Pneumococcal Serotypes in the Elderly

James D. Kellner¹ and Lionell Mandell²

¹Department of Pediatrics, University of Calgary, Alberta Children’s Hospital, Calgary, and ²Department of Medicine, McMaster University Medical School, Hamilton, Ontario, Canada

(See the article by Feikin et al. on pages 481–7)

It appears that the most important advancement in recent years for the prevention of invasive pneumococcal infections in adults has been the implementation of the 7-valent pneumococcal conjugate vaccine (PCV7) for routine immunization of children.

The Active Bacterial Core surveillance (ABCs) of the Centers for Disease Control and Prevention observed statistically significant decreases in the incidence of invasive pneumococcal infections in adults as well as children in the United States in 2000 and 2001 after the introduction of PCV7 for children, compared with 1998 and 1999, suggesting an indirect benefit for adults [1]. The decrease was greatest for persons aged ≥65 years. Similar decreases were observed in the Northern California Kaiser Permanente surveillance study [2]. The use of PCV7 in children, however, is probably not the sole cause of decreasing rates of invasive infection in adults. For example, the ABCs observed significant decrease in infections caused by both PCV7 serotypes and non-PCV7 serotypes in 20–39-year-old persons, suggesting a temporal change unrelated to receipt of the vaccine [1]. In addition, earlier decreases in the rate of infection in the elderly population were associated with use of the 23-valent polysaccharide vaccine, and because the prevalence of individuals vaccinated with the 23-valent vaccine continues to gradually increase, further decreases attributable to this vaccine should be expected [3–6]. However, it is reasonable to conclude that PCV7 has a significant indirect benefit in adults.

The serotypes in PCV7 were selected because they cause the vast majority of invasive pneumococcal infections in children in North America, but these serotypes cause a much smaller proportion of invasive pneumococcal infections in adults overall. Now, Feikin et al. [7] have presented data gathered in 1998 and 1999, before the introduction of PCV7, showing that, in sequentially older adult age groups, a progressively increased proportion of all invasive pneumococcal infections are caused by pediatric serotypes—in particular, 5 of the serotypes included in PCV7 (6B, 9V, 14, 19F, and 23F). This led Feikin and colleagues to conclude that a novel approach to disease prevention in the elderly population would be vaccination with PCV7. This provocative suggestion is worthy of discussion, but as Feikin and colleagues acknowledge, there are numerous important factors to consider before PCV7 could ever be used for elderly persons. The foremost consideration is whether PCV7 would be efficacious. As Feikin et al. [7] discuss, there are only limited immunogenicity data and no data on efficacy pertaining to prevention of invasive infections or pneumonia in adults. It is not known how many doses of PCV7 an adult would require, what age(s) the persons should be to receive the vaccine, and whether PCV7 should be given simultaneously with or some time before or after the 23-valent polysaccharide vaccine is given.

Although the immune systems of infants and elderly persons may be somewhat similar in that, for both age groups, the adaptive response to polysaccharide antigens may not be adequate and is not long-lasting, it is not appropriate to merely extrapolate pediatric data on immunogenicity and efficacy to the elderly population. One reason for this caution is that the predominant forms of invasive pneumococcal disease are very different in elderly persons than in children, with bacteremic pneumonia predominating in elderly persons, compared with sepsis and meningitis in children. Thus, the most important attribute for a pneumococcal vaccine for elderly persons is effective prevention of both bacteremic and nonbacteremic pneumonia. In the Northern California Kaiser Permanente clinical trial, the efficacy of PCV7 in preventing bacteremic pneumococcal pneumonia was 88%, but the number of cases was very small [8]. In the same trial, and in the South African
trial with the related 9-valent conjugate vaccine, the efficacies of the vaccines were 17% and 21%, respectively, for prevention of pneumonia with radiologic consolidation (any cause), and the efficacy was greatest for children aged <1 year [8, 9]. From these data, it cannot be predicted how effective PCV7 would be against pneumonia in elderly individuals.

The adult serotype data presented by Feikin et al. [7] were gathered in 1998 and 1999, before the introduction of PCV7. It will be important to also describe the current serotype distribution in invasive pneumococcal infections in the elderly population several years after the introduction of PCV7. It can be expected that the proportion of cases caused by pediatric serotypes will have decreased considerably, given the decrease in pediatric serotypes in the elderly population that was observed by the ABCs in 2000 and 2001. If the proportion of cases caused by pediatric serotypes was now much lower, there would be a less compelling argument for consideration of PCV7 use for elderly individuals.

It is right to seek more effective ways of preventing invasive pneumococcal infection and also nonbacteremic pneumococcal pneumonia in elderly persons, because of the continued high morbidity and mortality of these infections. The 23-valent polysaccharide vaccine should be used more extensively. It is moderately effective in preventing invasive pneumococcal infections in adults but ineffective in preventing noninvasive pneumonia [10]. In the United States, the national objective is for ≥90% of adults aged ≥65 years to be vaccinated with this vaccine by 2010 [3]. The most recently estimated overall level of vaccination for this age group is 64% in 2003 [3]. There is obviously a very considerable gap between the actual and targeted levels of vaccination.

Numerous protein vaccines offer the potential advantage of prevention of infections caused by all pneumococcal serotypes. Several are in various stages of development, but none can be expected to be available for several years at least [11, 12].

In addition to maximizing use of the 23-valent polysaccharide vaccine, consideration of the use of PCV7 in the elderly population is of interest. However, data on the current burden of illness caused by pediatric serotypes in elderly individuals are needed during the time of PCV7 use in children, as are data on the immunogenicity and efficacy of PCV7 in the elderly population.

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References