Section 4

Antimicrobial Resistance Surveillance

Description

Some scientists consider antibiotics to be the single most impressive medical achievement of the 20th Century. However, the continuing emergence and spread of antimicrobial resistance jeopardizes the utility of antibiotics and threatens public health globally. Resistant pathogens are often associated with increased morbidity and mortality, prolonged hospital stays, and increased intensity and duration of treatment.

Currently, the Florida Department of Health (FDOH) conducts surveillance for antibiotic resistance in five microorganisms. Practitioners, hospitals, and laboratories are required to report cases of invasive *Streptococcus pneumoniae* from a normally sterile site, including antibiotic susceptibility testing results; practitioners, hospitals, and laboratories are required to report cases of vancomycin non-susceptible *Staphylococcus aureus*; laboratories participating in electronic laboratory reporting are required to report all *S. aureus* isolates from a normally sterile site with antibiotic susceptibility testing results; isolates of *Neisseria meningitidis* from cases of meningococcal disease are sent to Centers for Disease Control and Prevention (CDC) for additional laboratory testing as part of MeningNet; *Neisseria gonorrheoeae* isolates from the first 25 men with urethral gonorrhea seen each month in one STD clinic in Miami are forwarded to CDC for susceptibility testing as part of the Gonococcal Isolate Surveillance Project (GISP); and all specimens submitted to the FDOH Bureau of Laboratories that test positive for *Mycobacterium tuberculosis* complex are tested for drug susceptibilities. While the requirement for electronic laboratory reporting of *S. aureus* isolates was implemented in 2008, submitting laboratories and the FDOH are working on technical issues regarding the transfer of those data. However, the FDOH has partnered with a large commercial laboratory to receive antibiotic susceptibility data for all the *S. aureus* isolates the laboratory tests that are from Florida residents. The laboratory primarily serves outpatient providers.

Ideally, each patient presenting with an infection suspected to be caused by any of these organisms would be treated based on resistance testing of their own isolate. As this is not always possible, a cumulative antibiogram can provide useful information for the selection of an empiric therapy for a presumptive diagnosis. The selection of an antibiotic for empiric treatment should not be based solely on the cumulative antibiogram. However, the cumulative antibiogram should be considered in conjunction with factors such as the pharmacology of the antibiotic, its toxicity and the patient's hypersensitivity, the potential for interaction of the drug with other drugs the patient may be taking, the effectiveness of the patient's defense mechanisms, and the cost of the drug. Cumulative antibiograms are also useful for tracking the antibiotic resistance patterns of clinically important microorganisms and for detecting trends towards antimicrobial resistance.

Streptococcus pneumoniae

Background

Drug-resistant *S. pneumoniae* (DRSP) invasive disease was added to Florida's list of notifiable diseases in mid-1996. Drug-susceptible *S. pneumonia* (DSSP) invasive disease was added to the list of notifiable diseases mid-1999 to permit the assessment of the proportion of pneumococcal isolates that are drug-resistant, however electronic data capture of resistance testing results was not fully implemented until 2005. When analyzing susceptibility testing results for *S. pneumoniae*, only one antibiotic susceptibility result per case was included, in accordance with Clinical Laboratory Standards Institute (CLSI) guidelines. If there was more than one susceptibility result per case, results were ranked on date of specimen collection (earliest to latest), date of report (latest to earliest), and number of antibiotics tested (most to least) and the top ranking result was selected for inclusion. The decision to include the first result was based on the aim of this report, which is to guide clinicians in the selection of empirical antimicrobial therapy for initial infections.

Not every isolate was tested for resistance to every antibiotic included in this report. When calculating percent susceptibility to an antibiotic, the denominator is the number of cases tested for that particular antibiotic. Susceptibility results are presented for only those antibiotics that are recommended for routine testing and reporting per 2008 CLSI guidelines. CLSI guidelines divide antibiotics into three groups for the purposes of reporting susceptibility testing results. Groups are based on clinical efficacy, prevalence of resistance, minimizing emergence of resistance, cost, FDA clinical indications for usage, and current consensus recommendations for first-choice and alternative drugs. Group A includes antibiotics that CLSI considers appropriate for inclusion in routine, primary testing; Group B includes agents that may warrant primary testing, but which CLSI recommends be reported only selectively; Group C includes agents considered alternative or supplemental antimicrobial agents. Please note that cumulative susceptibility results for antimicrobials in Group B and C may underestimate the actual susceptibility rates in the community if only those isolates resistant to Group A antimicrobials are tested against Group B or C agents.

Data Trends

There were a total of 694 DSSP cases and 816 DRSP cases in 2010. Of the 694 DSSP cases, 11 did not have antibiotic susceptibility data because the patient died and further testing was not done.

The aggregate percent susceptibility for Group A agents were all around 60% (see Table 1). Aggregate percent susceptibility among Group B agents were more variable, ranging from greater than 97% susceptibility to the fluoroquinolones (levofloxacin, moxifloxacin, and ofloxacin) and greater than 99% susceptibility to vancomycin to only 73% susceptibility to tetracycline and 78% susceptibility to clindamycin. Aggregate percent susceptibility for Group C agents were 85% or higher.

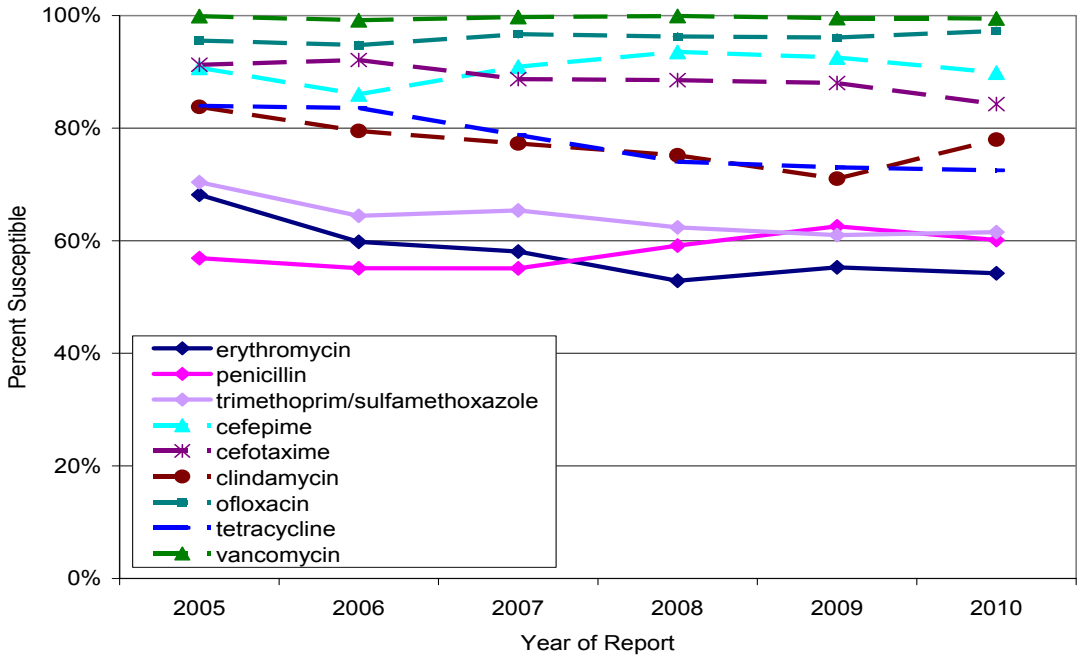
Table 1. *Streptococcus pneumoniae*, Invasive Disease, Antibiotic Resistance, Florida 2010

CLSI Group*	Antibiotic Name	Number of Isolates Tested	Susceptible	Intermediate	Resistant
Group A - primary test & report	Erythromycin	1160	54.2%	1.1%	44.7%
	Penicillin	1377	60.1%	19.2%	20.6%
	Trimethoprim/sulfamethoxazole	1014	61.5%	8.5%	30.0%
Group B - primary test; report selectively	Cefepime	158	89.9%	10.1%	0.0%
	Cefotaxime	783	84.3%	9.7%	6.0%
	Clindamycin	481	78.0%	1.9%	20.2%
	Levofloxacin	283	99.6%	0.4%	0.0%
	Moxifloxacin	85	100.0%	0.0%	0.0%
	Ofloxacin	223	97.3%	0.9%	1.8%
	Meropenem	99	76.8%	6.1%	17.2%
	Tetracycline	796	72.5%	0.6%	26.9%
	Vancomycin	1370	99.5%	0.2%	0.3%
Group C - supplemental; report selectively	Amoxicillin/clavulanic acid	66	90.9%	3.0%	6.1%
	Amoxicillin	67	85.1%	6.0%	9.0%
	Chloramphenicol	393	98.2%	0.0%	1.8%
	Imipenem	66	84.8%	9.1%	6.1%
	Linezolid	88	98.9%	0.0%	1.1%
	Rifampin	85	100.0%	0.0%	0.0%

* CLSI guidelines split antibiotics into three groups for the purposes of reporting susceptibility testing results. Groups are based on clinical efficacy, prevalence of resistance, minimizing emergence of resistance, cost, FDA clinical indications for usage, and current consensus recommendations for first-choice and alternative drugs. Group A includes antibiotics that CLSI considers appropriate for inclusion in routine, primary testing; Group B includes agents that may warrant primary testing, but which CLSI recommends be reported only selectively; Group C includes agents considered alternative or supplemental antimicrobial agents. Please note that cumulative susceptibility results for antimicrobials in Group B and C may underestimate the actual susceptibility rates in the community if only those isolates resistant to Group A antimicrobials are tested against Group B or C agents.

S. pneumoniae susceptibility to most Group A and Group B antibiotics stayed relatively stable from 2005 to 2010 (see Figure 2). Antibiotics with slight increases in susceptibility include penicillin and ofloxacin. Antibiotics with slight decreases in susceptibility include erythromycin, trimethoprim/sulfamethoxazole, cefotaxime, clindamycin, and tetracycline.

Figure 1. *Streptococcus pneumoniae*, Invasive Disease, Aggregate Percent Susceptible to Select CLSI Group A** and Group B** Antibiotics, Florida, 2005-2010



* In 2010, the FDOH increased the number of antimicrobials for which it was able to collect susceptibility testing results. Prior to 2010, aggregated susceptibility results are not available for these antimicrobials (levofloxacin, moxifloxacin, and meropenem) and they are not included on this graph.
** CLSI Group A antimicrobial agents are depicted on this graph with solid lines while Group B agents are depicted with dashed lines

In general, the lowest cumulative susceptibility was seen among young children (see Table 2). For example, only 33% of cases in young children (aged 1-4 years) tested for resistance to erythromycin were susceptible, versus 42% of cases in youth (aged 15-24 years) and over 50% in all other age groups. Only 39% of cases in young children were susceptible to penicillin, versus 47% or higher in all other age groups. And likewise, only 34% of cases in young children were susceptible to trimethoprim/sulfamethoxozole versus 53% or higher in other age groups.

Table 2. *Streptococcus pneumoniae*, Invasive Disease, Cumulative Percent Susceptibility to Select Antibiotics by Age Group, Florida 2010

		Group A - primary test & report			Group B - primary test; report selectively								
Age Group	Number of Isolates Tested‡	Erythromycin	Penicillin	Trimethoprim/ sulfamethoxazole	Cefepime	Cefotaxime	Clindamycin	Levofloxacin	Moxifloxacin	Ofloxacin	Meropenem	Tetracycline	Vancomycin
<1 (infant)	50	50%	48%	56%	*	93%*	88%*	100%*	*	100%*	*	70%	100%
1-4 (young child)	156	33%	39%	34%	93%*	67%	55%	100%*	*	100%*	*	50%	99%
5-14 (child)	44	53%	47%	53%	*	74%*	77%*	100%*	*	*	*	45%*	97%
15-24 (youth)	36	42%*	53%	54%*	*	75%*	100%*	*	*	100%*	*	67%*	100%
25-64 (adult)	710	60%	64%	63%	90%	85%	80%	99%	100%	97%	73%	77%	100%
65+ (senior)	514	55%	64%	69%	89%	89%	81%	100%	100%	97%	86%	75%	100%

* Marked observations are those in which too few cases (<30) were tested to produce reliable estimates of susceptibility. Results of age group/drug combinations where there were fewer than 10 cases tested were suppressed.

Resistance patterns were also summarized by Regional Domestic Security Task Force Region. The South West Region tended to have the lowest cumulative susceptibility for the majority of the antimicrobials, while the Northern regions (Northeast, North Central, Northwest) tended to have the highest cumulative susceptibility (See Table 3).

Table 3. *Streptococcus pneumoniae*, Invasive Disease, Cumulative Percent Susceptibility to Select Antibiotics by Regional Domestic Security Task Force Region, Florida 2010

		Group A - primary test & report			Group B - primary test; report selectively								
Region	Number of Isolates Tested‡	Erythromycin	Penicillin	Trimethoprim/ sulfamethoxazole	Cefepime	Cefotaxime	Clindamycin	Levofloxacin	Moxifloxacin	Ofloxacin	Meropenem	Tetracycline	Vancomycin
East Central	304	48%	58%	68%	100%*	86%	84%	100%	100%*	99%	80%*	70%	99%
North Central	35	70%*	76%*	65%*	*	81%*	95%*	*	*	*	*	91%*	100%
Northeast	158	62%	59%	66%	88%	87%	88%	100%*	*	*	84%*	83%	100%
Northwest	113	68%	65%	65%	91%	86%	83%	100%*	100%*	100%*	77%*	83%	97%
Southeast	457	55%	64%	55%	100%*	83%	73%	99%	100%*	96%*	*	72%	99%
Southwest	183	42%	53%	54%	*	85%	78%*	100%*	100%*	98%	69%*	60%	100%
West Central	260	54%	58%	61%	81%*	81%	72%	100%	100%*	89%*	74%*	67%	100%

* Marked observations are those in which too few cases (<30) were tested to produce reliable estimates of susceptibility. Results of age group/drug combinations where there were fewer than 10 cases tested were suppressed.

Staphylococcus aureus

Background

While the requirement for all laboratories participating in electronic laboratory reporting to submit *S. aureus* isolates with susceptibility testing results was implemented in 2008, submitting laboratories and the FDOH are still working to get participating facility data streams implemented and validated. However, in 2005, the FDOH began receiving antibiotic susceptibility data for all *S. aureus* isolates tested by a large commercial laboratory that primarily serves outpatient providers operating throughout Florida. Data from 2003 and 2004 were retrospectively collected and, as of 2010, eight years of data are available. That data is presented here. For the purposes of this analysis, and in accordance with Clinical Laboratory Standards 2008 (CLSI) guidelines, only the first isolate per person per 365 days was included; duplicate isolates were excluded from the analysis.

S. aureus bacteria are commonly found on the skin of healthy individuals, but have the potential to cause serious disease. About 20% of healthy individuals are persistent carriers of *S. aureus*, usually in the nose and on the skin, over 60% of the population may be intermittent carriers, and a small portion of people rarely carry S. aureus. Methicillin-resistant *S. aureus* (MRSA) is a strain of *S. aureus* that is considered to be resistant to all β-lactam antibiotics (including penicillins, cephalosporins, cephamicins, and monobactams). It may also be resistant to other antibiotics. Resistance testing for oxacillin is used to detect methicillin resistance.

Healthcare-acquired (HA) infections due to MRSA have been identified for over four decades. In recent years, however, infections due to MRSA have also been increasing in the community in individuals without healthcare-associated risk factors. Skin and soft tissue infections are the most common type of infection resulting from community-associated (CA) *S. aureus*. While the line between healthcare-associated and community-associated *S. aureus* has increasingly blurred, they are generally distinct strains of the bacteria with different antibiotic resistance patterns. While HA-MRSA is typically not more virulent or pathogenic than methicillin-susceptible *S. aureus* (MSSA), only more difficult to treat, CA-MRSA does have enhanced virulence. It can elicit tissue necrosis, grow faster, and compete more effectively than other strains of *S. aureus*. It is common for HA-MRSA to have resistance to multiple classes of antimicrobial agents; such wide resistance patterns are uncommon in CA-MRSA.

Data Trends

After the removal of duplicate isolates for individuals with more than one isolate in a 365 day period, there were 50,996 *S. aureus* isolates included in the analysis in 2006, 53,131 in 2007, 61,083 in 2008, 63,427 in 2009, and 60,947 in 2010. Resistance to penicillin was above 90% and rose throughout the period. The percentage of all isolates that were methicillin-resistant (as determined by oxacillin resistance) was 50-52% for the entire period. Resistance to other β-lactam drugs mirrored oxacillin resistance, remaining stable above 50% for the entire period. Resistance remained low for gentamycin, trimethoprim-sulfamethoxazole, linezolid, vancomycin and tetracycline. While in vitro resistance to clindamycin was only 15-21%, resistance to erythromycin was substantially higher (65%-68%), indicating the potential for inducible clindamycin resistance and subsequent treatment failure.

Table 4. Number Tested and Percent of *Staphylococcus aureus* Isolates from a Commercial Laboratory Susceptible to Select Antibiotics, Florida, 2006-2010

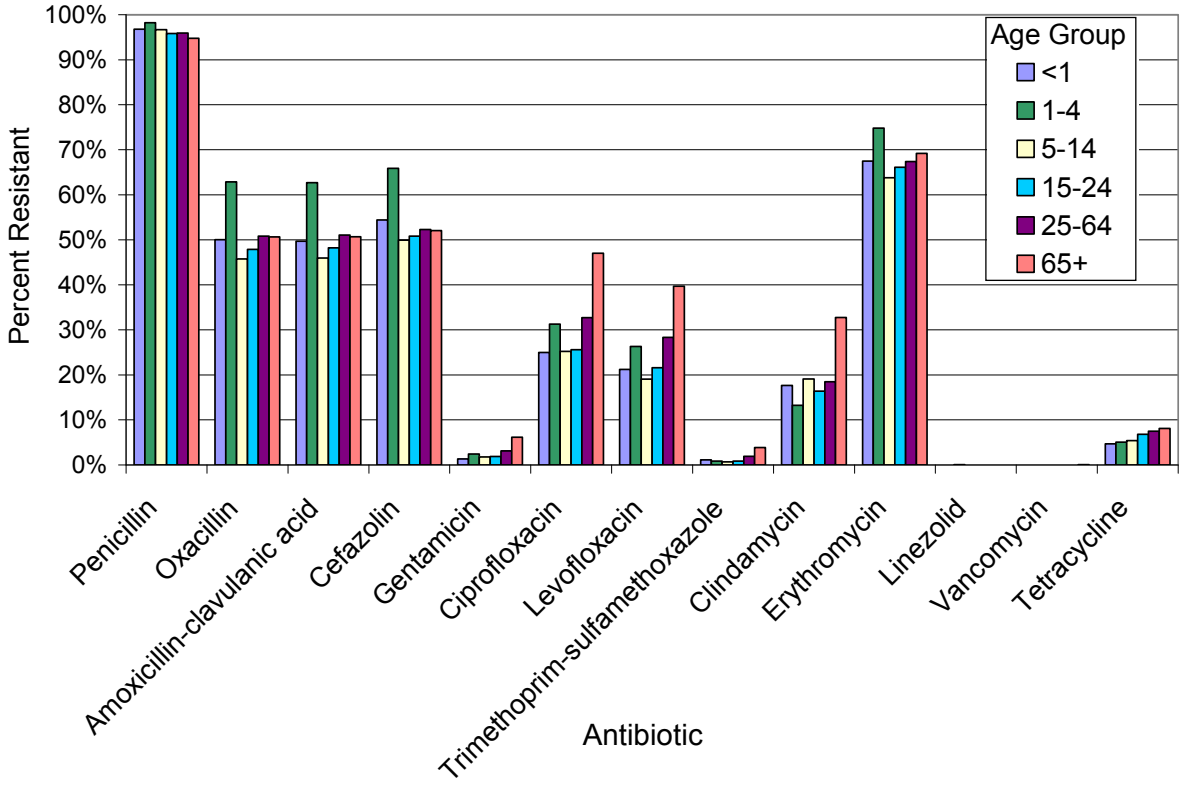
	Antibiotic Class	Antibiotic Name	2006		2007		2008		2009		2010	
			N*	%**	N*	%**	N*	%**	N*	%**	N*	%**
β-lactams	Penicillins	Penicillin	50763	8.7%	52066	8.3%	56334	7.1%	57188	5.0%	52067	4.0%
	Penicillinase-stable penicillins	Oxacillin (MRSA)	50840	49.9%	52462	48.0%	58255	48.1%	60416	49.9%	58005	49.2%
	β-lactam/β-lactamase inhibitor combinations	Amoxicillin-clavulanic acid	50808	49.7%	52450	47.7%	58404	48.1%	60481	49.8%	57797	49.0%
non-β-lactams	Cephalosporin I	Cefazolin	44968	43.9%	52175	47.8%	58352	48.1%	60401	49.7%	41861	47.0%
	Aminoglycosides	Gentamicin	50835	98.3%	52875	98.2%	60427	98.3%	62741	97.3%	60314	96.7%
	Fluoroquinolones	Ciprofloxacin	50803	74.5%	52754	72.5%	56530	71.9%	23167	71.9%	32437	66.1%
		Levofloxacin	24658	76.1%	1153	74.7%	6329	76.0%	42201	73.0%	57350	71.7%
	Folate Pathway Inhibitors	Trimethoprim-sulfamethoxazole	50824	98.8%	52585	98.7%	58542	98.3%	61290	98.1%	59031	98.1%
	Lincosamides	Clindamycin	34599	84.3%	31194	81.2%	54959	82.4%	56697	81.9%	54636	79.4%
	Macrolides	Erythromycin	38977	33.6%	14423	34.2%	15947	33.4%	17108	35.6%	36170	32.2%
	Oxazolidinones	Linezolid	406	99.8%	8535	99.9%	16136	100%	39544	100%	53650	100%
	Glycopeptides	Vancomycin	50814	100%	52536	100%	58258	100%	60786	99.9%	58426	100%
	Tetracyclines	Tetracycline	49409	93.8%	50731	94.4%	57613	94.5%	60227	94.0%	57994	93.0%

* N is the total number of isolates tested for susceptibility to the selected antibiotic
** % is the percent of isolates susceptible to the selected antibiotic
‡*Vancomycin non-susceptible isolates are likely false-positives. There were only 2 laboratory confirmed vancomycin-intermediate S. aureus cases (VISA) reported to the FDOH in 2010. The commercial laboratory that supplied the data for this analysis used the VITEK system to determine resistance patterns, a test method which has been noted for the occurrence of false-positive test results for vancomycin resistance. It is protocol that isolates that are initially non-susceptible to vancomycin should be retested using manual methods, but unfortunately, final results of that testing are not always included in the data. While there are several vancomycin non-susceptible isolates included in this data, to date, there have been no vancomycin-resistant S. aureus (VRSA) infections reported to the FDOH and only 12 laboratory confirmed VISA infections reported since 2007. There was one VISA case reported in 2007, 3 in 2008, 6 in 2009, and 2 in 2010. The case definition for VISA was changed during that period, lowering the Minimum Inhibitory Concentration (MIC). The increase in reported VISA from 2007 to 2010 is thus partly attributable to a reporting artifact and not reflective of the true magnitude of any increase in VISA that may have occurred.*

Of the nearly 61,000 isolates tested in 2010, 95.1% (n=58,005) were tested for susceptibility to oxacillin. Of those, just over half (50.8%) had intermediate or full resistance to oxacillin, indicating that they are MRSA and therefore resistant to all β-lactam antibiotics. Additionally, as in previous years, resistance was elevated to antibiotics belonging to the fluoroquinolone (ciprofloxacin and levofloxacin), lincosamide (clindamycin), and macrolide (erythromycin) classes. Tested organisms remained highly susceptible to drugs from the amino-glycoside (gentamicin), folate pathway inhibitor (trimethoprim-sulfamethoxazole), oxazolidinone (linezolid), glycopeptides (vancomycin), and tetracycline (tetracycline) classes.

The proportion of *S. aureus* isolates resistant to various antibiotics did not differ substantially by age group, with a few exceptions. Isolates taken from individuals aged 1 to 4 years had the highest level of resistance to oxacillin, causing them to be classified as MRSA and indicating resistance to all β-lactam antibiotics. Additionally, isolates taken from older individuals had greater resistance to gentamicin (6.1% versus 2.6% in those <65 years), ciprofloxacin (47.0% versus 30.1%), levofloxacin (39.7% versus 25.4%), trimethoprim-sulfamethoxazole (3.8% versus 1.4%), and clindamycin (32.7% versus 17.6%). Resistance was also higher in isolates taken from older patients for tetracycline and erythromycin (with the exception of high levels of resistance seen in those aged 1 to 4 years), although the difference was not as substantial (Figure 2).

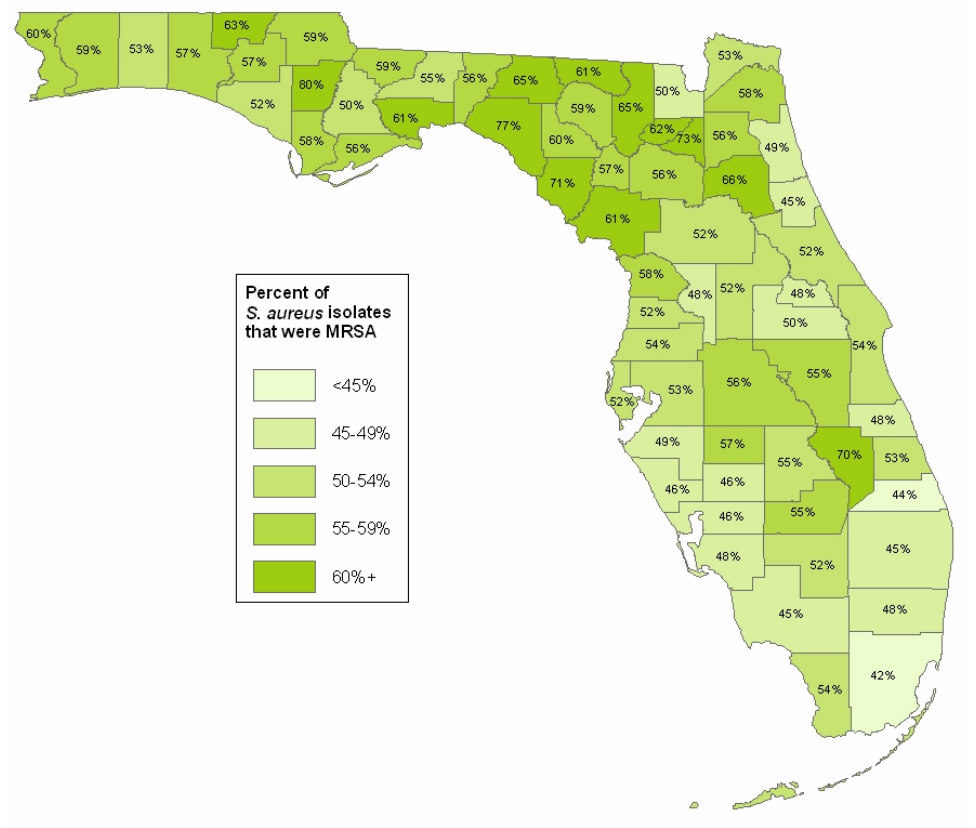
Figure 2. Resistance Patterns of *Staphylococcus aureus* Isolates Tested by a Commercial Laboratory by Age Group, Florida, 2010



Of the 54,192 isolates in 2010 where the patient's address could be assigned to a Florida county, the majority were from individuals who lived in the Southeast Region of the state (n=16,077, 29.7%). Nearly all of the isolates that could be mapped were tested for susceptibility to oxacillin (n=51,597, 95.2%). The Northern part of the state had the highest proportion of *S. aureus* isolates that were MRSA (61.1% in the North Central Region, followed by 56.8% in the Northwest Region and 56.0% in the Northeast Region), while the lowest proportion of isolates that were MRSA was seen in the Southeast Region (44.9%) (Figure 3).

The South East Region is comprised of Palm Beach, Broward, Miami-Dade, and Monroe Counties. The North Central Region is comprised of Gadsden, Liberty, Franklin, Leon, Wakulla, Jefferson, Madison, Taylor, Hamilton, Suwannee, Lafayette, Dixie, and Columbia Counties. The Northwest Region is comprised of Escambia, Santa Rosa, Okaloosa, Walton, Holmes, Washington, Bay, Jackson, Calhoun, and Gulf Counties. The Northeast Region is comprised of Baker, Union, Gilchrist, Levy, Marion, Alachua, Bradford, Putnam, Flagler, Clay, St. Johns, Duval, and Nassau Counties.

Figure 3. Proportion of *Staphylococcus auraus* Isolates Tested by a Commercial Laboratory that were Oxacillin-Resistant (MRSA), by Patient's County of Residence, Florida, 2010



Conclusions

Community-associated MRSA is a significant source of skin and soft tissue infections in Florida. Knowledge of the community antibiogram can be clinically useful when considering options for empirical treatment of skin infections. The proportion of *S. aureus* infections diagnosed in an outpatient setting that are MRSA is around 50%. Based on this high prevalence of MRSA, empiric treatment of skin and soft tissue infections with β-lactam antibiotics is not recommended.

A more detailed surveillance report on community-associated *S. aureus* is available on the FDOH website at: http://www.doh.state.fl.us/Disease_ctrl/epi/htopics/anti_res/MRSA_StatewideSummary_CHDs.pdf.

Neisseria meningitidis

The emergence of quinolone-resistant *Neisseria meningitidis* in the U.S. has raised important questions regarding current chemoprophylaxis guidelines and highlights the expanding threat of antimicrobial resistance in bacterial pathogens. The Centers for Disease Control and Prevention (CDC) responded to this threat by forming MeningNet, an enhanced meningococcal surveillance system that will be used to monitor antimicrobial susceptibility. As part of MeningNet, Florida Bureau of Laboratories (BOL) began forwarding all *N. meningitidis* isolates to the CDC for antibiotic susceptibility testing in late 2008.

Of the 60 cases of meningococcal disease in Florida in 2010, 55 cases had an isolate that was submitted to CDC for testing as part of MeningNet. Of those 55 isolates that were sent, four were non-viable upon arrival at CDC. All 51 remaining isolates from Florida were tested for susceptibility to penicillin, ceftriaxone, ciprofloxacin, rifampin, and azithromycin with the use of the Etest. Isolates that screened positive for decreased susceptibility were confirmed with the use of broth microdilution. All other isolates were fully (100%) susceptible to ceftriaxone, ciprofloxacin, and rifampin and fully susceptible or intermediate-susceptible to penicillin. Only one isolate tested non-susceptible to azithromycin, all other isolates were susceptible. This case was in an infant from Northwest Florida with serogroup B infection. No travel history or epidemiologicaly linked cases were noted.

Neisseria gonorrhoeae

Background

The treatment and control of gonorrhea has been challenged due to the development of resistance to several antimicrobial agents over time. In the 1970's the standard treatments of penicillin and tetracycline were abandoned due to increased resistance. As late as 2007, an increase in fluoroquinolone resistant isolates prompted recommendations for new treatment guidelines supporting the use of cephalosporins for gonococcal infections. In some parts of the world, the bacterium is now showing potential resistance to cephalosporins, the only recommended class of antibiotics left.

The Gonococcal Isolate Surveillance Project (GISP) was established in 1986 to continuously monitor trends in antimicrobial susceptibilities of strains of *N. gonorrhoeae* across 30 cities in the United States. In Florida, the Miami-Dade Sexually Transmitted Disease (STD) clinic has served as one of 29 GISP sites since 1998. The Miami-Dade STD clinic collects specimens each month for culture from symptomatic males. If the Gram stain is positive for the presence of diplococci, the specimen is forwarded to the Bureau of Laboratories-Miami for growth detection and identification, and then shipped to the CDC until 25 viable *N. gonorrhoeae* isolates are reached for the month. The CDC monitors susceptibility of isolates to cefixime, cefpodoxime, ceftriaxone, tetracycline, spectinomycin, ciprofloxacin, penicillin, and azithromycin.

Data Trends

In the past five years, 1,165 viable specimens were collected from the Miami-Dade GISP site. In 2010, 209 isolates were submitted in which resistance to penicillin and tetracycline remained high and resistance to the fluoroquinolone, ciprofloxacin, remained stable. Minimal increases in azithromycin were noted in 2010 compared to previous years. Recommendations to only use cephalosporins in 2007 have been credited with the steady decline of gonorrhea in Florida. Currently, the cephalosporin antibiotics, ceftriaxone and cefixime, have not shown any signs of resistance in Florida-submitted isolates.

Table 5. Percent of *Neisseria gonorrhoeae* Isolates Susceptible to Select Antibiotics, Miami-Dade GISP Site, 2006-2010

Antibiotic	2006 (N=212)*	2007 (N=266)*	2008 (N=259)*	2009 (N=219)*	2010 (N=209)*
Penicillin (MIC‡ > 2.0 ug/ml)	94.4%	79.4%	86.5%	87.7%	78.9%
Tetracycline (MIC‡ > 2.0 ug/ml)	70.3%	60.0%	61.4%	64.8%	67.0%
Spectinomycin (MIC‡ > 128.0 ug/ml)	100.0%	100.0%	100.0%	100.0%	100.0%
Ciprofloxacin (MIC ‡> 1.0 ug/ml)	80.2%	80.5%	85.7%	88.6%	86.1%
Ceftriaxone (MIC‡ > 0.5 ug/ml)	100.0%	100.0%	100.0%	100.0%	100.0%
Cefixime (MIC‡ > 0.5 ug/ml)	100.0%	100.0%	100.0%	100.0%	100.0%
Azithromycin (MIC‡ > 2.0 ug/ml)	100.0%	100.0%	100.0%	100.0%	98.6%

* N is the total number of isolates found to be resistant to the selected antibiotic
‡MIC=Minimum Inhibitory Concentration: the lowest concentration of antibiotic needed to inhibit visible growth of a microorganism in laboratory.

CDC recommends the regimen of 250 mg IM in a single dose of ceftriaxone, 400 mg orally in a single dose of cefixime, or a single dose injectible cephalosporin regimen plus azithromycin (1g orally in a single dose) or doxycycline (100mg orally twice a day for 7 days) for uncomplicated gonococcal infections of the cervix, urethra, and rectum.

References

Centers for Disease Control and Prevention, Gonorrhea-CDC Fact Sheet, available at: http://www.cdc.gov/std/Gonorrhea/STDFact-gonorrhea.htm.

Centers for Disease Control and Prevention, "Sexually Transmitted Diseases: Treatment Guidelines, 2010," *MMWR* 2010, 59 (no. RR-12).

Mycobacterium tuberculosis

Background

Tuberculosis (TB) is an infectious respiratory disease caused by the *Mycobacterium tuberculosis* bacilli. This disease is spread by aerosolized droplets from individuals with active TB when they cough, sing, speak, or laugh. Each year there are over nine million infections and 1.7 million deaths caused by the disease worldwide. The development of drug resistance is a serious development for patient care and public health. Multidrug-resistant TB (MDR TB) is TB that is resistant to at least two of the most important anti-TB drugs, isoniazid and rifampin. These drugs are considered first-line drugs and are used to treat all persons with TB disease. The Florida Department of Health (FDOH) BOL conducts susceptibility testing on all initial specimens positive for *Mycobacterium tuberculosis* complex submitted from Florida healthcare entities, as well as county health department clinics.

Current Data

In 2010, the susceptibility results to the first-line TB drugs for specimens submitted to the BOL for analysis are listed in Table 6. There were 4 patients diagnosed with MDR TB in Florida.

Table 6. *Mycobacterium tuberculosis* Complex Susceptibility Results to First-Line TB Drugs, Tested by the FDOH Bureau of Laboratories, 2010*

Antibiotic/Concentration	# Susceptible	% Susceptible	# Resistant	% Resistant
Rifampin 2.0 µg/ml	529	98.5%	8	1.5%
Isoniazid 0.1 µg/ml	499	92.9%	38	7.1%
Pyrazinamide 100 µg/ml	533	99.3%	4	0.7%
Ethambutol 2.5 µg/ml	532	99.1%	5	0.9%
Streptomycin 2.0 µg/ml	503	93.7%	34	6.3%

*Only one isolate per Florida TB patient included; N=537 total tested using BACTEC 460TB

References

Centers for Disease Control and Prevention, Drug-resistant TB, available at: http://www.cdc.gov/tb/topic/drtb/default.htm.

Centers for Disease Control and Prevention, Tuberculosis Data and Statistics, available at: http://www.cdc.gov/tb/statistics/default.htm.