CD Summary

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OREGON PUBLIC HEALTH DIVISION • DEPARTMENT OF HUMAN SERVICES

WHAT'S PNEU IN PNEUMOCOCCAL DISEASE?

Streptococcus pneumoniae is a leading cause of pneumonia, bacteremia, meningitis, otitis media, and sinusitis. In the United States, this bacterium causes an estimated 44,000 cases of invasive* pneumococcal disease (IPD) and 4,500 deaths annually.[1] Approximately 4,000 cases of IPD, mostly bacteremia and meningitis, occur in children <5 years old. In Oregon, IPD is monitored by the Active Bacterial Core surveillance (ABCs) program, which conducts active, laboratory-based surveillance for invasive disease due to six pathogens, including *Streptococcus pneumoniae*, primarily in the tri-county Portland metropolitan area.

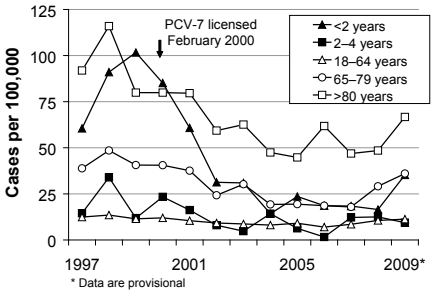
In this *CD Summary*, we review the epidemiology of pneumococcal infections over the last decade and discuss recommendations for the new 13-valent pneumococcal conjugate vaccine (PCV13, Prevnar 13®) approved by the FDA February 24, 2010.

SUCCESS OF PCV7 (GOOD NEWS)

Today there are 91 known pneumococcal serotypes, and, because exposure to capsular polysaccharide provokes an immune response in humans, these antigens are excellent targets for vaccine development and administration. Before the 7-valent pneumococcal conjugate vaccine (PCV7) was introduced in the U.S. in 2000, the seven pneumococcal serotypes covered by the vaccine (4, 6B, 9V, 14, 18C, 19F, and 23F) caused 80 percent of IPD cases among children <6 years of age,[2] and the incidence of IPD was relatively stable.[3] Following PCV7 introduction, national rates of IPD among children <5 years of age declined by 80 percent, with rates caused by serotypes included in PCV7 declining 99 percent.[4]

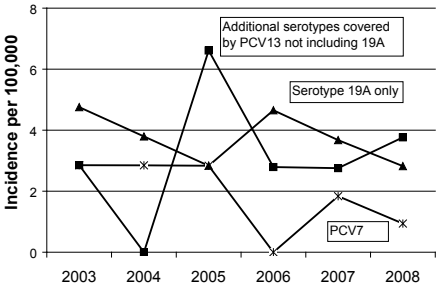
Based on Oregon ABCs data, two years before the introduction of the vaccine, the annual incidence was 56.8 cases per 100,000 children <5 years. By 2002, two years after introduction of PCV7, the incidence had decreased 70 percent to 17.3 per 100,000 (Figures 1, 2).†

Figure 1. IPD by age group, Portland tri-county surveillance area, 1997–2009



Presumably due to an overall decrease in carriage rates among children, PCV7-type IPD incidence among adults, particularly those age ≥65 also declined — from 31 per 100,000 in 1998–1999 to 0 in 2008.

Figure 2. IPD among children <5 years by serotype, Portland tri-county surveillance area, 2003–2008



A nationwide analysis of ABCs data indicated that the vaccine prevented more than twice as many IPD cases through *indirect* effects on pneumococcal transmission as through its direct effect of protecting vaccinated children; therefore, nearly 25,000 cases of IPD were prevented in 2003.[5]

EMERGING ISSUES (BAD NEWS)

While rates of PCV7-type IPD declined dramatically, we have been on the lookout for "serotype replacement" — i.e., non-PCV7 serotypes emerging to take the place of the seven serotypes in the vaccine.

Nationally, non-PCV7-type IPD has increased among children <5 years of age. In 2005, 40 percent of IPD among children aged <5 years were caused by serotype 19A.[4] In Oregon, serotype 19A has increased from 0.7 in 2003 to 1.2 cases per 100,000 in 2008.‡ However, during this time, an increase in 19A among children aged <5 years has not been observed.

The increase in incidence of IPD caused by serotype 19A may not be solely attributable to the use of PCV7.[6] Numerous studies have shown that the incidence of serotype 19A was increasing in countries around the world before the use of PCV7. In southern Israel, the introduction and proliferation of 19A among Bedouin and Jewish children occurred in the absence of PCV7. A dramatic increase in the prevalence of multidrug-resistant clones of 19A was observed among the Bedouin population, but not among their Jewish counterparts, suggesting that high antibiotic use and socioeconomic disparities also play a role in the emergence of pneumococcal serotypes within a community.[7]

NEW VACCINE AVAILABLE (GOOD NEWS AGAIN!)

Fortunately, a new 13-valent pneumococcal conjugate vaccine was licensed by the FDA in February 2010. PCV13 covers six additional serotypes: 1, 3, 5, 6A, 7F, and 19A. From 2007 through 2009, 210 cases in Oregon would have been prevented by PCV13 (36 percent of all IPD cases during the same time period).

The Advisory Committee on Immunization Practices (ACIP) recommends PCV13 for all children aged 2–59 months and those aged 60–71 months with certain underlying medical conditions. For infants and children who have not received any PCV7 or PCV13, please consult Table 1, *verso*, for vaccination guidance. Infants and children who have received one or more doses of PCV7 should complete the

*Invasive pneumococcal disease is defined as isolation of the *Streptococcus pneumoniae* bacterium from a normally sterile body site (e.g. blood, cerebrospinal fluid, pleural fluid, peritoneal fluid, joint aspiration).

† Oregon Public Health Division. *Streptococcus pneumoniae* Surveillance Report 2008, at *www.oregon.gov/DHS/ph/acd/diseases/pneu/spn08.pdf*. Accessed 12 Apr 2010.

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immunization series with PCV13 based on recommendations from Table 2. Note: to protect against the additional six serotypes, young children who have completed the PCV-7 series are advised to receive 1 or 2 doses of PCV-13 (Table 2).[8]

The transition from PCV7 to PCV13 has the potential to dramatically reduce remaining IPD, and because the marginal cost is low, it should be cost-effective.

FOR MORE INFORMATION

- Oregon's ABCs program, 971-673-1111; *www.oregon.gov/DHS/ph/acd/abc.shtml*
- PCV13 licensure and recommendations, *www.cdc.gov/vaccines/recs/acip*

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Table 1. Recommended routine vaccination schedule for PCV13 among infants and children who have not received previous doses of PCV7 or PCV13, by age at first dose[8]

Age at first dose (months)	Primary PCV13 series[1]	PCV13 booster dose[2]
2–6	3 doses	1 dose at age 12–15 months
7 –11	2 doses	1 dose at age 12–15 months
12–23	2 doses	—
24–59 (Healthy children)	1 dose	—
24–71 (Children with underlying medical conditions[3])	2 doses	—

1) Minimum interval between doses is 8 weeks except for children vaccinated at age <12 months for whom minimum interval between doses is 4 weeks. Minimum age for administration of first dose is 6 weeks.
2) Given at least 8 weeks after the previous dose.
3) For list of conditions, see MMWR 2010;59:9.

Table 2. Recommended transition schedule from PCV7 to PCV13 vaccination among infants and children, according to number of previous PCV7 doses received [8]

Infant series			Booster dose	Supplemental PCV13 dose
2 months	4 months	6 months	≥12 months[1]	14–59 months[2]
PCV7	PCV13	PCV13	PCV13	—
PCV7	PCV7	PCV13	PCV13	—
PCV7	PCV7	PCV7	PCV13	—
PCV7	PCV7	PCV7	PCV7	PCV13

1) No additional PCV13 doses are indicated for children age 12-23 months who have received 2 or 3 doses of PCV before age 12 months and at least 1 dose of PCV13 at age ≥12 months.
2) For children with underlying medical conditions, a single supplemental PCV13 dose is recommended through age 71 months.