serogroup Y cases.

Finally, over the years, the percentage of isolates from blood increased (Figure 4). The organism was isolated from the blood in as few as 24% of the cases in 1990 and as many as 63% in 1997. A concomitant decrease in cases in which the organism was isolated from the cerebrospinal fluid was also seen. Overall, generally less than one-fifth of cases had the organism isolated from both the blood and cerebrospinal fluid.

Contributed by C. Diane Woolard, PhD, MPH, Director, Division of Surveillance and Investigation, Office of Epidemiology.

Figure 4. Source of Specimen, Meningococcal Infections, Virginia, 1986-1999



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Of the ten students described in this article, all had serogroup C disease except for the graduate student who had serogroup B. According to national data from 1992-1996, serogroup C accounted for 35% of isolates for which serogroup information was available, serogroup B for 32%, serogroup Y for 26%, and serogroup W-135 for 4%.[4]

In order to make public health recommendations in the event of a meningococcal outbreak, especially with regard to using vaccine, it is essential to know the serogroup of the organism. Serogrouping is done at the state laboratory, the Division of Consolidated Laboratory Services (DCLS). All meningococcal isolates from normally sterile sites (e.g., blood and cerebrospinal fluid) should be sent to DCLS.

References

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

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3. Cookson ST, Corrales JL, Lotero JO, et al. Disco fever: epidemic meningococcal disease in northeastern Argentina associated with disco patronage. JID 1998; 178:266-9.

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Chemoprophylaxis of Contacts of a Meningococcal Case

The primary purpose of chemoprophylaxis of close contacts is to eliminate the bacteria from their noses and throats. That is, one of the close contacts may have been the source of exposure for the case. The antibiotic (usually rifampin or ciprofloxacin) is given to eliminate the carrier state, thus preventing the transmission of the organism.

The chemoprophylaxis is not, therefore, designed to protect the close contacts against meningococcal disease. Some of the contacts may already be protected due to recent (within the past three years) receipt of the meningococcal vaccine. A person who has been identified as a close contact of a patient with meningococcal disease for whom the prophylactic antibiotic is recommended should receive the chemoprophylaxis even if he has been vaccinated against the disease. The vaccine and the antibiotic serve different purposes. A vaccinated individual may still be a carrier of the bacteria and may need prophylaxis to eliminate the organism from his nose and throat.

While meningococcal disease may potentially be transmitted to others by the primary cases, their infectivity is low. Therefore, the primary means of preventing the spread of this disease is through the elimination of the carrier state among close contacts. Close contacts are defined as household members, day care center classmates, and other intimate contacts who may have exchanged nasopharyngeal secretions with the patient during the 10 days prior to illness onset. Examples of direct exposure to nasopharyngeal secretions include kissing, sharing drinks or eating utensils, and providing mouth-to-mouth resuscitation, suctioning or intubating the patient before antibiotic therapy is begun. Persons who provided other medical care to the sick person are not at increased risk for developing meningococcal disease and do not need chemoprophylaxis.

The recommendation for prophylaxis is restricted to close contacts because such close contact is necessary for the transmission of the organism from one person to another. These bacteria have no known reservoir outside of man, and asymptomatic carriers are usually the source of transmission.

Cases of Selected Notifiable Diseases Reported in Virginia*

Disease	Total Cases Reported, April 2000						Total Cases Reported Statewide, January through April		
		Regions							
	State	NW	N	SW	C	E	This Year	Last Year	5 Yr Avg
AIDS	46	6	10	0	15	15	298	238	324
Campylobacteriosis	57	11	12	18	5	11	106	103	125
***E. coli* O157:H7**	2	0	0	1	0	1	8	8	6
Giardiasis	36	9	14	7	2	4	130	96	94
Gonorrhea	1026	37	67	136	388	398	3458	3118	2948
Hepatitis A	5	3	1	0	0	1	50	41	59
B, acute	16	1	4	2	6	3	50	29	36
C/NANB, acute	1	0	0	0	0	1	1	6	4
HIV Infection	77	3	28	2	13	31	273	206	296
Lead in Children†	33	5	12	3	4	9	93	118	156
Legionellosis	0	0	0	0	0	0	3	6	6
Lyme Disease	7	2	3	1	1	0	12	3	2
Measles	0	0	0	0	0	0	0	3	1
Meningococcal Infection	6	3	0	1	2	0	23	19	21
Mumps	3	1	1	0	1	0	4	7	5
Pertussis	5	2	0	0	0	3	10	12	9
Rabies in Animals	55	15	3	10	9	18	159	135	166
Rocky Mountain Spotted Fever	0	0	0	0	0	0	0	0	0
Rubella	0	0	0	0	0	0	0	0	0
Salmonellosis	70	7	26	11	13	13	164	167	219
Shigellosis	19	1	4	10	3	1	33	21	82
Syphilis, Early§	20	1	3	8	1	7	108	141	271
Tuberculosis	25	2	11	4	0	8	73	82	102

Localities Reporting Animal Rabies This Month: Accomack 6 raccoons; Amelia 1 raccoon; Augusta 1 raccoon, 1 skunk; Bedford 1 raccoon, 1 skunk; Botetourt 1 cat; Caroline 1 skunk; Chesapeake 2 raccoons; Craig 1 bobcat, 1 skunk; Cumberland 1 raccoon; Dinwiddie 1 skunk; Essex 2 raccoons; Fairfax 1 fox, 1 raccoon, 1 skunk; Fluvanna 1 skunk; Franklin County 1 raccoon; Frederick 1 raccoon; Grayson 1 skunk; Greensville 1 raccoon; Halifax 1 cat, 2 raccoons; Henrico 1 raccoon; Henry 2 raccoons; Highland 1 raccoon; King & Queen 1 raccoon; Louisa 1 skunk; Northampton 4 raccoons; Orange 1 raccoon; Prince George 1 fox; Rockingham 1 fox; Shenandoah 1 dog, 2 raccoons, 1 skunk; Smyth 1 raccoon; Spotsylvania 2 raccoons; Virginia Beach 2 raccoons; Westmoreland 1 raccoon.

Occupational Illnesses: Asbestosis 14; Lead Exposure 8; Pneumoconiosis 3.

*Data for 2000 are provisional.

†Elevated blood lead levels ≥10µg/dL. §Includes primary, secondary, and early latent.

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