GEIS Respiratory Disease Surveillance Newsletter
DoD Center for Deployment Health Research
Naval Health Research Center, San Diego

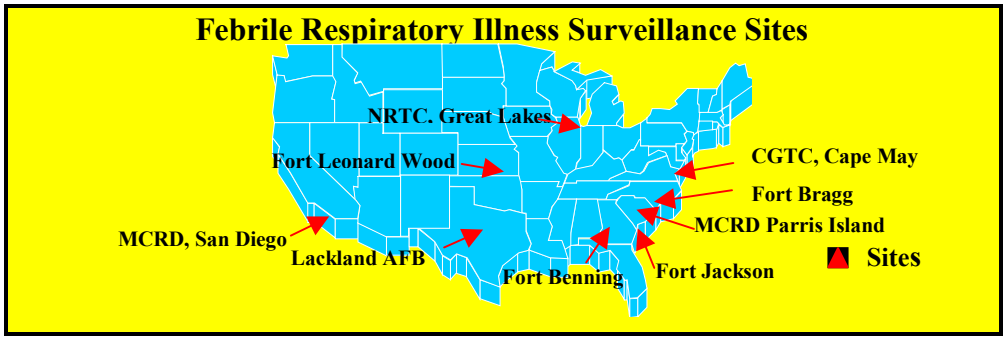
Background – Sponsored by the DoD Global Emerging Infections System (GEIS), the Naval Health Research Center (NHRC) is collaborating with numerous federal and state institutions conducting surveillance for respiratory pathogens (adenovirus, influenza, respiratory syncytial virrus (RSV), parainfluenza, *Streptococcus pyogenes*, and invasive *Streptococcus pneumoniae)*. We are also managing some new studies, which are detailed in the "What's New" section below. Additional information may also be found at www.nhrc.navy.mil/geis

What's New

Flu Diagnostic. A clinical trial of two rapid tests (Biostar, Flu OIA® and Quidel, Quick Vue®) for influenza has ended for this flu season at Forts Jackson, Benning, and Leonard Wood. We tested 205 trainees from 2/00 to 5/00. Trainees with symptom onset of <72 hours were considered eligible for the study. Standard culture and rapid test results were compared to evaluate the accuracy of the rapid testing method. Preliminary results indicate a sensitivity of 100% for both tests, a specificity of 54% for the Biostar test and 82% for Quidel. PPV of the Biostar test was 2% and 5% for Quidel. NPV was 100% for both tests. Testing will resume in fall 2000.

Pertussis Study NHRC's surveillance of *Bordetella pertussis* is underway at Marine Corps Recruit Depot (MCRD), San Diego. Surveillance will begin at Fort Benning and Fort Leonard Wood in August followed by Naval Recruit Training Center (NRTC), Great Lakes in September 2000.

Pneumococcal Vaccine Trial In collaboration with Wyeth-Lederle Vaccines, NHRC and 4 recruit training sites will conduct a double blind, placebo-controlled trial of a 23-valent pneumococcal vaccine. The study is scheduled to begin in the fall at MCRD, San Diego, Fort Leonard Wood, NRTC, Great Lakes, and Fort Jackson. The study will enroll 191,000 trainees and follow them over a period of 24 months for respiratory disease.



Adenovirus

Current Progress - Adenovirus remains the leading cause of febrile respiratory illness (FRI) among trainees, with 56% of the 4211 specimens collected between June 1998 and June 2000 were positive for adenovirus. Unvaccinated trainees (n =3694) were more likely to be adenovirus positive (OR=1.89, 95% CI 1.48–2.62) than vaccinated trainees who received only type 7 vaccine (n = 233). More than 89% of the adenovirus positive specimens (n = 2376) came from unvaccinated personnel.

Geographic Trends - The amount of morbidity caused by adenovirus varied by location ranging from 4.8% at Fort Bragg to 79.2% at MCRD, San Diego. In 1998, two sites accounted for the majority of FRI (adenovirus associated) morbidity. However, in 1999/2000, six of the eight surveillance sites reported epidemic level (1.50 cases per 100 trainees per week) FRI rates (Figure 1). Due to few cases, specimen collection was terminated at the Fort Bragg site in March.

Temporal Trends - The previously observed seasonal occurrence of adenovirus continues to be disrupted at several surveillance sites. In 1999, (after all of the remaining adenovirus vaccine was depleted) epidemic level FRI rates were seen as early as March, peaking in the fall and through December (Figure 1). In 2000, surveillance sites were crossing the epidemic threshold during every month between January and June. Preliminary results (from January to April) indicate that adenovirus is the leading cause of morbidity during those months (Figure 2).

Influenza

Current Progress - To date 323 (7.7%) of the 4211 FRI specimens tested were positive for influenza (6.2% type A and 1.5% type B). Overall rates are shown in Figure 3. Trainees who were not vaccinated against influenza, were six times more likely to be influenza-positive (OR= 6.19, 95% CI, 4.80–7.99). During the period of December 1999 to June 2000 (flu season), 929 FRI cases were reported. Of these 929 cases, 7.1% were identified with influenza as the responsible pathogen. Surveillance data indicate that influenza (type H3N2) was prevalent during this flu season. However, adenovirus remained the most prevalent FRI etiology (the proportional distribution is shown in Figure 4).

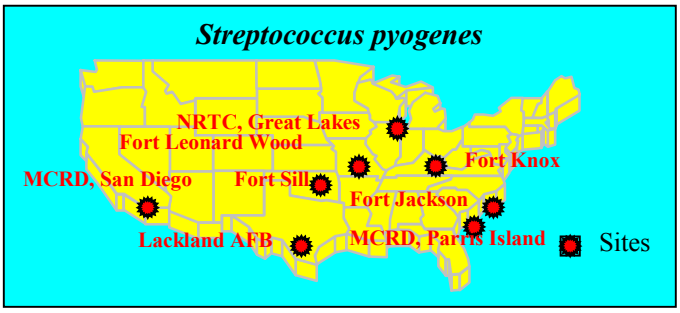
Geographic Trends – The amount of morbidity caused by infection with influenza A or B varied by location. During the 1998-1999 flu season, influenza isolation ranged from 0% at Cape May, to 55.6% at Fort Bragg. Influenza infection during the 1999-2000 flu season ranged from 0% at Lackland, to 23.1% at Fort Bragg (Figure 5).

Temporal Trends – During the period of 1/99 to 6/99, there were more than twice as many cases of influenza (n=196) as compared with 1/00 to 6/00 (n=66, Figure 6). The percentage of unvaccinated trainees was 38% during 1999 and 19% in 2000. Data from multiple surveillance institutions indicate the seasonal pattern of influenza (within the United States), remaining most prevalent during the Winter and Spring months. This is in stark contrast to adenovirus, which crossed the epidemic threshold during most every season in 1999.

Other Pathogens – Of the 4211 specimens tested, 21 (0.5%) were positive for RSV and 58 (1.4%) grew parainfluenza 1, 2, or 3.

FRI specimens tested per site 6/98 to 6/00

SITE	SPECIMENS TESTED
Fort Benning	682
Fort Bragg	63
Fort Jackson	1568
Fort Leonard Wood	616
NRTC, Great Lakes	609
MCRD, San Diego	322
MCRD, Parris Island	168
CGTC, Cape May	93
Lackland AFB	90



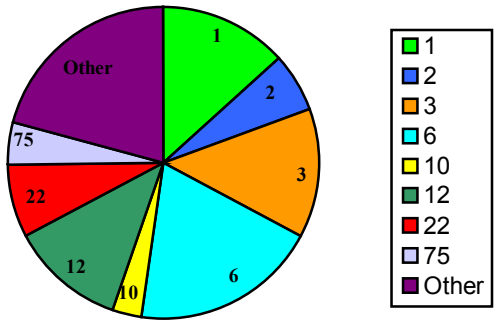
Streptococcus pyogenes

Current Progress – *Streptococcus pyogenes* (Group A streptococcus) continues to be a threat to the health of military trainees. Between 2/98 and 6/00, 252 clinical isolates were collected from trainees at 8 military sites.

Antibiotic Resistance – *S. pyogenes* maintains 100% susceptibility to three antibiotics (penicillin, levofloxacin, and vancomycin). Forty-two (16.7%) of the 252 isolates collected had full or partial resistance to erythromycin, 17 (6.7%) tetracycline, and 6 (2.9%) clindamycin (Figure 7). Three (1.2%) of the isolates were resistant to both erythromycin and tetracyline. Isolates from male (n=218) and female (n=31) trainees exhibited similar proportions of erythromycin resistance (16.5% and 19.4% , respectively).

Emm-gene Types – The most common emm-gene types (n=67) for *S. pyogenes* among military trainees were 6 (20.9%), 1 (13.4%), 3 (13.4%), 12 (11.9%), 22 (7.5%), 2 (7%), and 75 (4.5%). These seven emm-gene types made up more than 78% of all the typed isolates.

Emm-Gene Type Distribution of *Streptococcus pyogenes* Isolates Among U.S. Military Trainees



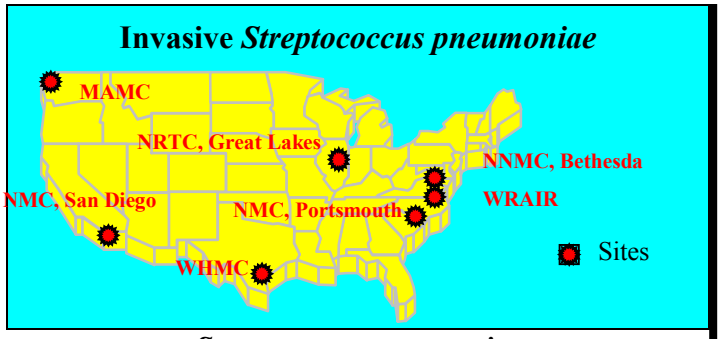
n = 67 Emm-gene typed isolates

Resistance by Emm-gene type – Erythromycin resistance varied by emm-gene type. Type 22 (80%) demonstrated the most erythromycin resistance of all emm-gene typed isolates (Figure 8).

Geographic Trends – *S. pyogenes* isolates from military trainees currently maintain high susceptibility to many commonly prescribed antibiotics. However, we continue to observe an unequal geographic distribution of erythromycin resistance at the sites. Resistance to erythromycin ranged from 0% at Fort Jackson to 30% at Lackland AFB. Additionally, 26 of the 93 (28%) isolates submitted by Lackland AFB were fully resistant to erythromycin (Figure 9).

***S. pyogenes* isolates received per site 2/98 to 6/00**

SITE	ISOLATES RECEIVED
NRTC, Great Lakes	55
MCRD, San Diego	4
MCRD, Parris Island	31
Fort Jackson	4
Fort Knox	23
Fort Leonard Wood	23
Ft. Sill	19
Lackland, AFB	93



Streptococcus pneumoniae

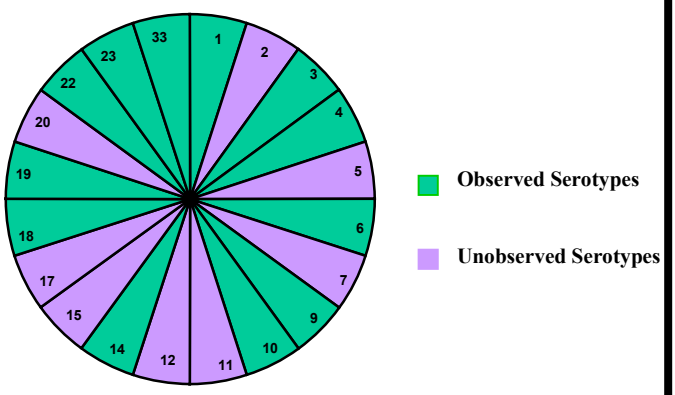
Current Progress – Testing is complete for 231 invasive clinical isolates collected between 8/97 and 6/00 from military healthcare beneficiaries at 7 military medical centers.

Antibiotic Resistance – Seventy-seven (33.3%) of the 231 isolates collected had full or partial resistance to penicillin, and 54 isolates (23.4%) exhibited resistance to three or more antibiotics (Figure 10). Males (33.6%) and females (33.0%) exhibited similar rates of full or partial resistance to penicillin. Similar rates of penicillin-resistance were also seen across all age groups. A majority of the penicillin resistant isolates came from those in the ≤=1 and ≥ 66 age group.

Invasive *S. pneumoniae* Penicillin Resistance by Age Group

Age	# Tested	Susceptible	Intermediate	Resistant
≤ 1	64	64%	25.00%	10.90%
2-4	23	65.2%	17.4%	17.4%
5-18	13	69.2%	23.1%	7.7%
19-65	40	75.0%	15.0%	10.0%
≥ 66	21	61.9%	4.8%	33.3%

23-Valent Pneumococcal Vaccine Serotypes/Serotypes Isolated at the Surveillance Sites



***S. pneumoniae* Serotypes** – Of 124 typed isolates, the most common serotypes were 14 (23%), 6 (15%), 19 (15%), 9 (13.0%), 4 (12%), 23 (9%), and 18 (4%) (Figure 11), all of which are included in the 23-valent pneumococcal vaccine. These seven serotypes made up more than 90% of the typed isolates at the sites. Four of the serotyped isolates came from vaccinated individuals.

Resistance by Serotype – Penicillin resistance differed by serotype with types 19 (69.2%), 9 (56.2%), and 6 (52.6%) having the most resistance. These three serotypes accounted for more than 74% of all penicillin resistance among the serotyped isolates, though they only accounted for 42% of the serotypes. Similarly, the distribution of serotypes varied by site (Figure 12).

Geographic Trends – We observed an unequal geographic distribution of penicillin resistance. Penicillin resistance ranged from 0% at NRTC, Great Lakes to 46.7% at Walter Reed Army Institute of Research (Figure 13), although the number of isolates contributed by each site was not distributed evenly.

Temporal Trends – Overall, the number of invasive *S. pneumoniae* isolates at the medical centers increased moderately during the fall and winter and decreased during the spring and summer months.

Invasive *S. pneumoniae* isolates tested per site 8/97 to 6/00

SITE	ISOLATES RECEIVED
NRTC Great Lakes	4
Naval Med. Ctr (NMC), San Diego	54
NMC, Portsmouth	2
National Naval Med. Ctr (NNMC), Bethesda	12
Walter Reed AIR	15
Madigan Army Med. Ctr. (AMC)	88
Wilford Hall MC	56

Final Note – A special thanks to all of the staff at the participating surveillance sites and collaborating institutions. This newsletter would not be possible without your hard work and dedication. Thank You!

We welcome any comments or suggestions you may have regarding the information contained in this newsletter. For additional information, please contact the newsletter staff.

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Figure 1.

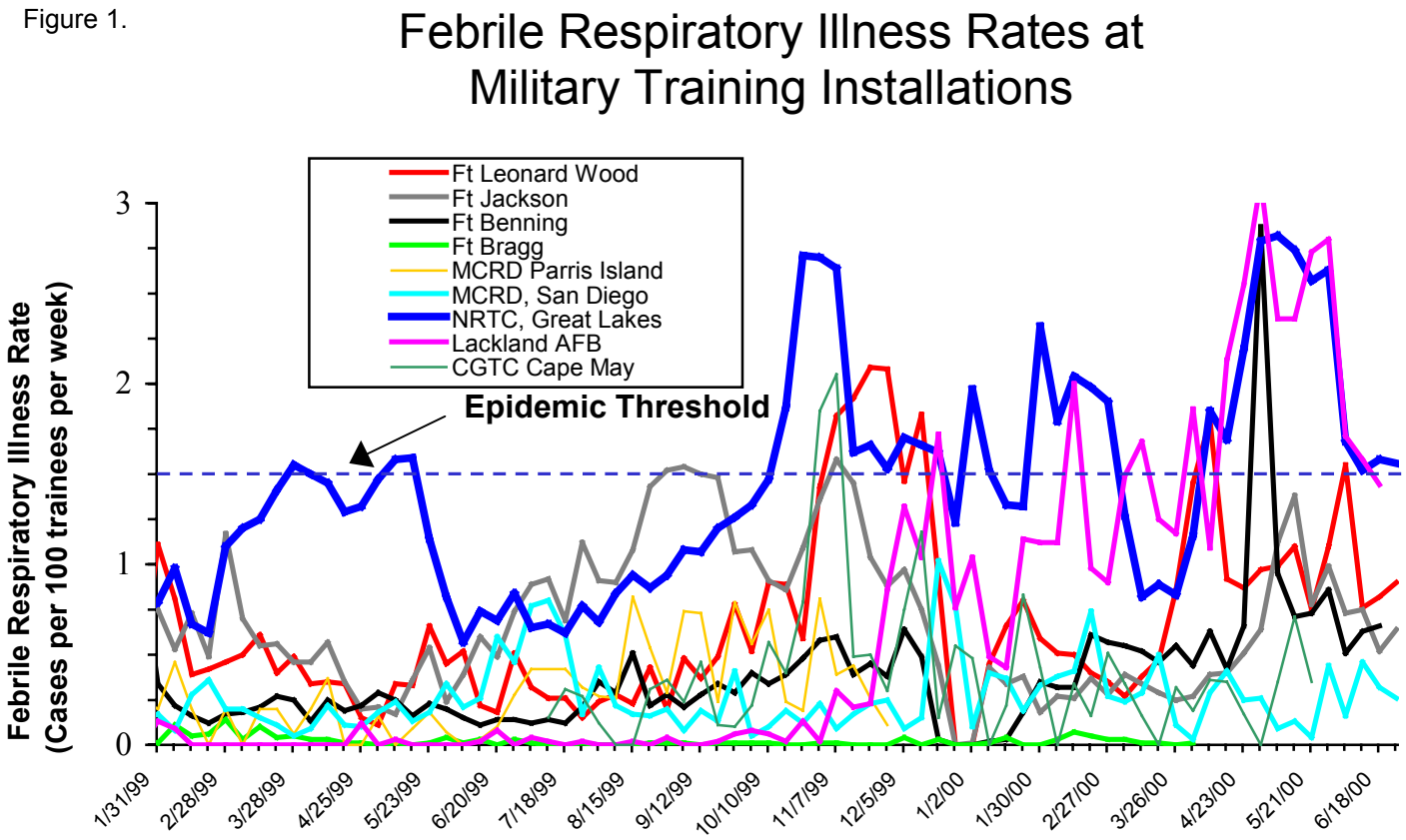


Figure 2.

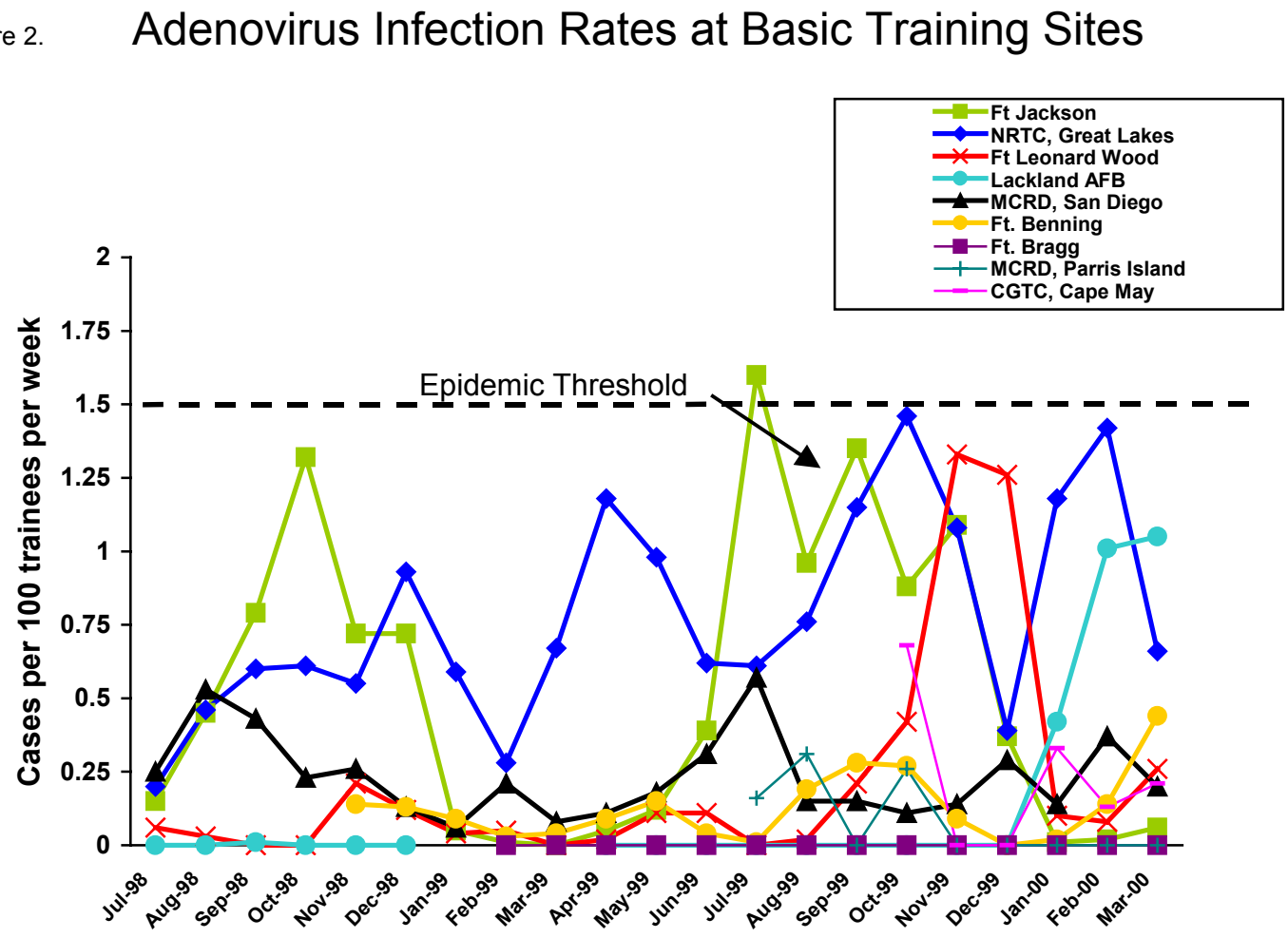


Figure 3.

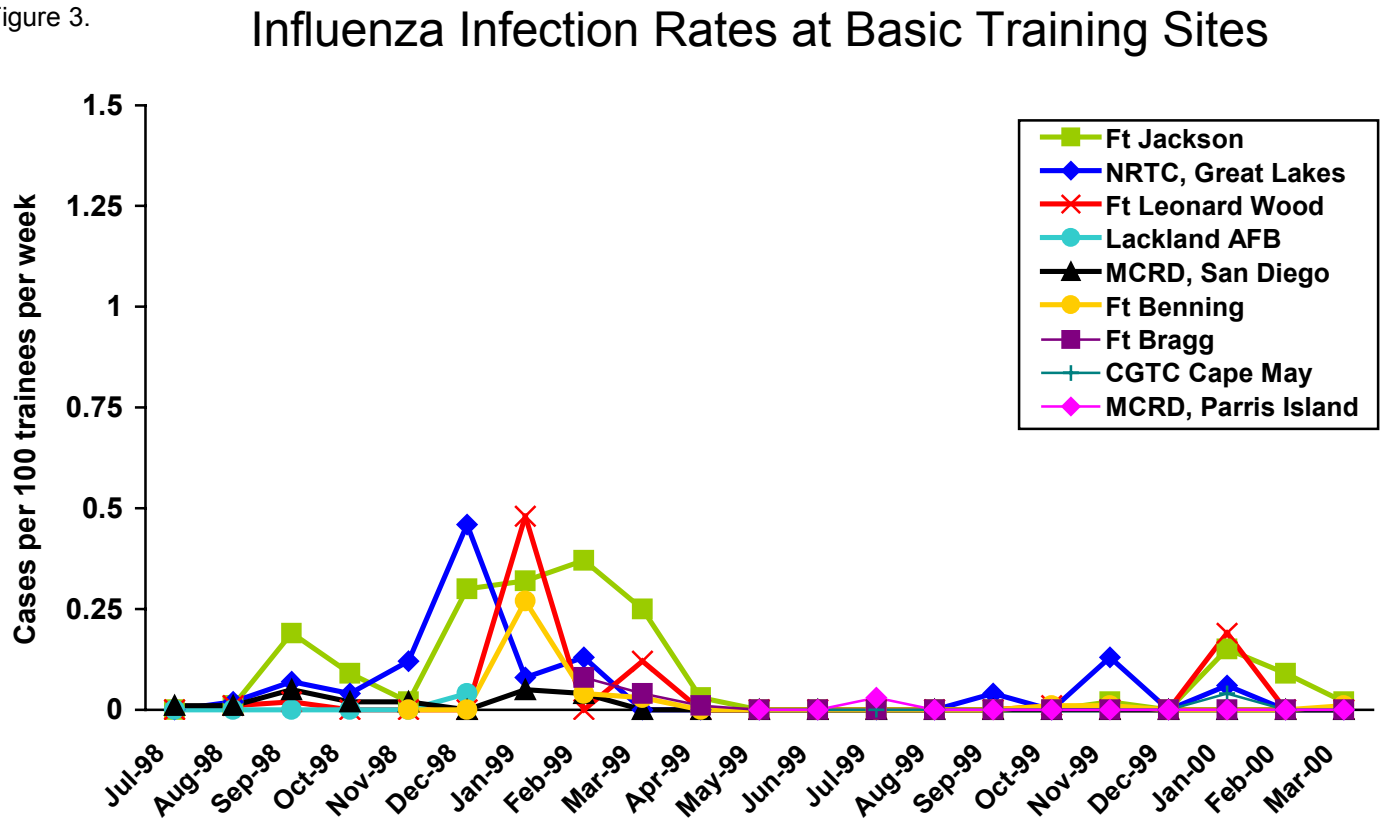
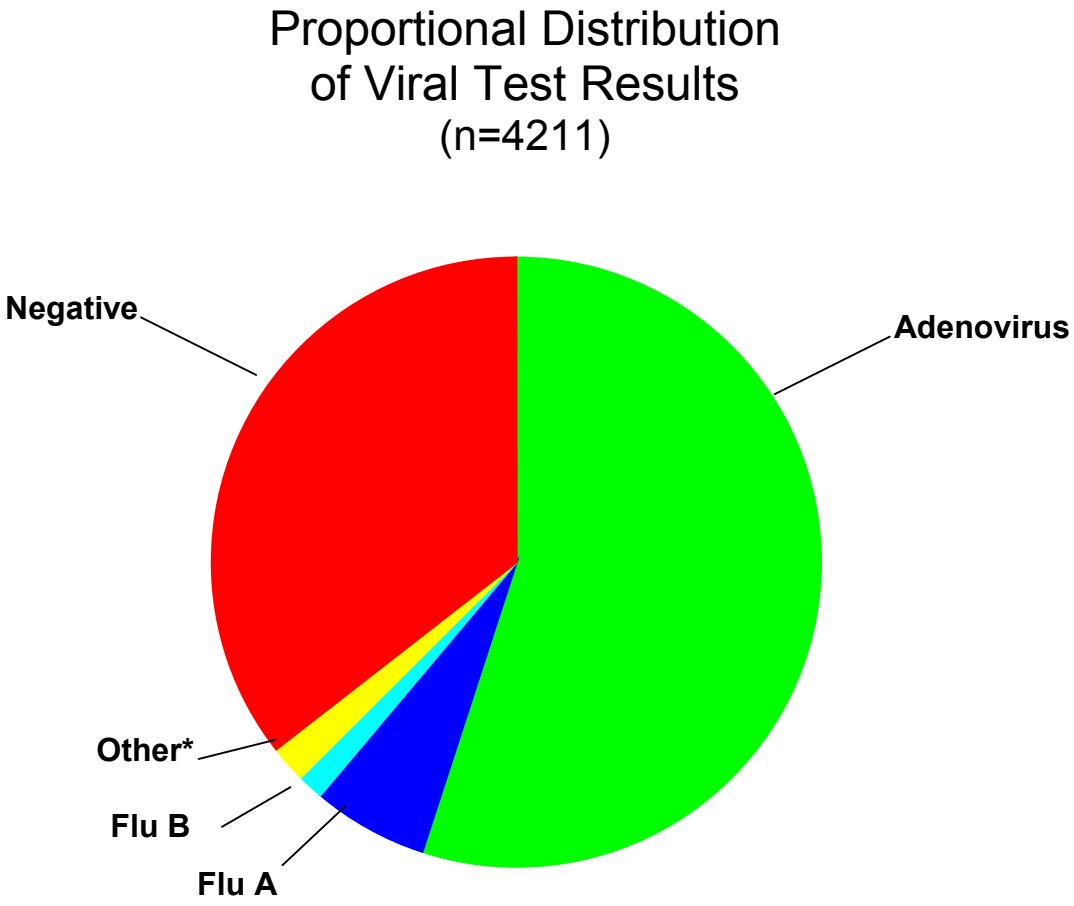


Figure 4.



*RSV and parainfluenza 1, 2, and 3

Figure 5.

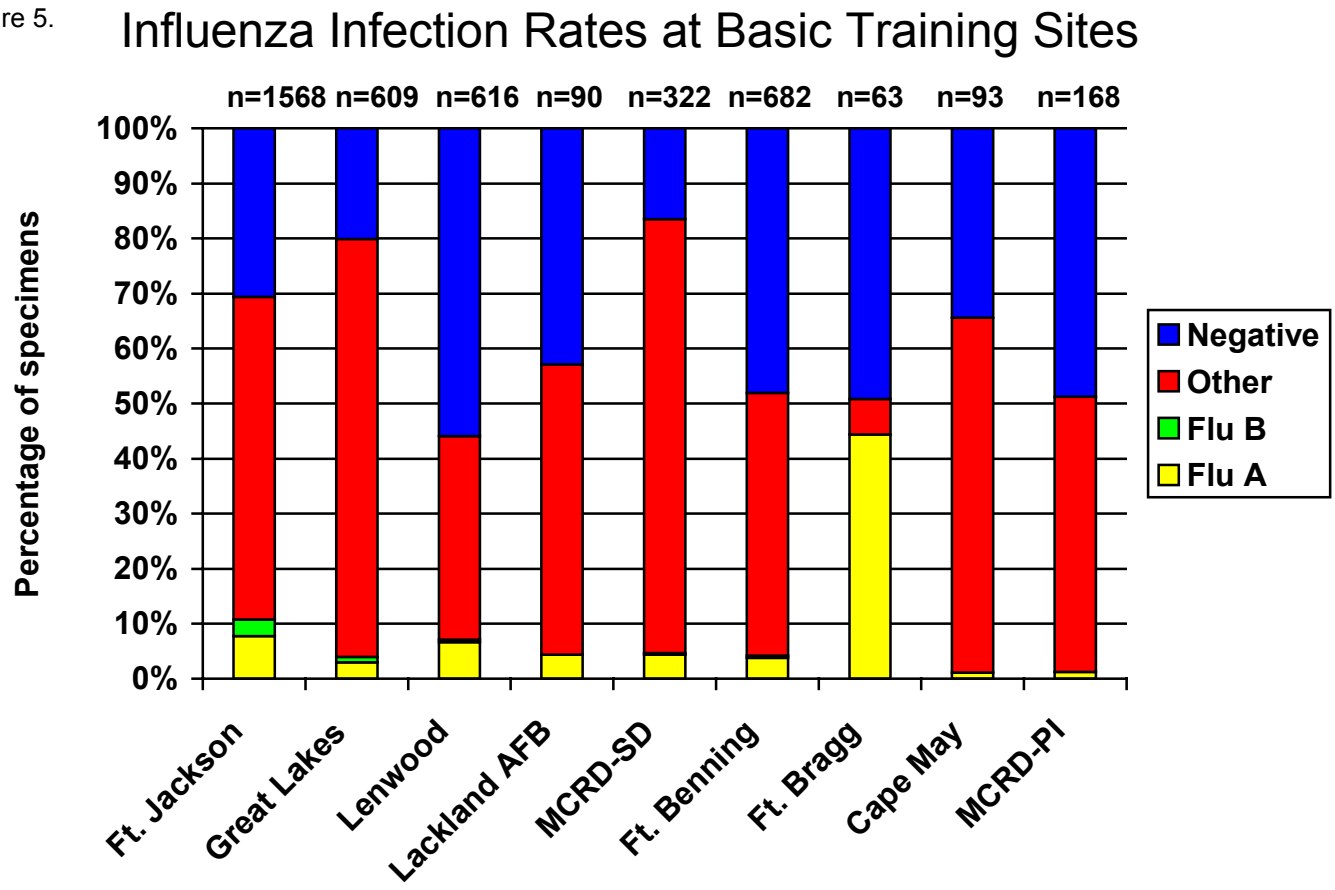
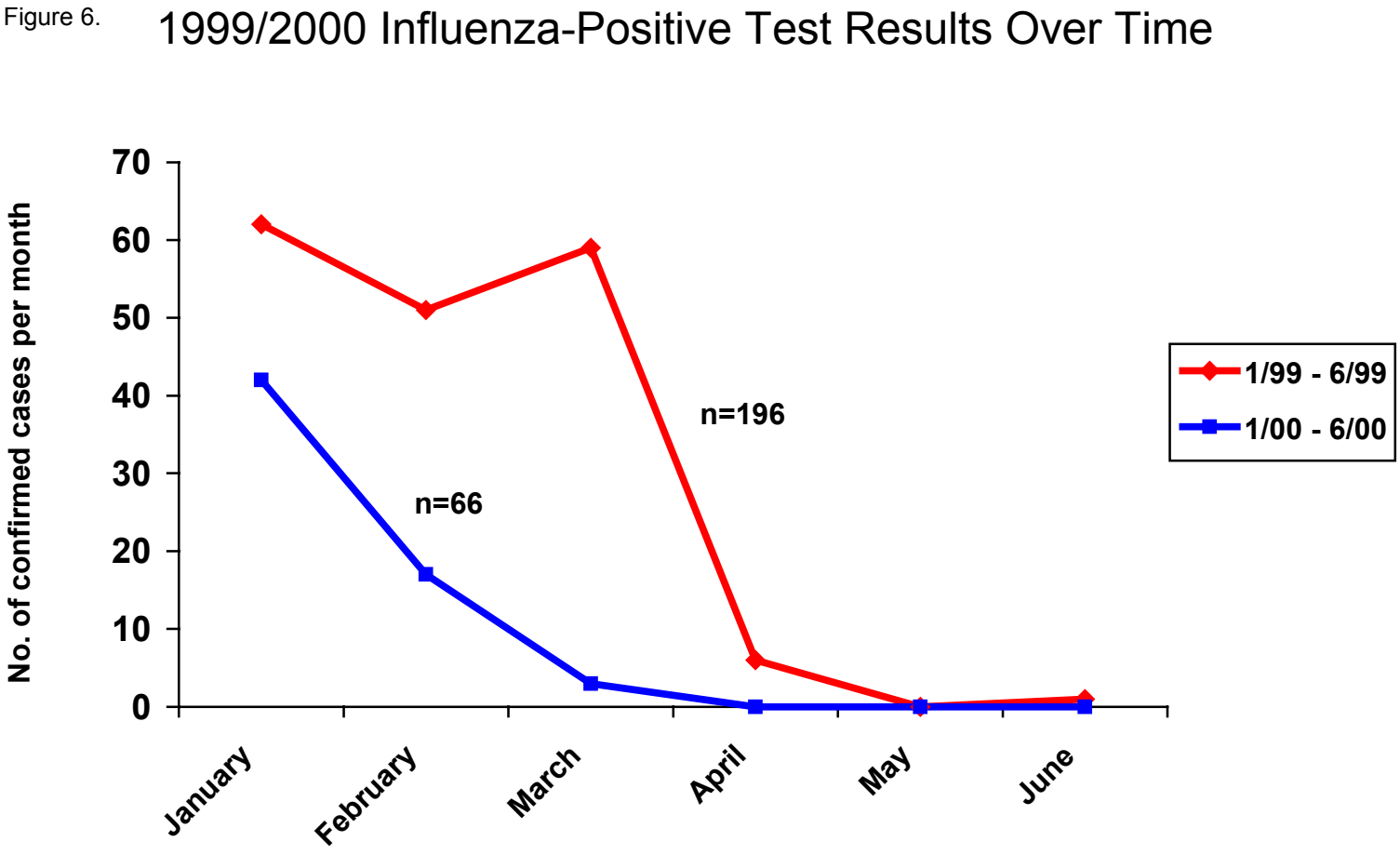
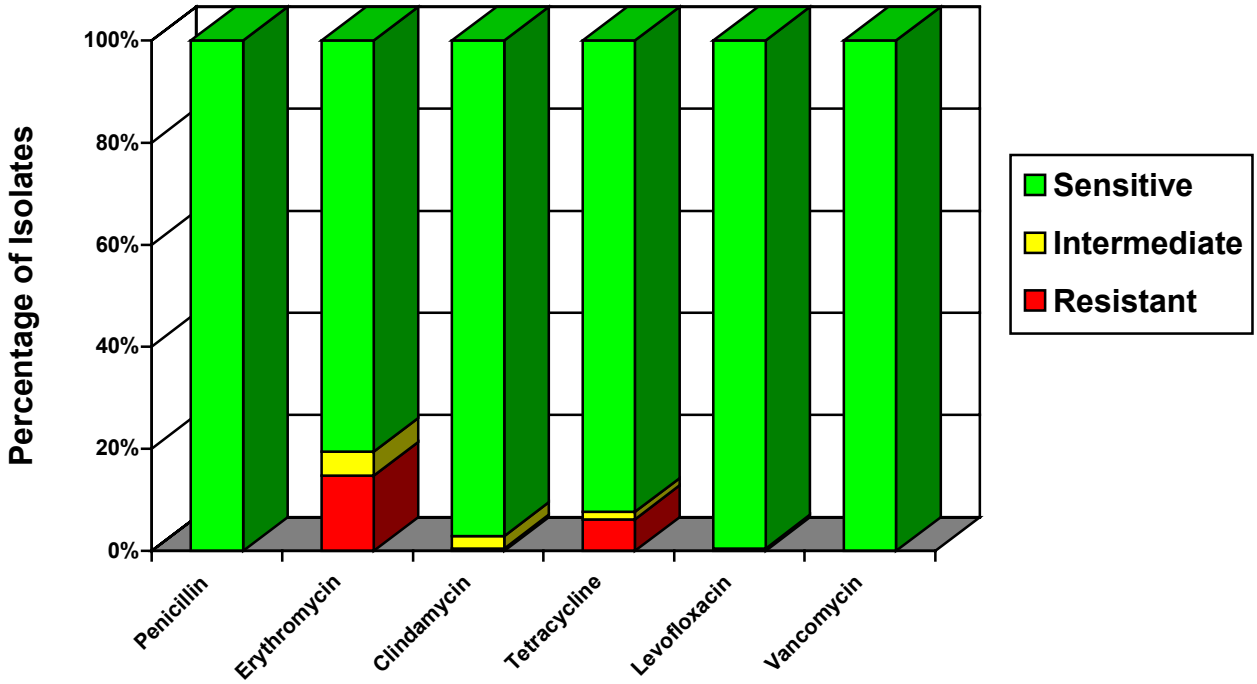


Figure 6.



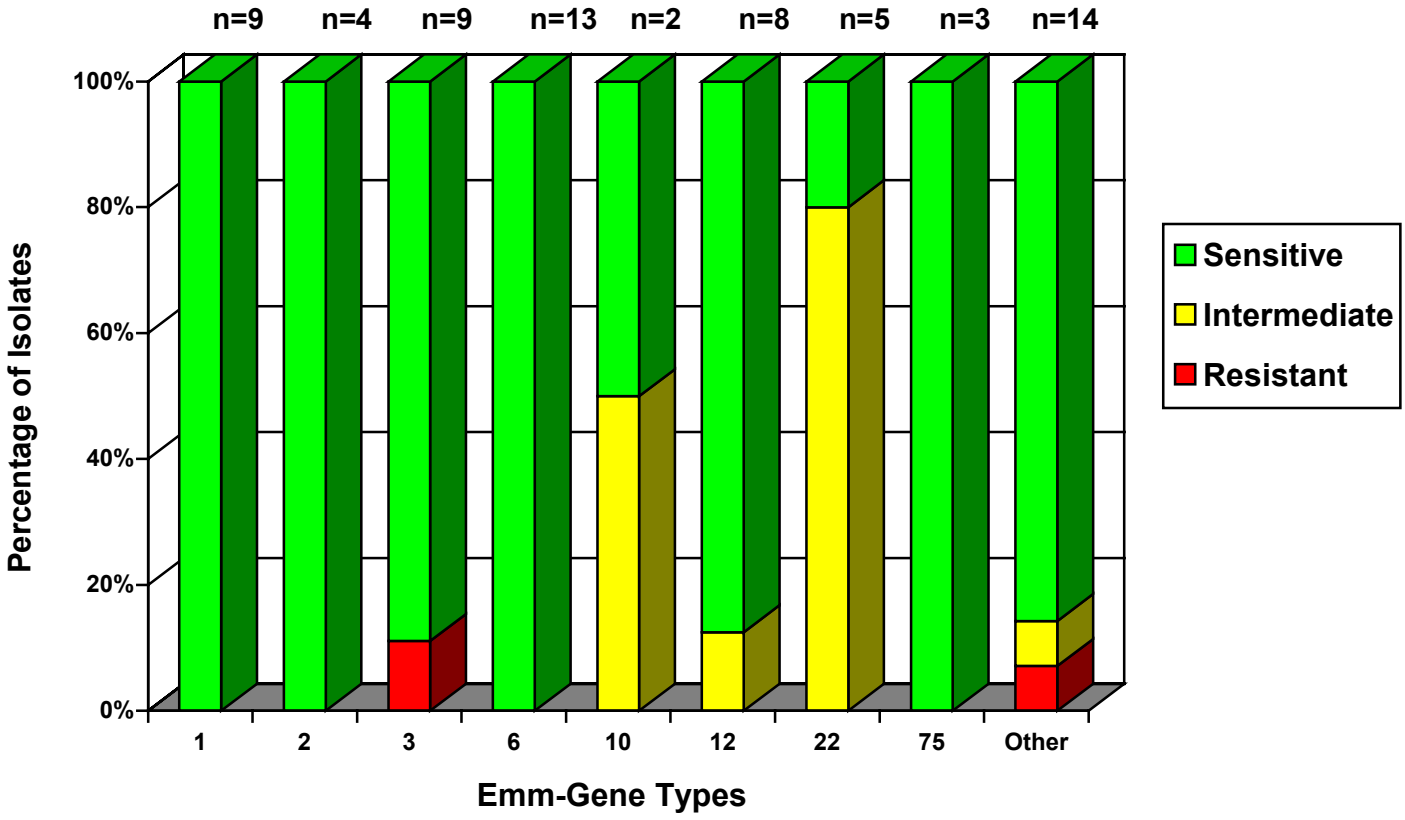
n=262 influenza-positive isolates from 1/99 to 6/99 and 1/00 to 6/00

Figure 7. Antibiotic Resistance Patterns of Clinical *S.pyogenes* Isolates from Military Trainees



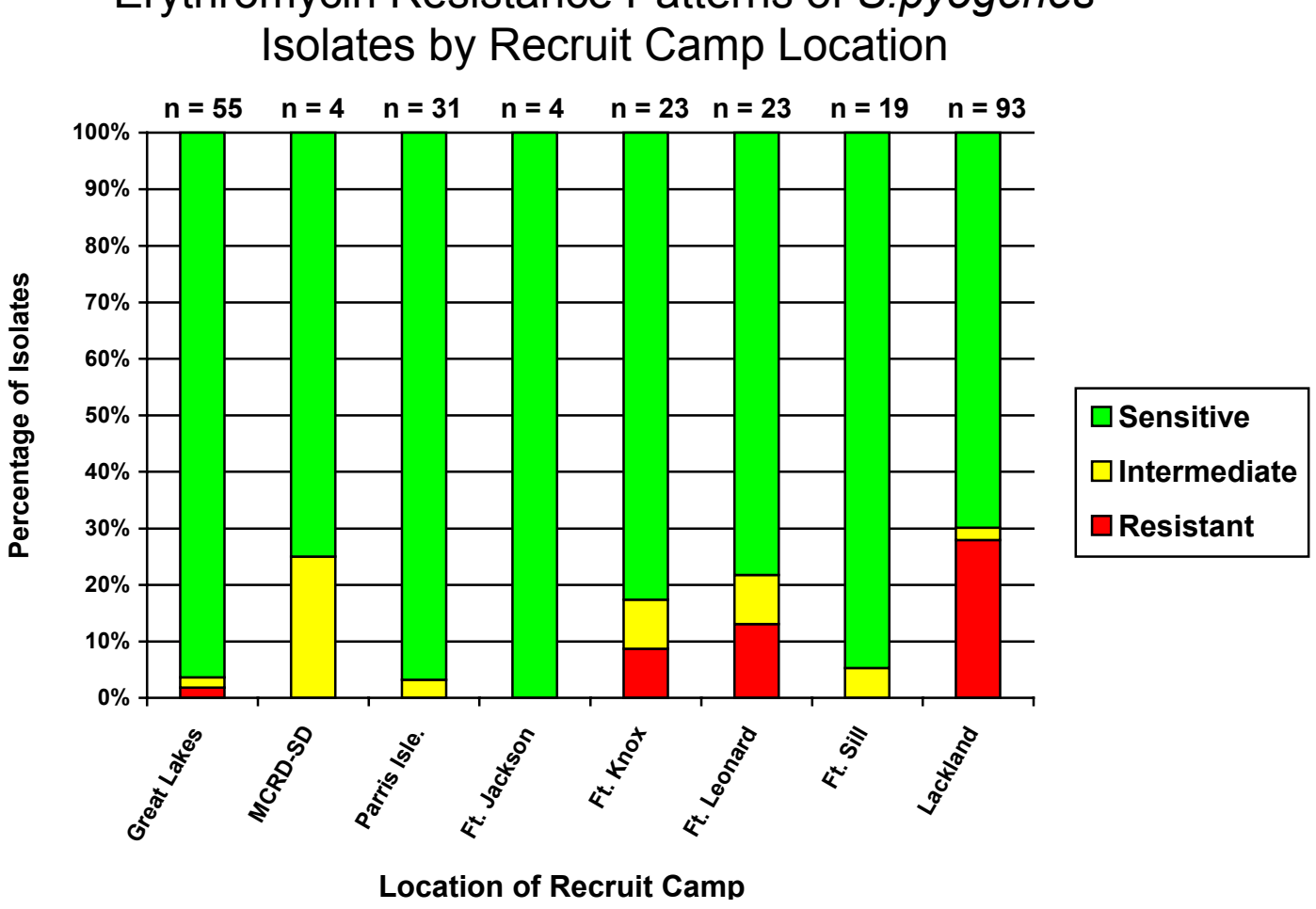
n=252 isolates collected between 2/98 and 6/00

Figure 8. Erythromycin Resistance Patterns by Emm-gene Type Distribution of *S. pyogenes* Isolates



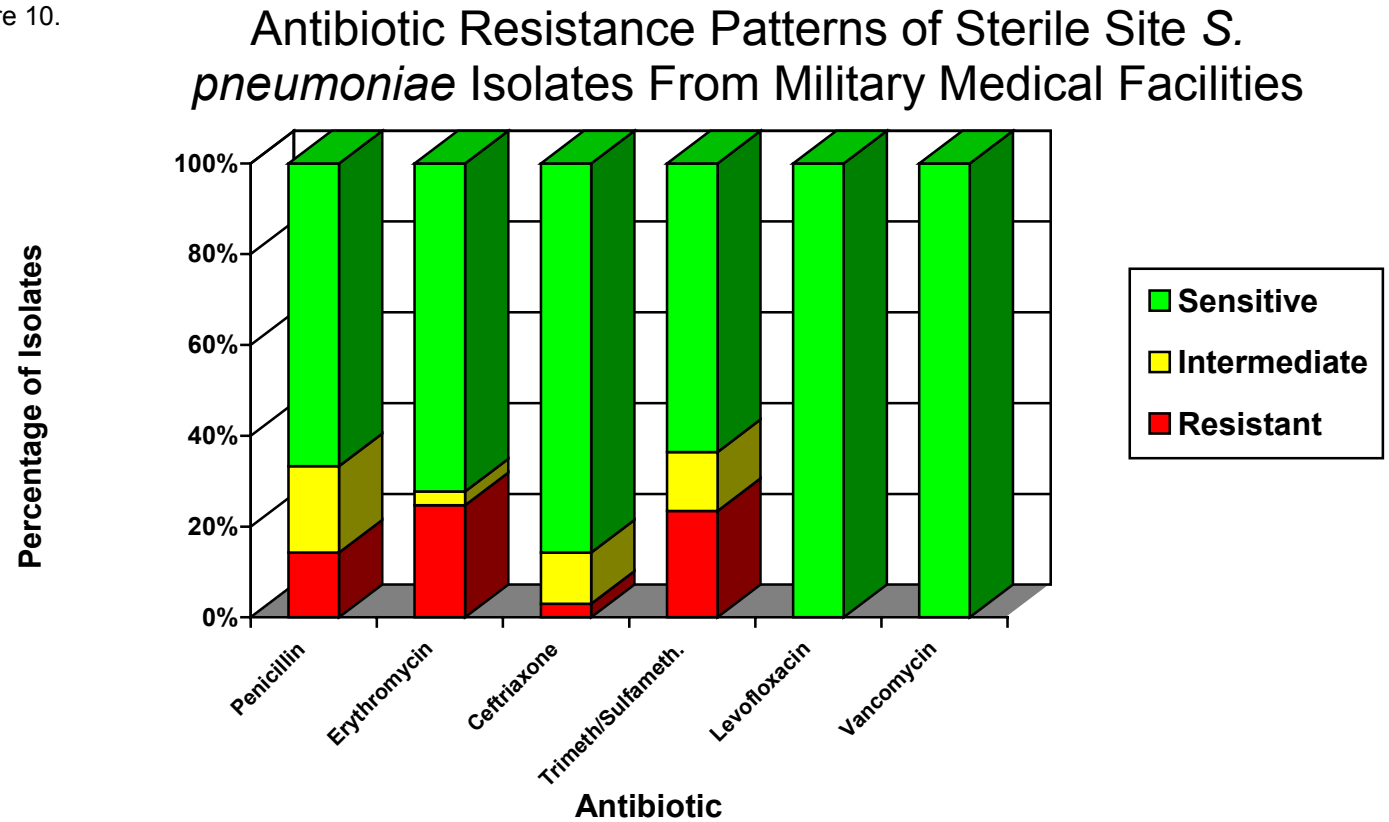
n=67 Emm-gene typed isolates collected between 2/98 and 6/00

Figure 9.



n=252 isolates collected between 2/98 and 6/00

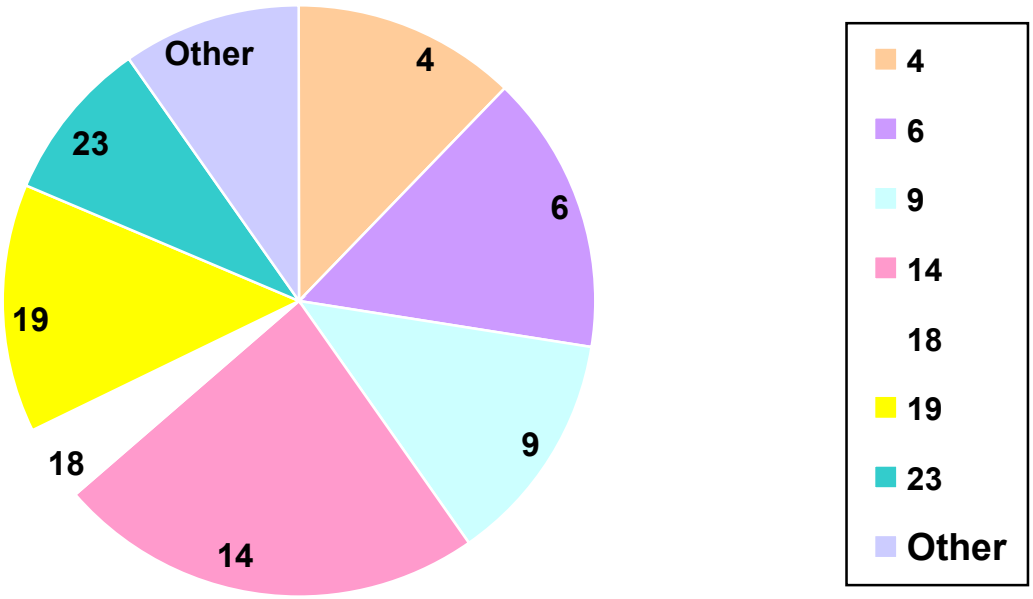
Figure 10.



n=231 isolates collected between 8/97 and 6/00

Figure 11.

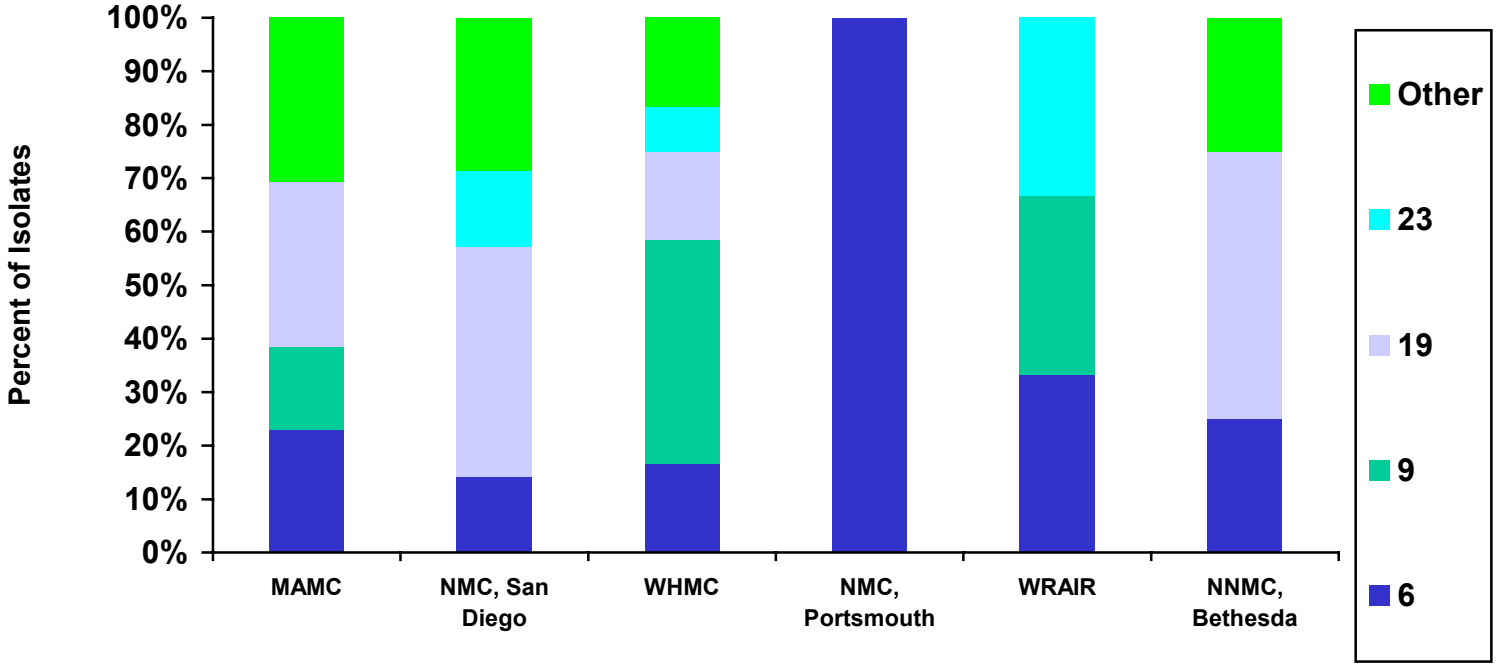
Serotype Distribution Patterns of Sterile Site *S. pneumoniae* Isolates



n=124 serotyped isolates collected between 8/97 and 6/00

Figure 12.

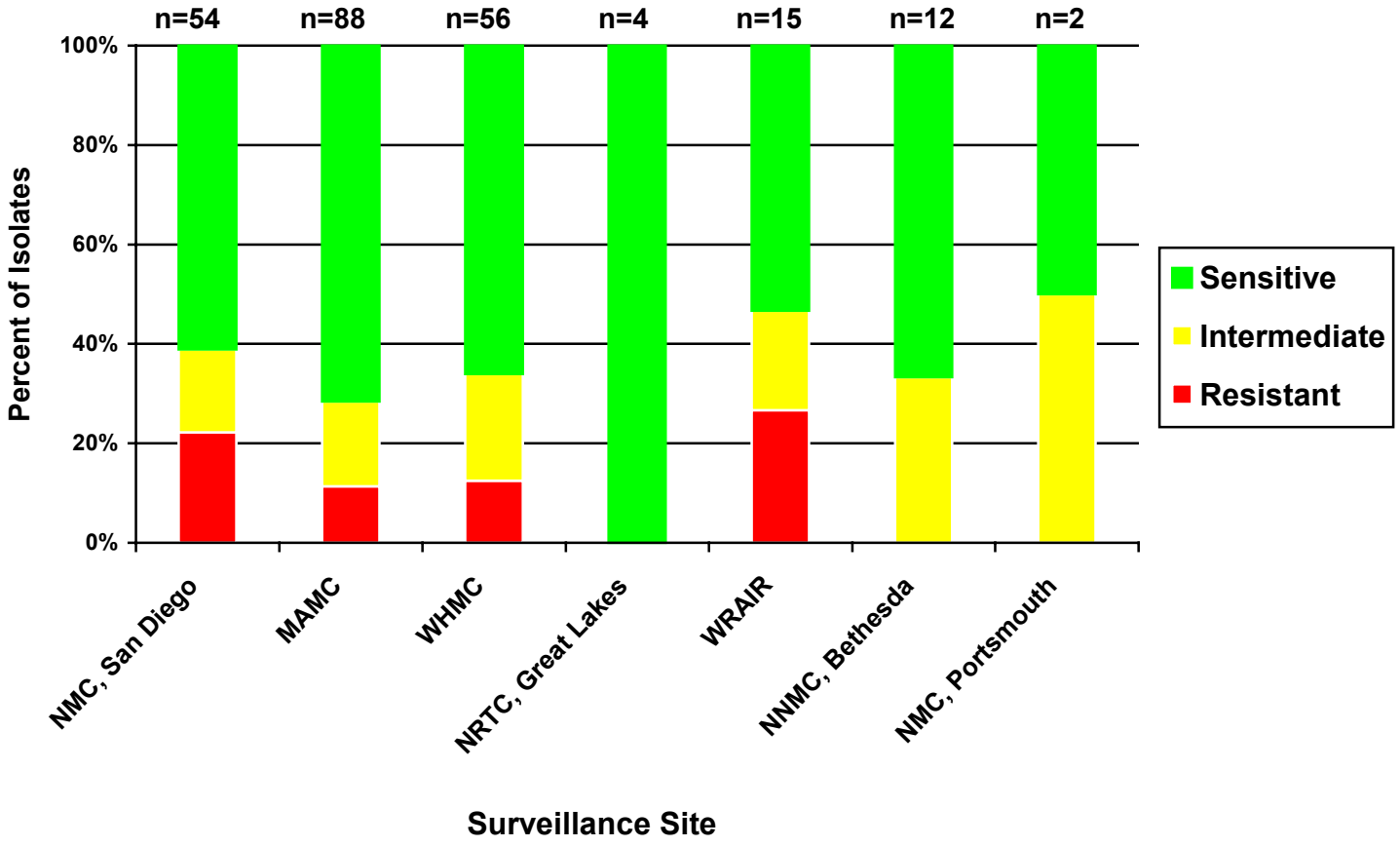
Distribution of Resistant *S. pneumoniae* Serotypes (6, 9,19 & 23) by Surveillance Site



n=64 “resistant” serotyped isolates (#6,#9, #19, #23, & Other) collected between 8/97 and 6/00

Figure 13.

Penicillin Resistance Patterns of Sterile Site *S. pneumoniae* Isolates by Surveillance Site



n=231 isolates collected between 8/97 and 6/00