Group B *Streptococcus* Surveillance Report 2005

Oregon Active Bacterial Core Surveillance (ABCs)
Office of Disease Prevention & Epidemiology
Oregon Department of Human Services
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Background

Active Bacterial Core surveillance (ABCs) is a core component of the Emerging Infections Program (EIP) Network sponsored by the Centers for Disease Control and Prevention (CDC). The purpose of ABCs is to determine the incidence and epidemiologic characteristics of invasive disease due to *Haemophilus influenzae*, *Neisseria meningitidis*, group A *Streptococcus* (GAS), group B *Streptococcus* (GBS), and methicillin-resistant *Staphylococcus aureus* (MRSA). The entire EIP Network represents 29.7 million persons in 10 surveillance areas around the United States. More information on the EIP/ABCs Network is found at: http://www.cdc.gov/ncidod/dbmd/abcs.

In Oregon, the surveillance area for invasive GBS disease comprises the Tri-County (Clackamas, Multnomah, and Washington) Portland metropolitan area with a 2005 estimated population of 1,543,910. More information on the Oregon ABCs program is found at: http://oregon.gov/DHS/ph/acd/abc.shtml.

Methods

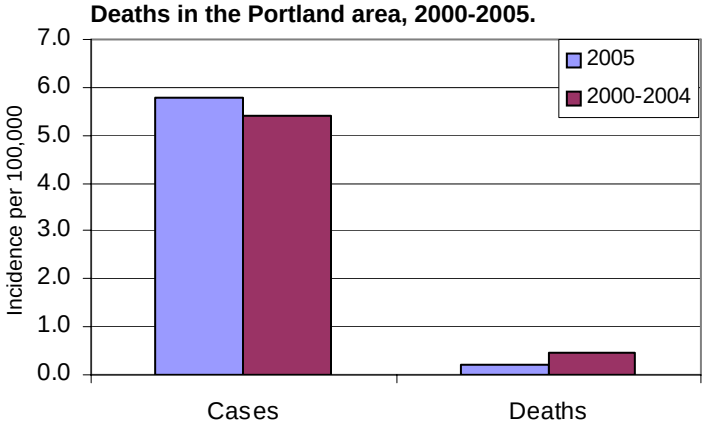
Invasive disease is defined as the isolation of GBS from a normally sterile body site in a Tri-County resident. Tri-County hospital laboratories submit GBS isolates to the Oregon State Public Health Laboratory, from where they are forwarded to CDC for serotyping and susceptibility testing. Additional cases are identified through regular laboratory record reviews. Health record reviews of each case allow standardized reports of demographic characteristics, clinical syndrome manifestations, underlying conditions, and illness outcome. Early-onset disease is defined as invasive GBS disease occurring in infants less than seven (<7) days of age; late-onset disease is defined as invasive GBS disease occurring in infants from 7 to 89 days of age.

Surveillance Results

Descriptive Epidemiology

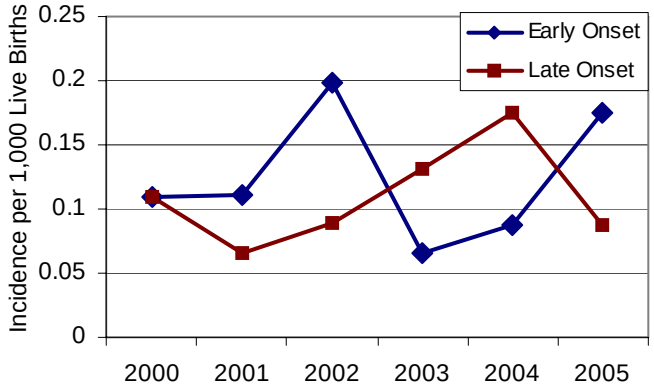
In 2005, 89 cases of invasive GBS disease were reported in the Tri-County Portland area, corresponding to an incidence rate of 5.8/100,000 persons (Figure 1). This is similar to the average annual incidence rate in the Portland area from 2000–2004 (5.4/100,000) and lower than the 2005 national projection of invasive disease (7.2/100,000).[1] Of these cases, there were three deaths, for an annual mortality rate due to invasive GBS disease of 0.2/100,000 (Figure 1). This rate is lower than that from 2000–2004 in the Portland area (0.5/100,000) and the 2005 national projections (0.55/100,000).[1] The 2005 case fatality rate for invasive GBS disease in the Portland area was 3%, lower than the Portland area from 2000–2004 (9%) and the entire ABCs network in 2005 (7%).[1] Of 80 cases where sex was known, 64% were male; of 50 cases where

Figure 1: Incidence of Invasive GBS Cases and Deaths in the Portland area, 2000-2005.



race was known, 88% were white, 6% were black, and 6% were another race; and of 27 cases where ethnicity was known, 5% were Hispanic or Latino.

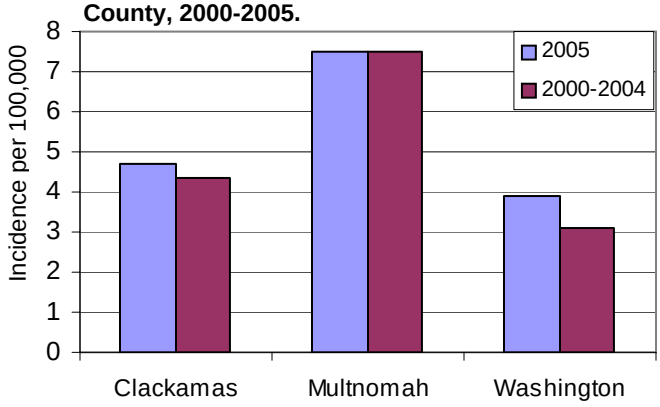
Figure 2: Incidence of Early- and Late-Onset Invasive GBS Disease, 2000-2005.



From 2000-2005, the incidence rates of both early- and late-onset invasive GBS disease were relatively stable, outside of annual fluctuations. In 2005, the incidence of early-onset disease was 0.2 per 1,000 live births and that of late-onset disease was 0.09 per 1,000 live births. The 2000-2004 annual average incidence for both early- and late-onset disease was 0.1 per 1,000 live births. This is lower than the national estimates of 0.33 and 0.31 per 1,000 live births for early- and late-onset disease, respectively.

As seen in Figure 2, the incidence rate of invasive GBS disease in Multnomah County in 2005 (7.5/100,000) was higher than that reported from either Clackamas (4.7/100,000) or Washington (3.9/100,000) Counties. This is similar to the historical pattern throughout the Portland area from 2000-2004. In 2005, the mortality rate due to GBS was also highest in Multnomah County (0.3/100,000), followed by Washington (0.2/100,000), and Clackamas (0/100,000), similar to the historical pattern.

Figure 2: Incidence of Invasive GAS Disease by County, 2000-2005.



The burden of disease and death due to invasive GBS disease was highest in those ≥65 years of age (31 cases; incidence 20.1/100,000 persons and 2 deaths; incidence 1.3/100,000), followed by those under four years of age (21 cases; incidence 19.8/100,000 and 1 death; incidence 0.9/100,000). The case and death incidences of GBS have been stable, outside of yearly variation, across all age groups since 2000.

Clinical Manifestations

The clinical manifestations of invasive GBS disease are listed in Table 1. While cellulitis was reported less frequently – and other syndromes, more frequently – in 2005 than during the previous five years, a significant trend over this time was not observed. No other significant changes in the profile of clinical syndromes have been noted since 2000. Clinical syndromes do vary according to age. Meningitis was reported most commonly among 0-4 year olds (21% of cases), after which point it became infrequent (0-4% of those over 5 years). The decrease in meningitis with increasing age was significant ($p<0.0001$). Pneumonia

Table 1: Percent of Invasive GBS cases reporting common clinical syndromes.†

Syndrome	2005	2000-2004
Primary Bacteremia	36	44
Pneumonia	11	13
Meningitis	4	4
Cellulitis	16	26
Other Syndrome‡	34	15

† Some cases report >1 syndrome; not all syndromes shown.
‡ Includes Abscess (not skin), peritonitis, HUS, pericarditis, septic arthritis, osteomyelitis, endometritis, and necrotizing fasciitis.

and cellulitis were positively associated with increasing age (p=0.005 and p<0.0001, respectively) and were reported in 20% and 30% of cases in those 65 years and older, respectively. Neither bacteremia nor other invasive syndromes were associated with age.

Bacteremia was the most common syndrome associated with early-onset GBS disease, comprising 73% of all cases; pneumonia was reported in 15% of these cases, and meningitis, 12%. While bacteremia was still most common among late-onset cases (60%), a far higher percentage were reported with meningitis (33%). For non early- or late-onset cases, bacteremia was reported most commonly (39%), followed by cellulitis (27%) and pneumonia (14%). Other invasive syndromes, although individually rary, comprised 20% of non early- or late-onset cases.

In addition to age, bacteremia and other invasive syndrome were significantly associated with fatal outcome among invasive GBS cases. A fatal outcome was 2.0 times (95% confidence interval [CI] 1.2, 3.4) more likely among those with bacteremia, and 2.8 times (95% CI [1.6, 4.9] less likely among those with other invasive syndrome, than among those with other clinical manifestations.

Underlying Conditions

Except for one case in which cancer was noted, no underlying conditions were reported for those less than 18 years of age. Table 2 lists underlying conditions reported in greater than 5% of adult invasive GBS cases in the Portland area during 2000–2005. Alcohol abuse, cirrhosis diabetes, and smoking were significantly associated with cases among younger adults, while cancer, cardiovascular disease, and chronic obstructive pulmonary disease (COPD), were significantly associated with cases among older adults.

Table 2: Percent of Adult Invasive GBS Cases with Reported Underlying Conditions.

	18-64	65+	p-value
Alcohol Abuse	**11**	**5**	**0.0014**
Cancer	**15**	**25**	**0.0018**
Cardiovascular Disease	**20**	**54**	**<0.0001**
COPD	**6**	**14**	**0.0007**
Cirrhosis	**12**	**5**	**0.0009**
Diabetes	**37**	**27**	**0.0076**
Dialysis	9	5	0.0869
Immunosuppression	7	7	0.8716
Smoking	**13**	**5**	**0.0003**

Invasive GBS disease manifesting as bacteremia was associated with dialysis (p=0.008), cirrhosis (p=0.002), cancer (p=0.001), and cardiovascular disease (p=0.020). No other positive associations between clinical syndrome and underlying conditions were seen. [note: I thought this ordering of the paragraphs flowed a little better]

Table 3 shows statistically significant associations between underlying conditions and death due to invasive GBS disease. Older age, cancer, and cardiovascular disease were all significantly associated with a fatal outcome in bivariate analysis. However, in a logistic regression model controlling for age, only cardiovascular disease was independently associated with death.

Table 3: Significant Associations between Underlying Conditions and Death.

Bivariate Analysis	OR	95% CI
Age 65+	2.8	(1.6, 5.0)
Cancer	2.1	(1.2, 3.8)
Cardiovascular Disease	2.9	(1.6, 5.0)

Logistic Regression	aOR	95% CI
Age 65+	2.1	(1.1, 3.9)
Cardiovascular Disease	2.2	(1.2, 4.0)

Serotype Analysis

Overall, serotype V was the most common cause of invasive GBS (27%) of all cases, followed by serotype IA (25%) and serotype III (14%) (Table 4). However, the distribution of serotypes was not constant across the disease spectrum. Compared with other serotype and nontypable isolates, early-onset disease was associated with serotypes IA (p=0.026) and III

(p<0.0001), and late-onset disease was associated with serotype III (p<0.0001). Serotype III was associated with meningitis (p=0.0004), bacteremia (p=0.021), and pneumonia (p=0.016) and serotype V was also associated with pneumonia (p=0.029). No serotype was significantly associated with a fatal outcome from invasive GBS disease.

Table 4: Serotype of Invasive GBS Isolates, 2000-2005.

Serotype	Early-Onset	Late-Onset	Other
IA	32	19	25
IB	14	4	10
III	32	59	9
V	14	15	29
Other‡	7	0	18
NT	0	4	9

‡Includes serotypes II, IV, VI, and VII

Antibiotic susceptibility

Of 333 invasive GBS isolates tested for susceptibility to common antibiotics since 2000, 100% were susceptible to penicillin, ampicillin, cefuroxime, cefazolin, and vancomycin. Fourteen percent (14%) displayed resistance to clindamycin and 26% were resistant to erythromycin. Resistance to erythromycin and clindamycin was associated with serotype, such that serotype V was 2.0 times more likely to be resistant to clindamycin (95% CI 1.0, 4.0) and 3.5 times more likely to be resistant to erythromycin (95% CI 1.9, 6.2) than other or non-typable strains. Serotype 1a was 5.6 times less likely to be associated with resistance to clindamycin (95% CI 1.3, 25.0) than other serotypes. Despite the associations between serotype and resistance and between serotype and other clinical characteristics of invasive GBS disease, resistant isolates were not significantly associated with any clinical syndrome or fatal outcome of disease.

Discussion

A major focus of surveillance for invasive GBS disease has been the epidemiologic characterization of early-onset disease, which has been used to assess the impact of screening and treatment guidelines for pregnant women, first published in 1996. These guidelines, which promoted use of either a risk-based approach (screening women with recognized risk factors for having an infant with GBS disease) or a screening-based approach (universal screening of all pregnant women at 35-37 weeks gestation), led to decreases in the incidence of early-onset GBS, both nationally and in Oregon.[2] Revised guidelines published in 2002 favored adoption of the universal screening approach, which led to further declines nationally. In Oregon, a decrease was seen in the rate of early-onset GBS from 2002-2003, although this has since increased. Likely, this is due to annual variation in incidence and artifact of a small sample size. However, continued vigilance in surveillance for early-onset invasive GBS will be necessary to determine if an increasing trend emerges in future years or is reflected in national data. Fortunately, the incidence of early-onset GBS disease in Oregon has been far below the Healthy People 2010 target rate of 0.5/1,000 live births throughout the surveillance period.[1] This highlights the success of prevention measures in reducing early-onset disease and reinforces their continued need to keep incidence low in the neonatal population.

The epidemiologic profile of invasive GBS disease in adults in Oregon is consistent with national data and previous studies.[3] In particular, invasive GBS in this population frequently occurs among those with increasing age or with one or more underlying condition. While diabetes is most frequent, other conditions include cancer, cirrhosis, cardiovascular disease, and smoking. Increasing resistance to erythromycin and clindamycin has also been reported nationally.[3] So far in Oregon, however, this increasing resistance does not seem to have translated into broad treatment failures leading to GBS mortality. Continued surveillance for invasive GBS disease among adults will be needed to identify the emergence of additional antibiotic resistance as well as better characterize disease occurrence among a population at an increasing risk of disease.

References:

1. Centers for Disease Control and Prevention. 2006. Active Bacterial Core Surveillance Report, Emerging Infections Program Network, Group B Streptococcus, 2005-*provisional.* Available at http://www.cdc.gov/ncidod/dbmd/abcs/survreports/gbs05.pdf.
2. Centers for Disease Control and Prevention. Early-Onset and Late-Onset Neonatal Group B Streptococcal Disease – United States, 1996-2004. *MMWR*. 2005; 54(47)1205-8.
3. Farley MM. Group B Streptococcal Disease in Nonpregnant Adults. *Clin Infect Dis*. 2001; 33:556-61.