Group A *Streptococcus* Surveillance Report 2010

Oregon Active Bacterial Core Surveillance (ABCs)

Office of Disease Prevention & Epidemiology
Oregon Health Authority

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Background

The Active Bacterial Core surveillance (ABCs) program is a core component of the Emerging Infections Program (EIP) Network sponsored by the Centers for Disease Control and Prevention (CDC). The purpose of the ABCs program 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), *Streptococcus pneumoniae*, and methicillin-resistant *Staphylococcus aureus* (MRSA). The entire EIP Network for invasive GAS disease represents 32 million persons in 10 surveillance areas around the United States. More information on the EIP/ABCs Network is found at: http://www.cdc.gov/abcs/index.html.

In Oregon, the surveillance area for invasive GAS (*Streptococcus pyogenes*) disease comprises the tri-county (Clackamas, Multnomah, and Washington) Portland metropolitan area, with a 2010 estimated population of 1,644,535.* More information on the Oregon ABCs program is found at:
http://public.health.oregon.gov/DiseasesConditions/CommunicableDisease/Pages/abc.aspx.

Methods

Invasive GAS disease (IGAS) is defined as the isolation of GAS from a normally sterile body site or fluid, or from a wound accompanied by necrotizing fasciitis or toxic shock syndrome in a tri-county resident. Tri-county hospital laboratories submit GAS isolates to the Oregon State Public Health Laboratory, which forwards them to CDC for typing. 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 illnesses or conditions, and illness outcome.

Surveillance Results

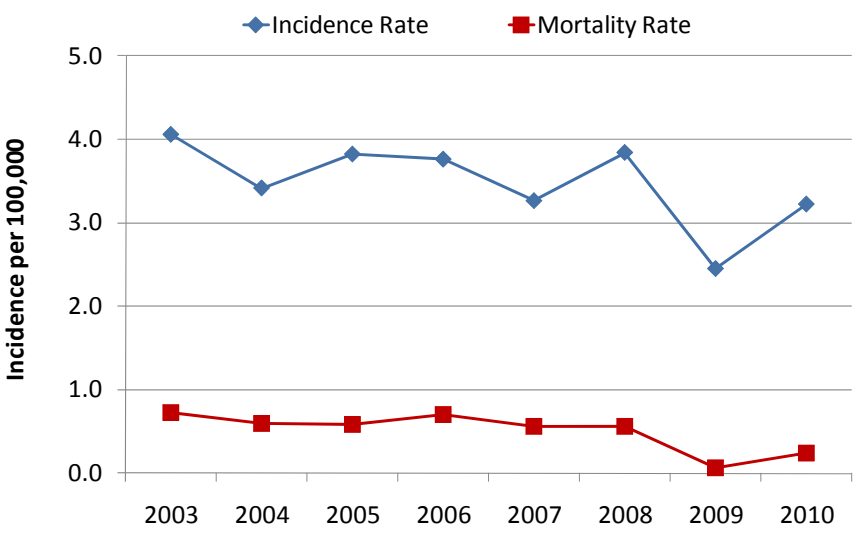
Descriptive Epidemiology

In 2010, 53 IGAS cases were reported in the tri-county Portland area, for an incidence rate of 3.2/100,000 persons (Figure 1). This is 11 percent lower than the 2009 national projection of invasive disease (3.6/100,000) and the average annual incidence rate in the Portland area from 2005–2009 (3.4/100,000).[1] Of these cases, there were four deaths, for an annual mortality rate due to IGAS disease of 0.2/100,000 (Figure 1). This rate is lower than the figure reported from 2005-2009 in the Portland area (0.5/100,000) and the most recent national projections (0.4/100,000).[1]

* Source: Portland State University Population Research Center (http://www.pdx.edu/prc/)

The 2010 case fatality rate for IGAS in the Portland area was 8 percent, compared with 14 percent for the Portland area from 2005–2009 and 12 percent for the entire ABCs network in 2009.[1]

Figure 1: Incidence and Mortality Rates of IGAS Cases in Tri-county Area

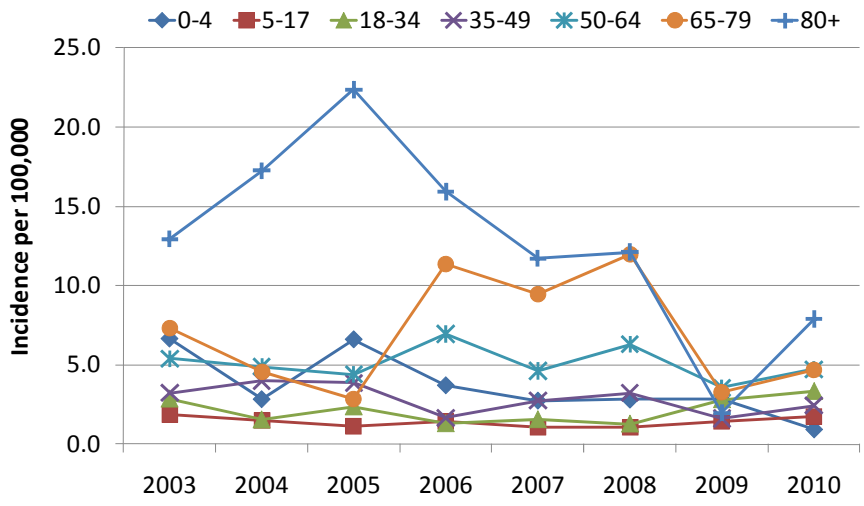


The mean and median ages of IGAS cases were 46 and 49 years, respectively (range: 2–95). Almost 50 percent of cases were male; of 30 cases where race was known, 25 (84%) were white, 4 (13%) were black, and 1 (3%) was American Indian/Alaska Native. Eight-three percent of the 30 cases with known ethnicity were non-Hispanic.

The 2010 incidence of IGAS was highest in Multnomah (5.2/100,000), followed by Washington (1.9/100,000), and Clackamas (1.3/100,000) counties. Compared with the previous five-year average, the 2010 incidence was 55 percent lower in Clackamas, 13 percent higher in Multnomah, and 13 percent lower in Washington counties.

The burden of disease was highest in those ≥80 years of age (4 cases; 7.9/100,000 persons), followed by those 50-64 years of age (15 cases; 4.7/100,000) and those 65-79 years of age (6 cases; 4.7/100,000) (Figure 2). The incidence among the other age groups, with the exception of those aged 0-4 years, has remained relatively stable, within annual variation, over the past seven years. Since 2003, the incidence of IGAS in the youngest age group has decreased 86 percent.

Figure 2: Incidence of IGAS Cases Tri-county Area by Age



Clinical Manifestations

With the exception of meningitis (p=0.0026), the clinical profile of IGAS in 2010 was not significantly different compared with the previous 5-year average (Table 1). In 2010, six cases of necrotizing fasciitis and five cases of toxic shock syndrome were reported, with two presenting with both syndromes. All nine of these cases were hospitalized, and there was one fatal outcome. Five reported at least one underlying condition. Among cases reported since 2005, the only clinical syndromes that significantly varied by age were bacteremia and septic arthritis (p=0.0132 and p=0.0321, respectively). After adjusting for age, bacteremia and necrotizing fasciitis were significantly associated with fatal outcome (p=0.0286 and p=0.0334, respectively).

Table 1: Percent of IGAS Cases† Reporting Common Clinical Syndromes by Age Group

Syndrome	2010			2005-2009		
	<18 years (n=6)	18-64 years (n=37)	65+ years (n=10)	<18 years (n=37)	18-64 years (n=160)	65+ years (n=75)
Abscess	0	8	0	3	5	7
Bacteremia	17	19	20	19	25	37
Cellulitis	17	38	50	16	39	27
Meningitis	0	0	0	11	2	3
Necrotizing Fasciitis	0	16	0	0	6	7
Pneumonia	50	5	30	22	13	24
Septic Arthritis	0	24	0	19	16	4
Streptococcal Toxic Shock	33	8	0	8	7	4

† Some cases report more than one syndrome. Not all syndromes reported are shown here.

Underlying Conditions

In 2010, two children (33%) carried a diagnosis of asthma and the remainder had no underlying conditions listed in their medical record. Among adults, the profile of underlying conditions reported in 2010 was similar to that reported from 2005-2009. Younger adults were more likely to report intravenous drug use (IDU) or no underlying conditions, while older adults were more likely to have cardiovascular disease or COPD (Table 2).

Table 2: Underlying Conditions Reported Among Adult IGAS Cases by Age Group, 2005-2010

Underlying Condition	18-64 years (n=240) n (%)	65+ years (n=85) n (%)
Asthma	21 (9)	5 (6)
Blunt trauma	29 (12)	13 (15)
Burns	9 (4)	2 (2)
Cardiovascular disease*	17 (7)	36 (42)
COPD*	5 (2)	20 (24)
Diabetes	40 (17)	21 (25)
Dialysis	9 (4)	4 (5)
Immunosuppression	27 (11)	12 (14)
Intravenous drug use (IDU)	18 (8)	1 (1)

Underlying Condition	18-64 years (n=240) n (%)	65+ years (n=85) n (%)
Nephrotic syndrome*	10 (4)	10 (12)
Obesity	34 (14)	12 (14)
Penetrating trauma	31 (13)	9 (11)
Surgical wound	10 (4)	3 (4)
None	50 (21)	6 (7)

* Significant difference by age group (p<0.05).

After adjusting for age, immunosuppression was the only clinical syndrome associated with fatal outcome (p=0.0036). In terms of clinical manifestation, after adjusting for age, pneumonia was associated with COPD (OR 2.8, CI 1.1, 7.4) and necrotizing fasciitis was associated with blunt trauma (OR 4.8, CI 1.8, 12.5) and burns (OR 6.2, CI 1.5, 25.6).

emm Type Analysis

The surface M protein – a known virulence factor for disease – has been the basis for GAS strain typing for decades. Since 1995, CDC has determined the M protein type through sequencing the DNA of the corresponding gene (*emm*), providing an *emm* type.[2] In 2010, 11 *emm* types were determined for isolates from 26 cases (49%). The most frequent *emm* types reported in 2010 were 1 (31%), 11 (12%), 28 (12%), and 82 (12%).

Since 2005, 37 *emm* types were determined for 325 isolates. The most frequent *emm* types seen over this time are presented in Table 3.

Table 3: Selected Demographic and Clinical Attributes of IGAS Disease by *emm* Type, 2005-2010

emm Type	Total (n=325) n (%)	Fatal outcome (n=43) n (%)	65+ years (n=85) n (%)	Necrotizing fasciitis (n=21) n (%)	Pneumonia (n=55) n (%)
1	77 (24)	16 (37)	20 (24)	12 (57)	26 (47)
12	25 (8)	4 (9)	7 (8)	3 (14)	4 (7)
28	24 (7)	2 (5)	10 (12)	1 (5)	2 (4)
03	17 (5)	4 (9)	6 (7)	0 (0)	3 (5)
89	15 (5)	3 (7)	7 (8)	0 (0)	1 (2)

* Percentages are number of isolates with displayed *emm* type out of the total number of isolates in that category.

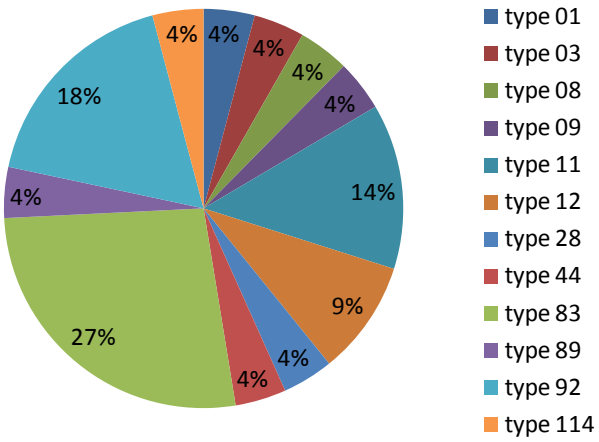
Emm type 1 is positively associated with a fatal outcome (OR 2.9, CI 1.3, 6.4) and pneumonia (OR 3.9, CI 2.0, 7.7), while negatively associated with cellulitis (OR 0.5, CI 0.3, 0.9). *Emm* type 28 is positively associated with older age (OR 2.7, CI 1.1, 6.5). *Emm* type 89 is positively associated with cellulitis (OR 3.6, CI 1.2, 11.0) and older age (OR 3.3, CI 1.1, 9.6).

Antibiotic Susceptibility

The antibiotic susceptibility profile of invasive GAS strains has been assessed at several points since the beginning of ABCs. Antibiotic susceptibility results are available for 248 isolates obtained from 2006-2010. Of these, 100 percent were susceptible to penicillin, ampicillin, cefotaxime, and vancomycin. Twenty-seven isolates (11%) exhibited some level of antibiotic resistance: two displayed intermediate resistance and 19 displayed full resistance to erythromycin alone; six were resistant to erythromycin and clindamycin. Erythromycin-resistance is not associated with any particular clinical manifestation of invasive GAS disease or with a fatal outcome.

Figure 3 shows the percentage of erythromycin-resistant isolates by *emm* type. Since 2006, *emm* types 11, 83, and 92 have accounted for the largest percentage (56%) of the erythromycin-resistant isolates.

Figure 3: Percentage of Erythromycin-Resistant Isolates by emm Type 2006-2010 (N=23)



Discussion

Generally, IGAS disproportionably affects the elderly in Oregon, who are more likely to have systemic disease associated with chronic underlying conditions that may affect immune function. Among young adults, invasive disease is more likely to be associated with injection drug use or no reported underlying condition. Although it is not possible to assess risk factors for disease through surveillance alone, this association has been well documented.[3] Monitoring trends in necrotizing fasciitis and toxic shock syndrome as well as potentially-preventable nosocomial infections (such as surgical wound infections) have also been objectives of IGAS surveillance through the ABCs network. In general, most clinical manifestations have remained relatively stable over the past few years. Trends will continue to be monitored by the Oregon ABCs surveillance program.

References

1. Centers for Disease Control and Prevention. 2010. Active Bacterial Core Surveillance Report, Emerging Infections Program Network, Group A *Streptococcus*, 2009. Available via the Internet: http://www.cdc.gov/abcs/reports-findings/survreports/gas09.pdf. Accessed 04 Oct 2011.
2. Beall B, Facklam RR, Thompson T. Sequencing *emm*-specific PCR products for routine and accurate typing of group A streptococci. *J Clin Microbiol* 1996;34:953-8.
3. Factor SH, Levine OS, Schwartz B, et al. Invasive Group A Streptococcal Disease: Risk Factors for Adults. *Emerg Infect Dis* 2003;8:970–7.