

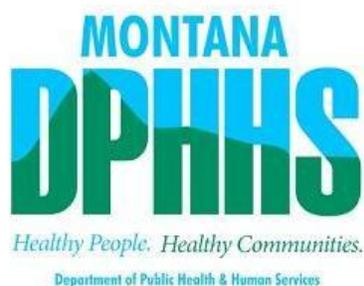
# The State of Montana

## Antimicrobial Susceptibility Testing

### Survey 2011



Prepared by  
Montana Public Health Laboratory



## **INTRODUCTION**

Resistance to antimicrobial agents continues to evolve and expand and has unquestionably contributed to increased morbidity and mortality from failed treatment regimens. Emergent antibiotic resistance is a growing global problem that threatens to undermine our cache of antimicrobial agents.

Accurate and timely antibiotic susceptibility testing procedures are essential for patient therapy, as well as for effective antimicrobial stewardship and public health. Appropriate testing practices and the collection of susceptibility data in the form of an antibiogram help to ensure appropriate antimicrobial therapy and the protection of our antimicrobial arsenal.

The increase in the prevalence of drug-resistant pathogens is occurring at a time when the development of new antimicrobial agents is slowing. For the first time in most of our lifetimes, we may be facing potentially untreatable infections.

## **BACKGROUND**

The Montana Public Health Laboratory (MTPHL) has conducted biennial surveys of Montana's clinical laboratories to assess antimicrobial susceptibility testing (AST) practices in Montana and to identify opportunities for training and improvement. The following report presents the results of the antimicrobial susceptibility testing survey conducted in 2011. Fifty nine Montana clinical laboratories determined to provide microbiology testing were solicited for participation. One of these laboratories has discontinued microbiological testing. Of the remaining 58 laboratories, 38 (66%) completed the 2011 survey. These 38 facilities performed a total of 60,549 antimicrobial susceptibility tests in the previous year. Collected responses represent testing completed from January 1 through December 2010. Five previous surveys have been completed through 2009. Where possible, comparisons have been drawn between the 2011 survey and previous iterations.

## **METHODOLOGY**

The 2011 survey reflected significant changes from previous versions. A large number of demographic questions have been deleted, since it was determined that this information was relatively stable. Similarly, previous iterations showed minimal fluctuation in identification of

challenges to attending training and preferences for training venues. These sections were also deleted. Knowledge-based questions have been updated to reflect the newest recommendation from Clinical Laboratory Standards Institute. The collection of information regarding primary methodologies for screening and confirmation of specific organisms has been simplified. Overall, the survey was significantly shorter than previous versions, and for the first time, was offered in a web-based format.

Contact information for each laboratory was confirmed by phone conversations prior to the release of the survey. Requests to participate, containing the website and instructions, were sent July 18, 2011. Reminders were sent via email and the Laboratory Sentinel in August and September. Non-respondents were contacted by telephone in October and November. The survey was closed to response on November 23, 2011.

Data from the questionnaire were compiled and summarized by the web program and descriptive statistics were generated using Excel.

Five laboratories participated in the survey for the first time in 2011. Twenty five responding laboratories have participated in all three of the most recent surveys: 2007, 2009, and 2011.

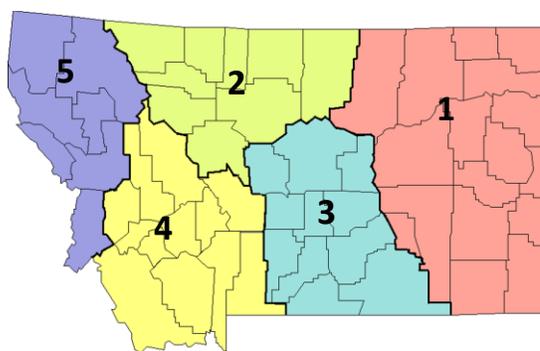
## DEMOGRAPHICS

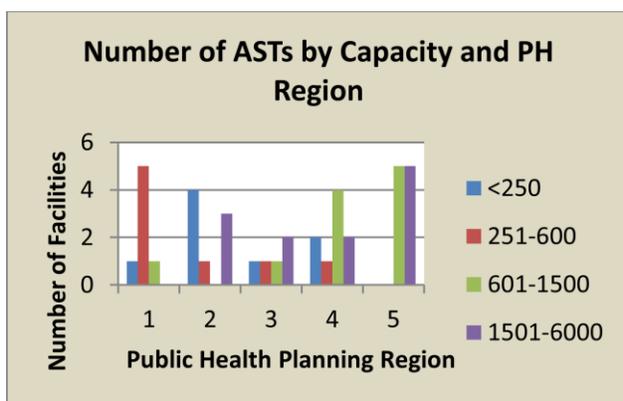
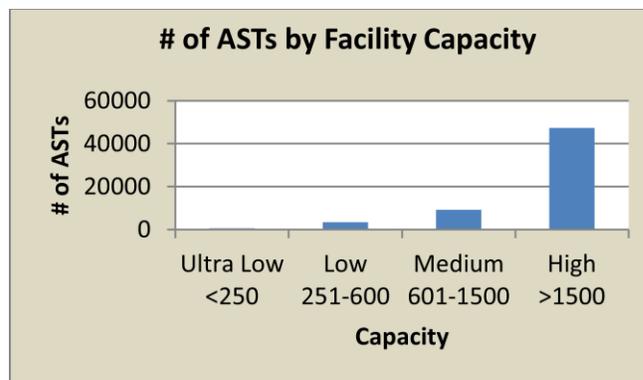
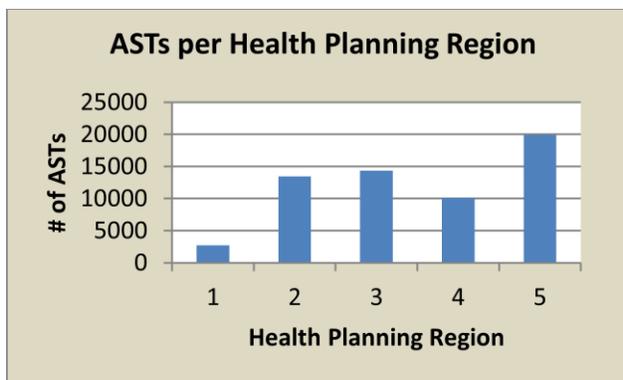
The 60,549 ASTs reportedly performed in 2010 were stratified by Health Planning Region and by Laboratory Size based on the average number of ASTs performed annually.

Laboratories in Region 5 reported 19,935 ASTs (33%) in 2010. Region 1 Laboratories reported 2702 ASTs (5%). The remaining 37,912 reported ASTs were distributed between Regions 2, 3, & 4.

Almost 80% of reported ASTs were performed in the 12 largest-capacity laboratories.

**Montana Five Health Planning Regions**





The highest number of large-capacity laboratories responded from Region 5 in northwestern Montana. No large-capacity laboratories responded from Region 1 in eastern Montana. The greatest number of ultra-low capacity laboratories responded from Region 2.

41% of responding laboratories accept routine specimens from other laboratories for antimicrobial susceptibility testing.

77% of responding laboratories have between two and five FTEs trained to perform AST. In 72% of facilities, between 2 and 5 FTEs routinely perform analyses in other laboratory areas in addition to microbiology.

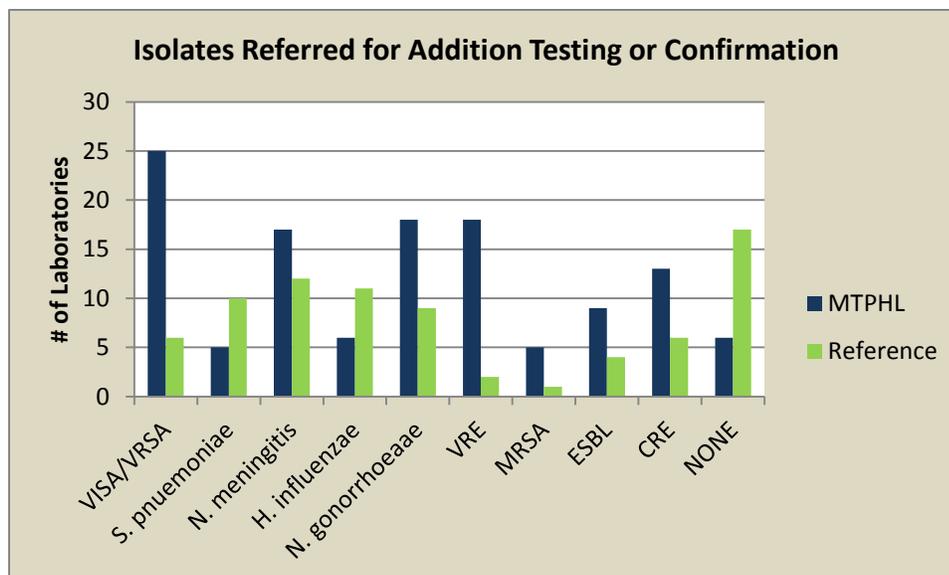
## GENERAL PRACTICES

89% of responding laboratories have at least partially integrated Clinical and Laboratory Standards Institute (CLSI) M100 guidelines into their AST practices. 8% of respondents were unsure. Only one laboratory reported that CLSI guidelines have not been integrated into their AST practice, citing insufficient staff as the cause for non-integration. The person responsible for integrating the CLSI guidelines is most often a microbiology supervisor, technical director, specialist, or section leader.

87% of respondents have made changes in AST practices within the last year after reviewing CLSI guidelines.

## REFERRAL PRACTICES

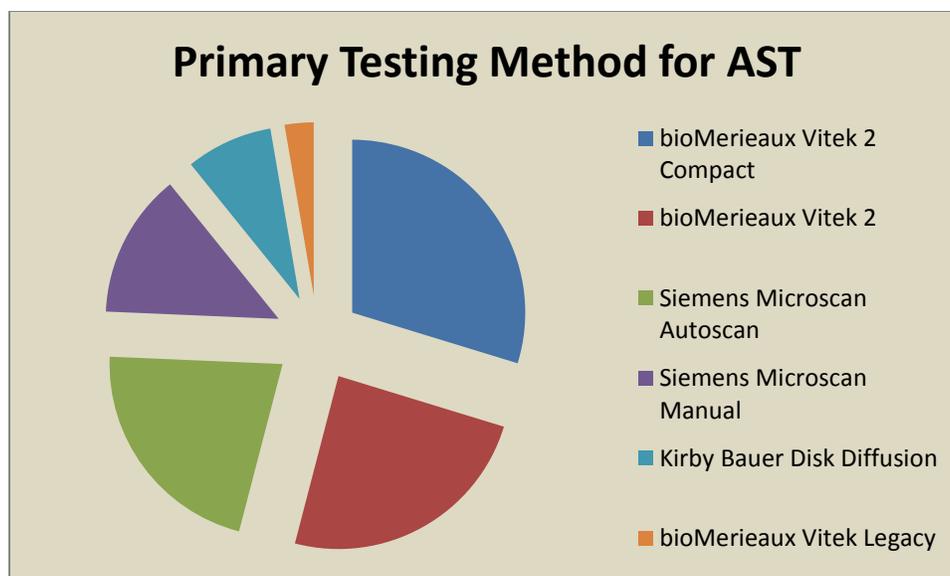
In addition to the State Public Health Laboratory, facilities referred samples to LabCorp, PAML, Mayo Clinic, ARUP, and to the larger clinical laboratories within the state.



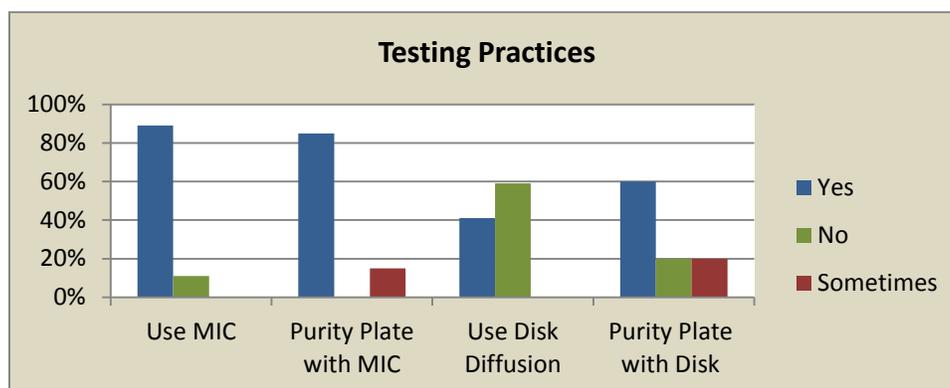
It is a concern that eight laboratories reported that they do not refer Vancomycin Resistant/Intermediate *Staphylococcus aureus* (VRSA/VISA) to either the MTPHL or a reference laboratory. One explanation may be that, having not had any suspect VRSA/VISA, the respondents did not select either choice. Although there is no law requiring submission of isolates, VRSA is of such public health importance that it is hoped that any potential isolates would be referred to the public health laboratory and subsequently to CDC. This topic will again be addressed in 2012.

## METHODOLOGY

57% of respondents used one of the bioMerieux Vitek systems as their primary AST testing method. Other methods include Siemens Microsan systems and Kirby Bauer Disk Diffusion.



Most laboratories using MIC methodology (85%) routinely included purity plates in analyses. Only 60% of laboratories using Disk Diffusion methodology routinely included purity plates and 30% reported that they never include purity plates.



79% of laboratories using MIC methodology include both MIC and interpretation in reports. Most (73%) laboratories using Disk Diffusion methodology report only interpretation. 27% include both zone diameter and interpretation in reports.

## LABORATORY PRACTICES

Four (11%) of facilities performed rectal surveillance for VRE. The majority of laboratories (62%) did not perform AST on fecal *Salmonella* and *Shigella* isolates. 30% performed AST routinely and 8% performed AST upon request. Over half of laboratories (54%) did not perform AST on invasive (blood or CSF) *Streptococcus pneumoniae* isolates. 40%

routinely performed AST and 5% had no invasive *S. pneumoniae* isolates in 2010. 54% of laboratories performed the D-test for inducible clindamycin resistance on isolates of *Staphylococcus*. 43% did not perform the D-test and one respondent did not know. A majority of laboratories (68%) speciated isolates of *Enterococcus* before reporting AST results. 32% did not speciate.

## **ANTIBIOGRAMS**

78% of responding laboratories generate and distribute a cumulative antibiograms for their facility. Of the 29 facilities that do generate antibiograms, 86% are generated by the laboratory. One laboratory generates the antibiogram in collaboration with their infection control section and one facility has the antibiogram generated by a reference laboratory. Most facilities rely (66%) on an automated instrument printout for antibiogram development.

Most facilities (76%) remove surveillance isolates and 72% remove multiple isolates. 76% share results with the PHL, 79% with physicians, 62% with pharmacies, and 69% with their infection preventionists.

## **APPLICATION OF CLSI GUIDELINES**

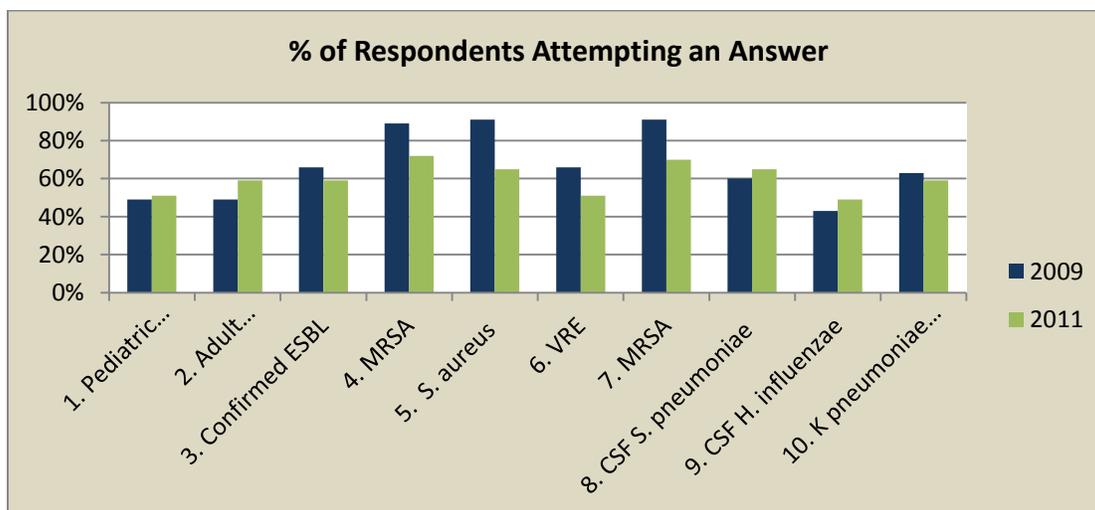
The survey included ten scenario questions, designed to determine the level of understanding of appropriate actions to specific situations. A significant number of respondents selected the 'I Don't Know' response or provided no answer to these questions. The following charts show both the percentage of correct responses relative to the total attempts, the percentage of respondents who did not attempt to answer, and comparisons with previous surveys. A series of Laboratory Sentinel articles will explore each of these questions in detail.

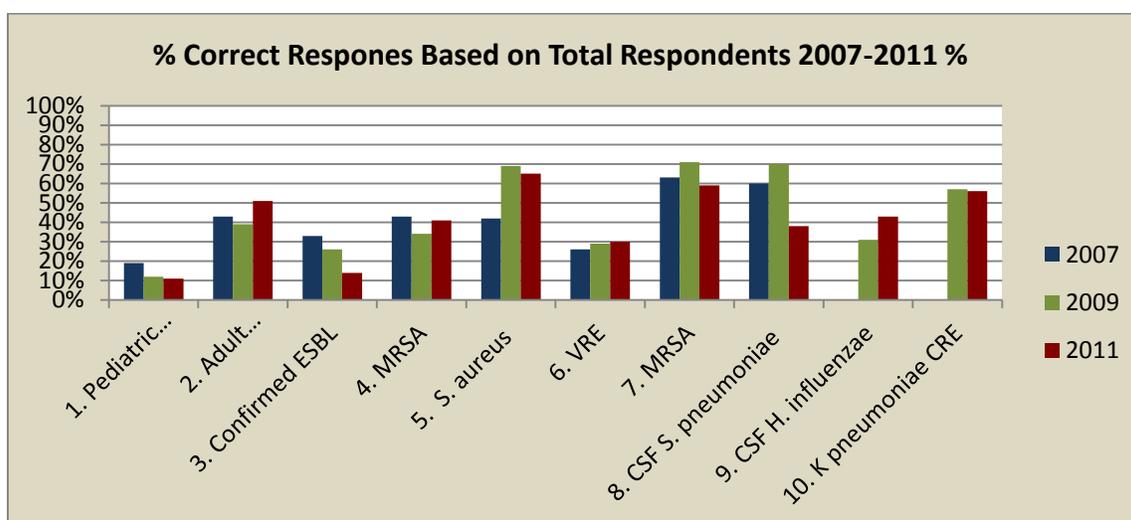
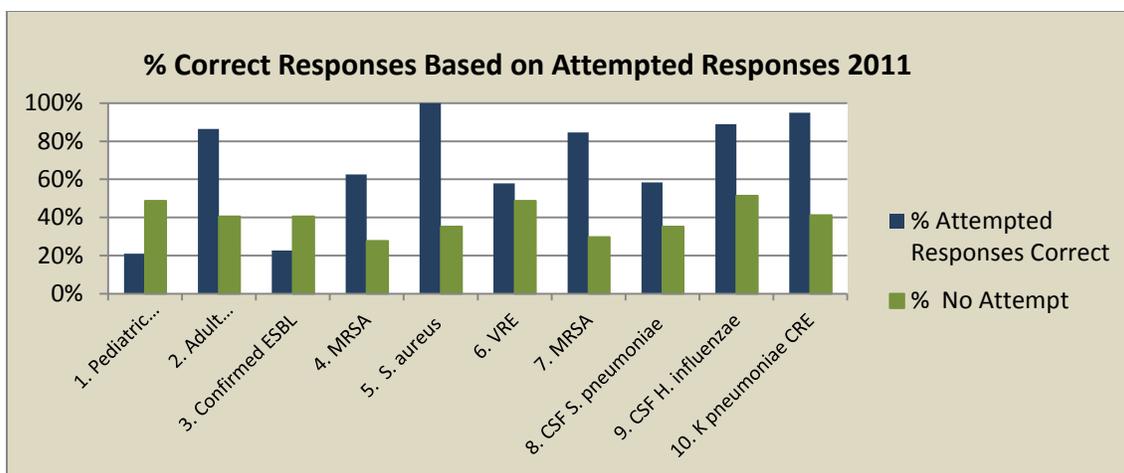
The survey questions are:

1. When testing fecal isolates of *Salmonella* and *Shigella* spp. from a pediatric case, what antimicrobials should be reported?
2. When testing fecal isolates of *Salmonella* and *Shigella* spp. from an adult case of infection, what antimicrobials should be reported?
3. When reporting a confirmed ESBL-producing strain of *Enterobacteriaceae*, which of the following antimicrobials should be reported as resistant?

4. When testing a MRSA strain that is resistant to penicillin and oxacillin, which of the following antimicrobials should be reported as resistant? (NOTE: Resistance to penicillin and oxacillin indicates the presence of a beta-lactamase and resistance to carbapenems; however, imipenem is not FDA approved for use with *Staphylococcus aureus*, and, therefore, was not considered in the assessment of responses.)
5. What additional testing should be performed on a *Staphylococcus aureus* isolate that is erythromycin resistant and clindamycin susceptible?
6. When testing a rectal surveillance culture for VRE that reveals an Enterococcus spp. with a vancomycin MIC of 8 mcg/ml what action should be taken?
7. A dialysis patient with a healthcare-associated bacteremia due to MRSA has been referred to your facility. You have been told that the isolate is susceptible to vancomycin by a disk diffusion test, but the patient is not doing well on vancomycin. What action should be taken?
8. A CSF culture is growing *Streptococcus pneumoniae*. What susceptibility testing should be performed?
9. What antimicrobial agents should be reported when testing a CSF isolate of *Haemophilus influenzae*?
10. If a *K. pneumoniae* isolate has an ertapenem MIC of 2 ug/mL and imipenem or meropenem MIC of 2-4ug/mL, and your facility has not yet established new breakpoints for CRE, what additional testing is warranted?

### Knowledge-Based Questions





Ten of the twelve largest capacity facilities account for 72% of the total volume of AST performed by the responding laboratories. The twelve largest capacity facilities performed 78% of the total volume of AST performed by responding laboratories; however, two of these laboratories opted out of the knowledge-based questions. The remaining twenty one laboratories that responded to these questions account for 17% of the total volume of AST performed by responding laboratories. Overall, the highest capacity facilities demonstrated a better understanding of knowledge-based questions; however, facilities in each of the other capacity categories also performed extremely well on these questions. Smaller capacity laboratories scored significantly higher on questions regarding isolates that are more commonly encountered, such as *Staph aureus*, as opposed to the much rarer Extended Spectrum Beta Lactamases. In total, seven responding facilities opted out of answering these questions.

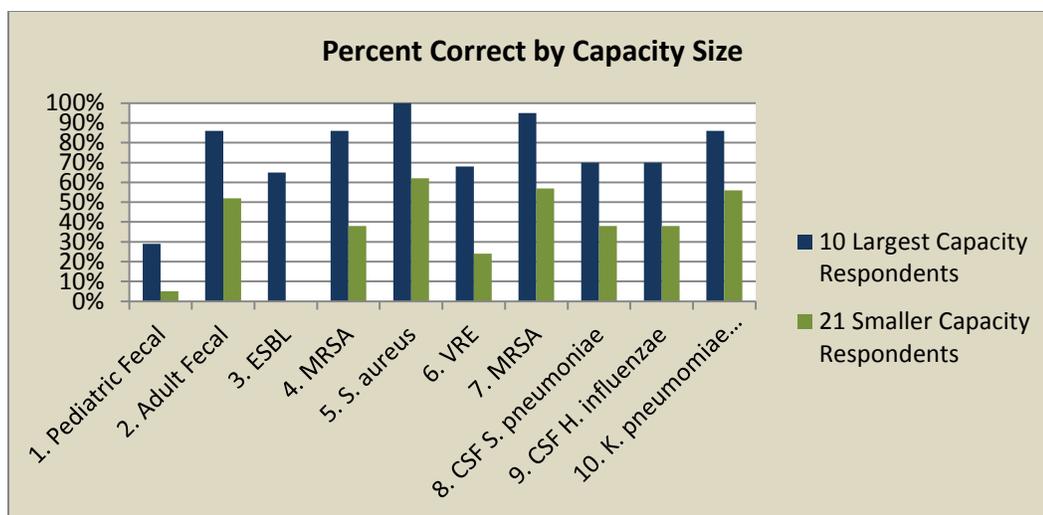
Several of the laboratories that opted out of all or most of the knowledge based questions have indicated that they refer atypical and unusual isolates to the Public Health Laboratory or a reference laboratory for confirmation and susceptibility testing. A number of medium and high capacity laboratories also opted out of this section, but indicated that they do not refer isolates, suggesting that they chose to omit this section of the survey.

The eight largest-capacity laboratories indicated that two or more FTEs work full-time in microbiology. Two medium-capacity laboratories responded that at least one FTE is full-time in microbiology. All of the ultra-low- and low capacity-laboratories, and the remaining medium- and high-capacity laboratories report having staff that routinely perform other laboratory functions in addition to microbiology. This suggests that the benefit of permanent microbiology staff enhances the knowledge base of the eight largest laboratories.

The Public Health Laboratory continues to provide training opportunities and to make the most current information and guidance on susceptibility testing available to clinical laboratories. Without cooperation and feedback from our clinical partners, it is difficult to assess needs; however, some critical areas have been identified. Antibiograms have indicated that since 2007, 32 VRSA isolates have been reported by Montana laboratories, although the Public Health Laboratory has received none of these isolates for confirmatory testing. Confirmatory testing and referral to CDC are vital components in an effective surveillance system and in successful antimicrobial management.

While it is appropriate for laboratories that do not have the resources to deal effectively with unusual isolates to refer them to other laboratories, it is also important that laboratories recognize isolates with unusual patterns of resistance. The section of knowledge-based questions provides an opportunity for laboratories to test their skills at identifying isolates of increased public health significance.

An illustration of the distribution of correct answers by capacity size follows:

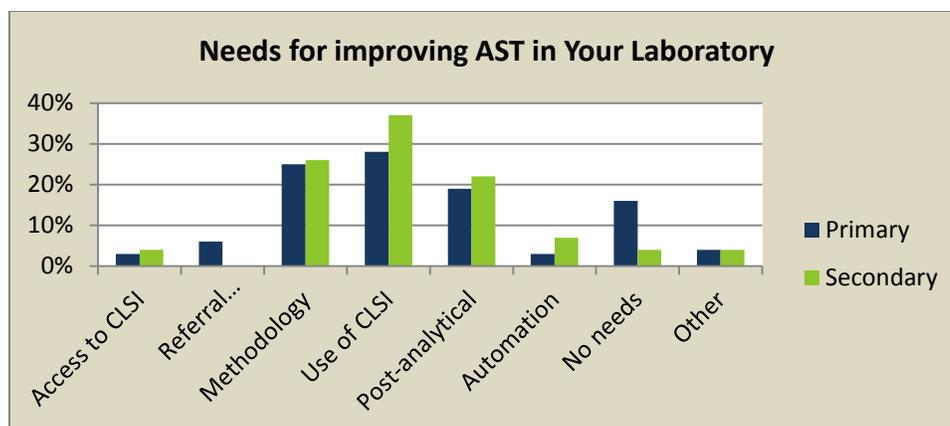


## EXISTING TRAINING PRACTICES

Forty percent of respondents report receiving AST training at least annually. 32% report receiving AST training whenever new staff are added. 27% report receiving no training or training less than annually. The number of laboratories that have a designated individual responsible for providing AST training is approximately 50%. 35% of respondents were unaware of annual AST training opportunities provided by the PHL, APhL, or other outside sources.

## FUTURE NEEDS

Respondents were asked what was needed to improve Antimicrobial Susceptibility Testing in their laboratories. Questions allowed the selection of both primary and secondary choices. The greatest needs for improvement were identified as training in technical processes and methodology, training in the use of CLSI guidelines, and training in reporting and other post-analytical processes.



## DISCUSSION AND SUMMARY

The PHL has determined that responses to the General Practices and Referral Practices questions might be more clearly defined if available choices included “No isolates in 2010.”

In a few instances, the percentage of correct responses to knowledge-based questions has increased, however; in more instances, the percentage of correct responses has decreased.

Although more laboratories submitted surveys than in 2009, a smaller percentage attempted to answer the ‘knowledge-based’ questions. This may have been the result of the new survey format that allowed respondents to skip individual questions.

The variation in staff and resources and the degree of proximity to outside resources affects the degree to which laboratories can perform specialized testing. Competing priorities in smaller and isolated facilities can be intense and the practice of performing identification and antimicrobial susceptibility testing on non-routine isolates may not be in the best interest of public health nor private health care, making referral of isolates to outside laboratories appropriate. Consideration should be given, however, to the importance of analysts being aware of the indications for and proper use of specialized methodologies in order to recognize unusual results and to appropriately refer isolates for additional testing or confirmation when necessary, even though specific individual tests may not be performed in every laboratory.

The MTPHL continues to make AST training available via professional conferences, teleconferences, and workshops. Notification of these trainings is posted in the Laboratory Sentinel and on the Laboratory Services [website](#). In addition, a discussion of each of the

“knowledge-based” questions has been available on the website throughout 2010. The PHL will evaluate the possibility of a variety of training venues, including web-based options. Additionally, the PHL will make every effort to address post-analytical, reporting, and referral procedures to this training. Discussion have already taken place investigating the possibility of a roundtable discussion of automated methods, allowing those individuals most experienced with each methodology to mentor laboratories newer to instrumentation.

### **ADDITIONAL SURVEY COMMENTS AND RESPONSES**

1. Six respondents requested a ‘don’t perform in our laboratory’ or “send to reference laboratory” option for the knowledge-based scenario questions.

Knowledge-based questions are included in the survey in order to allow respondents an opportunity to test their skill at applying CLSI guidelines to specific circumstances that might be encountered in a laboratory setting. Even if the test is not performed in a laboratory, it is beneficial to understand the logic behind testing practices. All answers to these questions are easily accessible in the CLSI M100 and participants are encouraged to use the guidelines in selecting appropriate responses.

2. Two respondents indicated a need for additional training and would like the training provided across the state to facilitate participation. Another respondent commented on the complexity of the guidelines and difficulty in using them effectively.

Training has been provided at ASCLS and IMSS conferences. The Public Health Laboratory will investigate the possibility of providing workshops using Web Conferencing.

3. One respondent requested follow-up feedback on the survey questions.

Discussions of the knowledge-based questions have been available on the MTPHL website. In addition, each topic will be addressed in upcoming issues of the Laboratory Sentinel.

4. One respondent expressed confusion over the disparity between CLSI guidelines and FDA regulations.

The laboratory will continue to disseminate information regarding updates to guidelines and regulations. An update to guidelines is presented by Janet Hindler each January and is available for viewing at the Public Health Laboratory or through individual site registration.