

Serotypes of *Streptococcus pneumoniae* Blood Culture Isolates from Adults in Franklin County, Ohio

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Isolates of *Streptococcus pneumoniae* in cultures of blood from 258 adults seen in 10 Franklin County, Ohio, hospitals from 1991 and 1992 were serotyped. Most strains (230 [89.2%]) belonged to serotypes that are included in the current pneumococcal vaccine. An additional 16 isolates (6.2%) were immunologically related to strains with serotypes that are included in the vaccine. Only 12 isolates (4.6%) were not covered by the vaccine. The rate of mortality from pneumococcal bacteremia in adults remains high (20%). While recent studies have documented the efficacy of the pneumococcal vaccine for preventing pneumococcal bacteremia (56 to 70%), use of the pneumococcal vaccine in susceptible patients by physicians remains low (19% in Franklin County). Additional efforts need to be expended to increase the use of the pneumococcal vaccine.

Streptococcus pneumoniae continues to be the leading cause of community-acquired pneumonia in adults (7). The 23-valent pneumococcal vaccine was licensed in 1983 (5). The serotypes selected for inclusion in the vaccine reflected those that caused disease 10 years ago. To determine if strains not covered by the vaccine more commonly caused invasive disease, isolates in cultures of blood from adults ($n = 258$) with pneumococcal bacteremia admitted to 1 of 10 Franklin County, Ohio, hospitals were collected as part of a community-based pneumonia incidence study (7). Isolates were serotyped by agglutination, and the serotypes were confirmed by the Quellung reaction as described previously (2, 4, 6). Patient demographic information and hospital discharge status were obtained from hospital records. Patient groups were compared by chi-square analysis.

Most strains (230 [89.2%]) belonged to serotypes that are included in the current pneumococcal vaccine (Table 1). An additional 16 isolates (6.2%) were immunologically related to strains that are included in the vaccine (2, 4, 6). The most common serotypes were 4 (12.8%), 14 (12.0%), 23F (9.7%), 9V (8.1%), 6B (6.2%), 1 (6.2%), and 3 (5.0%). Only 12 (4.6%) isolates had serotypes that were not covered by the vaccine (Table 2). The serotypes in Franklin County were similar to the serotypes previously reported in nationwide data (3). Variations included a lower proportion of serotype 3 strains and a higher proportion of serotype 9V strains in Franklin County.

The hospital mortality rate was 19% (43 of 230) in patients infected with strains with serotypes covered by the vaccine, 31% (5 of 16) in patients infected with strains immunologically related to strains with serotypes covered by the vaccine, and 33% (4 of 12) in patients infected with strains with serotypes not covered by the vaccine. These rates were not statistically different.

Pneumococcal bacteremia was most common (41% of cases) in the winter (December to February), least common (9% of

cases) in the summer (June to August), and intermediately common in the spring (28% of cases) (March to May) and fall (22% of cases) (September to November). A higher proportion of strains with serotypes not covered by the vaccine (17%; 4 of 23) were seen in the summer than during the rest of the year ($P = 0.14$). The proportions of strains with serotypes not covered by the vaccine that occurred in the other seasons were 5.5% (6 of 106) in the winter, 1.7% (1 of 57) in the fall, and 1.3% (1 of 72) in the spring.

S. pneumoniae continues to be an important and lethal

TABLE 1. Serotypes of *S. pneumoniae* covered by the pneumococcal vaccine

Serotype in vaccine (related serotype)	No. of isolates	No. (%) of deaths
1	16	1
2	0	0
3	13	4
4	33	4
5	3	1
6B (6A) ^a	16 (7)	5 (4)
7F	3	0
8	6	1
9N	6	1
9V	21	3
10A	0	0
11A	8	2
12F	11	2
14	31	5
15B (15A, 15C, 15F)	1 (2, 1, 1)	1 (0)
17F	3	0
18C	4	0
19F	11	4
19A (19C)	10 (3)	1 (1)
20	0	0
22F (22A)	8 (1)	3 (0)
23F	25	4
33F (33A)	1 (1)	1 (0)
Total vaccine isolates	230	43 (19)
Total vaccine related isolate	16	5 (31)

^a Serotypes in parentheses are those of isolates immunologically related to the vaccine.

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TABLE 2. Serotypes of *S. pneumoniae* isolates not immunologically related to the vaccine

Serotype	No. of isolates	No. (%) of deaths
13	3	0
16	1	1
29	1	1
31	2	1
34	1	0
45	2	1
Nontypeable	2	0
Total	12	4/12 (33)

pathogen in our community (Franklin County), with a mortality rate of 20%, which is similar to the mortality rate of 24% reported by Austrian and Gold (1) 30 years ago. Failure to prevent pneumococcal disease in Franklin County is not due to an inappropriate vaccine composition because most of the serotypes (95%) that cause bacteremia are included in the current 23-valent pneumococcal vaccine. Despite recent admonitions from public health authorities (2, 8) and studies demonstrating efficacy rates of the pneumococcal vaccine for the prevention of pneumococcal bacteremia of 56% (9), 64% (2), and 70% (10), the use of pneumococcal vaccine remains low. Interviews from patients in Franklin County indicated that only 19% of patients 64 years old or older had received the pneumococcal vaccine (7a). Additional efforts need to be expended to increase the rate of use of the pneumococcal vaccine by physicians.

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