

AN EPIDEMIOLOGY PUBLICATION OF THE OREGON DEPARTMENT OF HUMAN SERVICES

## DOWN WITH *STREPTOCOCCUS PNEUMONIAE*

**I**N 2000, THE NEWLY licensed heptavalent pneumococcal conjugate vaccine (PCV-7) offered for the first time to children  $\leq 2$  years of age an immunization against invasive pneumococcal disease (IPD). It is recommended for use in all infants and in children aged 2–5 years who are at high risk for infection.<sup>1</sup> In this issue of the *CD Summary*, we review Oregon IPD surveillance, comparing pre- and post-PCV7 vaccine years.

*Streptococcus pneumoniae*, a Gram-positive diplococcus available in 90 serotypes, causes a broad spectrum of community-acquired infection, from the common childhood otitis media<sup>2</sup> to serious invasive infections in all ages.<sup>3</sup> In the waning years of the last millennium, the pneumococcus caused an estimated 106,000–175,000 cases of pneumonia, 2,600–6,200 cases of meningitis, and 7,000–2,000 deaths annually in the U.S.<sup>3,4</sup> Population-based surveillance for IPD (defined as isolation of *S. pneumoniae* from a normally sterile site) has been conducted in Clackamas, Multnomah, and Washington counties since July 1995. Hospital labs identify and ship isolates to the Oregon State Public Health Lab. These go on to a reference lab for susceptibility testing and, beginning in 1998, to CDC for serotyping. In pre-PCV7 years, the overall IPD incidence was 19 cases per 100,000 residents per year; but children and adults  $\geq 65$  of age (formerly known as the elderly) bore the burden of disease. During 2000–2002, the annual incidence declined annually: 17.1, 14.9, and 11.3, respectively.

### PREVNAR™

The conjugate vaccine consists of polysaccharide antigens of *S. pneumoniae* linked to a nontoxic variant of diphtheria toxin. Serotypes causing childhood pneumococcal disease differ from those infecting adults. Seven

serotypes (4, 6B, 9V, 14, 18C, 19F, and 23F) are most commonly isolated from children with IPD—hence their selection for inclusion in the vaccine. These serotypes accounted for 86% of invasive disease in children  $< 5$  years old in Oregon prior to the introduction of *Prevnar*™. All children  $< 2$  years and high-risk children 24–59 months of age should be immunized.<sup>1</sup> High-risk conditions include sickle cell disease, asplenia, or splenic dysfunction; congenital immunodeficiency; HIV infection; cancer; chemotherapy or long-term systemic corticosteroid therapy; solid-organ transplantation; chronic cardiac, renal, or lung (not asthma) disease; chronic CSF leak; or diabetes mellitus. For kids  $< 12$  months, 2–3 doses (depending on age at 1st dose) are recommended, 2 months apart, with a 3rd dose at 12–15 months of age; infants starting the series at 12–23 month of age should receive 2 doses, 2 months apart. Consider PCV7 for all children 24–59 months old (1 dose for healthy kids, 2 doses at least 8 weeks apart for at-risk kids) giving priority to kids 24–35 months, those of African-American, Alaska Native, or American Indian descent, and those who attend group day care.<sup>1,5</sup>

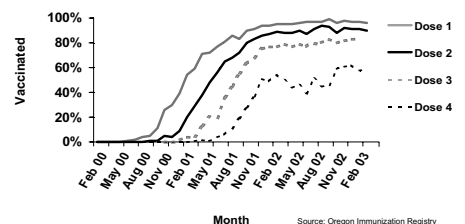
In a prospective, double-blind trial at a California Kaiser HMO,<sup>6</sup> 37,868 healthy kids randomly received either PCV7 or a control vaccine. These were administered at 2, 4, 6, and 12–15 months of age. Cases of IPD were identified through active surveillance. When efficacy analysis was performed in April 1999, 40 cases of IPD had occurred in children who had received 4 doses of the vaccine to which they'd been randomized (either PCV7 or control); 39 of these were in control vaccine recipients—which means PCV7 proved 97% protective (95% C.I. 83%–100%). More good news: vaccination

of infants with PCV7 reduces frequency of office visits for otitis media, antibiotic prescriptions, and tympanoplasty procedures.<sup>7</sup>

### VACCINE UPTAKE

Following the introduction of the PCV7, vaccine coverage in Oregon infants has been nothing short of phenomenal. In August 2001, CDC announced a shortage of PCV7. At that time, approximately 1 year after promulgation of the recommendations, ALERT (Oregon's statewide immunization information system) reported that 80% of kids  $< 17$  months of age had at least 1 dose of PCV7. By February 2003, despite the shortage, coverage improved to 96% for at least 1 dose, with 83% having received 3 doses (see graph below). Dare we dream of triple-digit coverage when supplies are adequate?

PCV 7 vaccination at 16 months of age Oregon, Feb 2000 to Feb 2003



### IPD DOWNFALL

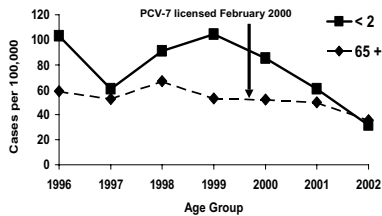
During 1998–2002, 1,158 cases of IPD were documented in persons of all ages living in the Tri-County area. For children  $< 2$  years of age, the incidence averaged 98 cases per 100,000 in 1998–99. In 2001, it fell to 61/100,000 and by 2002, it had dropped 65% from the 1998–99 rate—32 cases/100,000. For children 2–5 years, the magnitude of decline was less, but still notable at 57%: from 19/100,000 (98–99) to 8/100,000 (2002). A 39% decline was documented for adults  $> 65$ : from 60/100,000 (98–99) to 36/100,000 (2002) (see graph, *verso*). Actually, IPD de-



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Invasive pneumococcal disease by age group and year, Portland Tri-County, 1996–2002



clines were documented in all other age groups comparing these same pre- and post-PCV7 vaccine years: >50% in 5–17 and in 18–34 year olds; and >15% in 35–64 year olds.

#### SEROTYPE DISTRIBUTION

Trends in IPD-associated serotypes are of intense interest. In 1998–99, 93% of the IPD in Tri-county kids <5 was caused by vaccine (4, 6B, 9V, 14, 18C, 19F, and 23F) and vaccine-related (6A, 9A, 9L, 9N, 18A, 18B, 18F, 19A, 19B, 19C, 23A, and 23B) serotypes, an incidence of 41 cases/100,000. By 2002, this had plummeted to 8/100,000—an 81% decline. Other age groups may be benefiting from PCV7-sponsored decrements in carriage. In Oregon adults 65 and older, IPD due to conjugate vaccine and related serotypes decreased from 49/100,000 in 1998–1999 versus 14/100,000 in 2002—a 70% decline.

#### VACCINE FAILURES

Despite this good vaccine and superb utilization, childhood IPD continues to occur. Obviously, non-vaccine serotypes cause IPD; but disease from vaccine serotypes has also been reported even in immunized children. Although the overall efficacy is 97%,<sup>6</sup> there may be serotype-specific differences.<sup>8</sup>

Our ongoing case-control study of IPD in children 3–59 months of age may help sort this out. In the meantime, isolates from children who develop IPD despite immunization may be submitted to the Oregon State Public Health Laboratory for serotyping.<sup>9</sup>

This vaccine is preventing IPD in youngsters and, quite possibly oldsters as well, in Oregon and throughout the U.S.<sup>6,8</sup> With the good news of return to adequate supply, a catch-up schedule has been provided.<sup>5</sup> It seems hardly necessary with the here-to-now exemplary utilization of this safe, effective immunization. Keep up the good work.

#### ACKNOWLEDGMENTS

Without the cooperation of Tri-county hospital microbiologists, this surveillance would not have occurred. We are deeply indebted to you and laud your commitment.

#### REFERENCES

1. CDC. Preventing pneumococcal disease among infants and young children: Recommendations of the ACIP. MMWR 2000;49:1–35. Available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr4909a1.htm> or <http://www.cdc.gov/mmwr/pdf/rr/rr4909.pdf>. (accessed 5/30/2003).
2. Stool SE, Field MF. The impact of otitis media. *Pediatr Infect Dis J* 1989;8:S11–4.
3. Robinson KA, Baughman W, Rothrock G, et al. Epidemiology of Invasive Streptococcus pneumoniae Infections in the United States, 1995–1998: Opportunities for Prevention in the Conjugate Vaccine Era. *JAMA* 2001;285:1729–35.
4. Feikin DR, Schuchat A, Kolczak M, et al. Mortality from Invasive pneumococcal pneumonia in the era of antibiotic resistance, 1995–1997. *Am J Public Health* 2000;90:223–9.
5. CDC. Notice to Readers: Pneumococcal Vaccine Shortage Resolved. MMWR 2003;52:446–7. Available at <http://www.cdc.gov/mmwr/preview/mm5219a6.htm> or <http://www.cdc.gov/mmwr/pdf/wk/mm5219.pdf> (accessed 5/30/2003).
6. Black S, Shinefield H, Fireman B, et al. Efficacy, safety and immunogenicity of heptavalent pneumococcal conjugate vaccine in children. Northern California Kaiser Permanente Vaccine Study Center Group. *Pediatr Infect Dis J* 2000;19:187–95.

7. Fireman B, Black SB, Shinefield HR, Lee J, Lewis E, Ray P. Impact of the pneumococcal conjugate vaccine on otitis media. *Pediatr Infect Dis J* 2003;22:10–6.
8. Whitney CG, Farley MM, Hadler J, et al. Decline in invasive pneumococcal disease after the introduction of protein-polysaccharide conjugate vaccine. *N Engl J Med* 2003;348:1737–46.
9. Reporting Invasive Pneumococcal Disease in Children <5 Years Who Have Received Pneumococcal Conjugate Vaccine. Available at <http://www.cdc.gov/nip/diseases/pneumo/PCV-survrpts/default.htm> (accessed 6/10/2003).

## Influenza: Looking Ahead

ALTHOUGH community transmission of influenza in Oregon has increased, epizootics of avian influenza among domestic fowl flocks in Asia and Europe and the occurrence of H7N7 and H5N1 infections among humans raise the specter of pandemics past. Coinfections with these and circulating human strains may produce recombinant pandemic candidates.

As a consequence, the Oregon State Public Health Laboratory will continue to accept catarrhal specimens to “rule out influenza” and culture them without charge through the summer and into the 2003–2004 influenza season.

Considering all sources of culture-positive reports, this season’s tally came to 71 isolates, 58 type A and 13 type B. Last season’s tally climbed to 109 isolates by this same time, 108 type A and 1 type B. Thanks to all who participated in our surveillance activities, including the sentinel reporters!

For the recap of this past season and recommendations for the forthcoming one, please visit our website at: <http://www.dhs.state.or.us/publichealth/acd/docs/influenza.cfm>.