Group A *Streptococcus* Surveillance Report 2009

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 2009 estimated population of 1,631,665.* 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

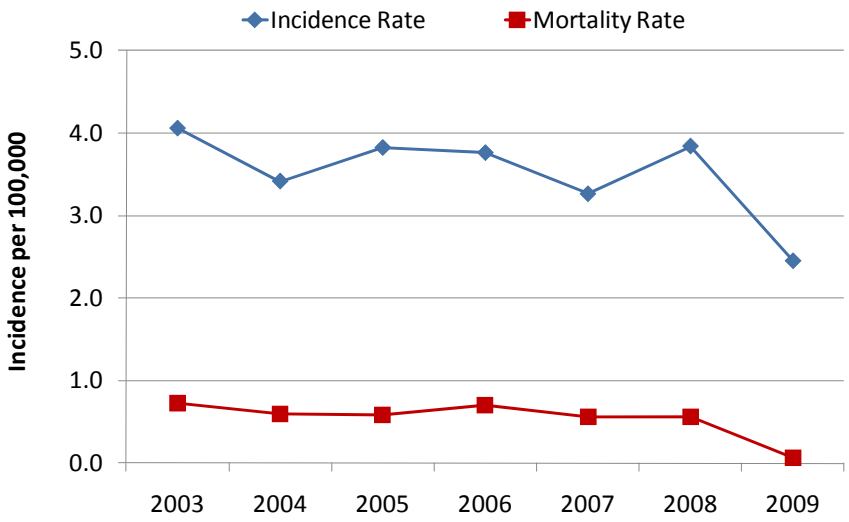
Descriptive Epidemiology

In 2009, 40 invasive GAS cases were reported in the tri-county Portland area, for an incidence rate of 2.5/100,000 persons (Figure 1). This is 31 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 2004–2008 (3.6/100,000).[1] With only one death reported in 2009, IGAS mortality was at an all-time low (0.1/100,000) (Figure 1). The mean and median ages of IGAS cases were 41 and 40 years, respectively (range: 1-85). The one death occurred in an 85 year old male. The 2009 case fatality rate for IGAS in the Portland area was 2.5 percent, compared with 17 percent for the Portland area from 2004–2008 and 12 percent for the entire ABCs network in 2009.[1] Over sixty percent of

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

cases were male; of 17 cases where race was known, 16 (94%) were white and 1 (6%) was Asian/Pacific Islander. Eight-seven percent of the 17 cases with known ethnicity were non-Hispanic.

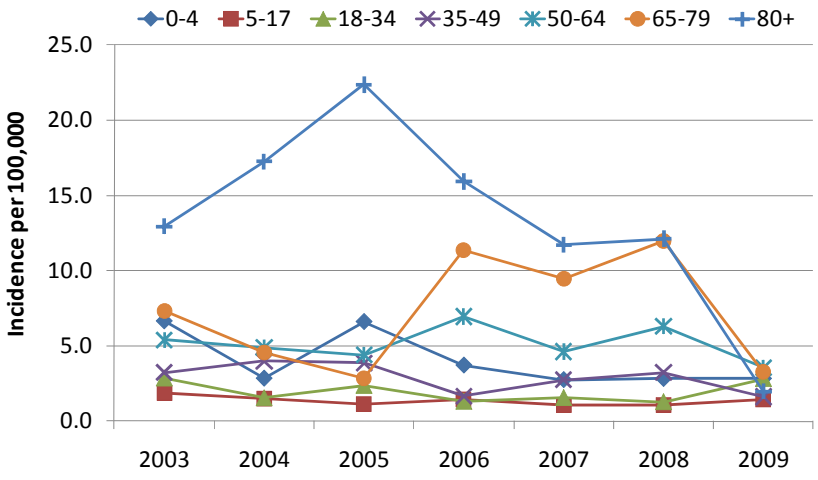
Figure 1: Incidence and Mortality Rates of IGAS Cases in Tri-county Area



The 2009 incidence of IGAS was highest in Multnomah (3.0/100,000), followed by Clackamas (2.4/100,000), and Washington (1.7/100,000) counties. Compared with the previous five-year average, the 2009 incidence was 15 percent lower in Clackamas, 38 percent lower in Multnomah, and 30 percent lower in Washington counties. The one death in 2009 occurred in Washington county.

The burden of disease was highest in those 50-64 years of age (11 cases; 3.6/100,000 persons), followed closely by those 65-79 years of age (4 cases; 3.3/100,000) (Figure 2). The incidence among the other age groups has remained relatively stable, within annual variation, over the past six years.

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



Clinical Manifestations

With the exception of bacteremia (p=0.0122), the clinical profile of IGAS in 2009 was not significantly different compared with the previous 5-year average (Table 1). In 2009, one case of necrotizing fasciitis and five cases of toxic shock syndrome were reported. All six of these cases survived. Three reported at least one underlying condition. Among cases reported since 2004, the only clinical syndrome that significantly varied by age was septic arthritis (p=0.0057).

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

Syndrome	2009			2004-2008		
	<18 years (n=7)	18-64 years (n=28)	65+ years (n=5)	<18 years (n=37)	18-64 years (n=164)	65+ years (n=83)
Abscess	0	0	20	5	6	5
Bacteremia	0	18	0	27	24	35
Cellulitis	14	43	20	16	38	33
Meningitis	0	0	20	14	2	1
Necrotizing Fasciitis	0	4	0	0	7	6
Pneumonia	57	14	40	11	14	23
Septic Arthritis	0	21	0	24	15	5
Streptococcal Toxic Shock	43	7	0	0	7	4

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

Underlying Conditions

In 2009, one child (14%) 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 2009 was similar to that reported from 2004-2008, with the exception of burns. Burns were reported less frequently in 2009 (p<0.0001). 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 and COPD (Table 2). All other underlying conditions were reported similarly among all adults.

Table 2: Underlying Conditions Reported Among Adult IGAS Cases by Age Group, 2004-2009

Underlying Condition	18-64 years (n=236) n (%)	65+ years (n=88) n (%)
Asthma	18 (8)	6 (7)
Blunt trauma	26 (11)	13 (15)
Burns	5 (2)	2 (2)
Cardiovascular disease*	20 (9)	43 (49)
COPD*	10 (4)	20 (23)
Diabetes*	38 (16)	24 (27)
Dialysis	7 (3)	4 (5)
Immunosuppression	26 (11)	13 (15)
Intravenous drug use (IDU)*	25 (11)	1 (1)
Obesity	29 (12)	10 (11)

Underlying Condition	18-64 years (n=236) n (%)	65+ years (n=88) n (%)
Penetrating trauma	27 (11)	8 (9)
Surgical wound	11 (5)	2 (2)
None*	50 (41)	4 (11)

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

In terms of clinical manifestation, after adjusting for age, pneumonia was associated with COPD (OR 3.2, CI 1.3, 7.5) and necrotizing fasciitis was associated with blunt trauma (OR 4.0, CI 1.4, 11.4) and burns (OR 7.2, CI 1.3, 40.2).

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 2009, 18 *emm* types were determined for isolates from 38 cases (95%). The five most frequent *emm* types reported in 2009 were 1 (28%), 11 (10%), 12 (8%), 4 (5%), and 6 (5%).

Since 2004, 38 *emm* types were determined for 324 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, 2004-2009

emm Type	Total (n=324) n (%)	Fatal outcome (n=48) n (%)	65+ years (n=88) n (%)	Necrotizing fasciitis (n=18) n (%)	Pneumonia (n=56) n (%)
1	82 (25)	19 (40)	23 (26)	10 (56)	28 (50)
12	29 (9)	5 (10)	8 (9)	3 (17)	5 (9)
28	22 (7)	2 (4)	9 (10)	1 (6)	1 (2)
03	17 (5)	5 (10)	7 (8)	0 (0)	2 (4)
92	17 (5)	2 (4)	2 (2)	1 (6)	2 (4)
89	15 (5)	3 (6)	8 (9)	0 (0)	1 (2)

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

Emm types 1 and 3 are both significantly associated with a fatal outcome (OR 3.3, CI 1.5, 7.1 and OR 4.5, CI 1.4, 15.0, respectively). *Emm* type 1 is positively associated with pneumonia (OR 3.8, CI 1.9, 7.5) and negatively associated with cellulitis (OR 0.4, CI 0.2, 0.8). *Emm* type 28 is positively associated with bacteremia (OR 2.8, CI 1.1, 7.1).

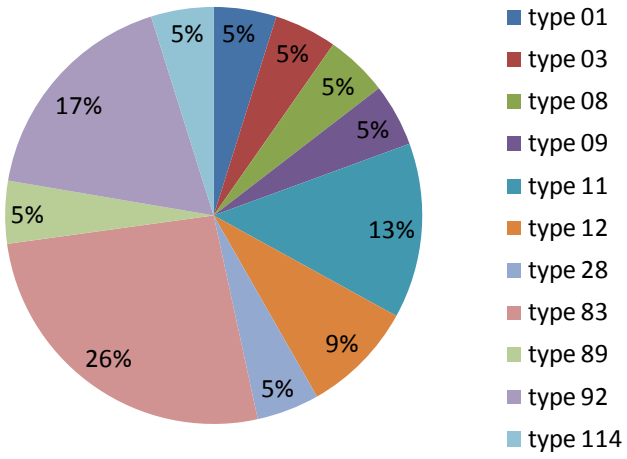
Antibiotic Susceptibility

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 200 isolates obtained from 2006-2009. Of these, 100 percent were susceptible to penicillin, ampicillin, cefotaxime, and vancomycin.

Twenty-four isolates (12%) exhibited some level of antibiotic resistance: two displayed intermediate resistance and 16 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 83, 92, and 11 have accounted for the largest percentage (56%) of the erythromycin-resistant isolates.

Figure 3: Percentage of Erythromycin-Resistant Isolates by emm Type 2006-2009 (N=22)



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 six 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 28 Jun 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.