Preventing errors in the microbiology lab

By Cynthia B. Schofield, MPH MT(CAMT)

The first words a medical technologist intern learns are relatively simple; yet, they may become the most important of his exhaustive vocabulary list. The two words are often used synonymously, although accuracy and precision carry decidedly different meanings in the clinical laboratory. As defined by Merriam Webster, accuracy denotes “freedom from mistake or error; conforming exactly to truth or a standard.” Precision is “the degree of refinement with which an operation is performed or a measurement stated.” The novice technologist may not fully grasp the finite distinction between these two words; but, after a year of internship, their significance should be decidedly clear.

Performing maintenance on a plethora of medical instruments or recording data — whether it constitutes laboratory quality control or patient reports — all require the utmost accuracy. Repeating any specific task, such as performing serial dilutions, taking measurements, or quantitatively analyzing chemical compounds, on the other hand, requires unrelenting precision.

The mere mention of “laboratory error” strikes fear in the heart of every technologist who first experiences an inspection by the College of American Pathologists (CAP). The checks and balances of standardization, automation and quality control, and the daily supervision by experienced laboratory personnel, serve to promote accuracy. An occasional human error, however, can occur in laboratory medicine as in any other field.

Halting pre-analytic errors

Resolution of problems that incur error has been demonstrated in all three laboratory-testing phases: pre-analytic, analytic, and post-analytic. In 2001, medical centers in Michigan, New Jersey, Georgia, and Illinois took advantage of advanced technology to deter specimen mislabeling — a common cause of laboratory error. A hand-held computer system, BD.id Patient Identification (BD Diagnostics) was initiated to scan bar-code identification on both patient ID wristbands and phlebotomist or sample-taker badges. Physicians’ test orders could also be scanned. Other
deterrents included rejecting blood culture specimens for inadequate sample volume or because incomplete identification forms accompanying clinical specimens were submitted.\(^2\)\(^,\)\(^3\)

In another attempt to halt errors in the pre-analytic phase, a laboratory incident-report classification study was initiated by researchers at the University of Washington and the University of California at San Francisco Schools of Medicine. A database was created for the period from June 2000 to September 2001 to document the laboratory’s incident reports (reports generated when a problem that may impact patient care arises). Of 129 reports, 92 or 71% occurred during the pre-analytic phase of testing. This phase includes collection of patient information and physician-ordered lab tests, specimen collection, specimen identification, labeling, transportation, handling and storage, and it ends in the laboratory with specimen processing.\(^3\)

Between 2003 and 2005, “lab-quality research” at the University of California at Los Angeles (UCLA) Medical Center calculated an error rate at 16,000 of 4.29 million blood specimens or approximately 0.4%. Of this number, UCLA reported that 12% were considered “critical errors,” defined as those with incorrect labeling — one patient’s name on another patient’s tube of blood. UCLA instituted a phlebotomy service to operate 24/7 that freed up nurses and doctors who were overwhelmed by other tasks. Parts of the specimen-processing system were automated, and an electronic error-reporting system was installed. Once more, errors were dramatically reduced.\(^2\)

Inadequate specimens, or mislabeling blood or microbiology specimens can lead to incorrect antibiotic treatment or treatment of the wrong patient for the wrong disease. A false-positive or a false-negative result can affect the morbidity and mortality of the patient, when acute illness or malignancy is in question.\(^2\)\(^,\)\(^4\)

Of the studies conducted to address problems of patient safety and efforts to improve accuracy, the subjects of patient misidentification, mislabeled specimens, and the poor quality of specimens are continually highlighted. From the Institute of Medicine’s first report in 1999, “To Err is Human,” to the recent attempts to classify incident reports, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), the Centers for Disease Control and Prevention (CDC), the CAP as well as individual medical centers continue to monitor hospital and laboratory procedures to prevent errors.\(^3\)

### Objectives in specimen collection

The focus of this article is the microbiology department, often designated the “step-child” of the laboratory because of its more subjective approach to clinical diagnosis. To identify areas where lapses in procedure occur and the potential for human error result, we need to examine the protocol for the pre-analytic phase of testing. Surgical specimens, sampled in the operating suite and transported to the microbiology lab for testing, have been chosen because of their critical nature. The following sections are procedural recommendations taken from the 6th and 8th editions of the Manual of Clinical Microbiology practiced by many certified clinical laboratories.\(^5\)\(^,\)\(^6\)

The first objective of specimen collection is to assure that the utmost quality of the specimen is preserved during collection and handling. Another objective relates to the safety of the healthcare personnel who may be exposed to bacterial or viral pathogens. Above all, establishing a beneficial climate of communication between the surgical staff and the laboratory personnel is essential to carrying out the first two objectives.

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### Safety: Adherence to “universal precautions” (based on the CDC recommendations published in the 1980s) is a universally instituted protocol in all U.S. hospitals and medical centers. These precautions apply to all steps of the collection, transport, and processing of specimens in the microbiology laboratory. Healthcare personnel must be protected from exposure to pathogens while specimen integrity is maintained in an appropriate environment prior to processing as follows:

1. Specimens must be submitted in leakproof containers.
2. Syringes must be capped with needles removed.
3. Paperwork must include patient identification/bar-code information.
4. Labels or requisitions that accompany specimens must be contained in separate plastic bags.

### Identification and labeling:

1. Specimen containers must include patient information with bar code, if used, to include:
   - source or site;
   - date of collection;
   - time of collection; and
   - initials of collector.
2. Explicit details of the specimen are required (e.g., exact location, numbered order of sampling).
3. Unless the physician can be contacted, unlabeled specimens will not be processed.

### Suitability of specimen: A list of common surgical/clinical specimens suitable for culture of bacteria, anaerobes, fungus, and mycobacteria or acid-fast bacillus (AFB) are presented in Table 1. Microorganisms that are likely pathogens and those that are likely contaminants are also included. A more detailed listing of common specimen types with instructions for collection, transportation, and storage can also be found in the 6th and 8th editions of the Manual of Clinical Microbiology:\(^5\)\(^,\)\(^6\):

- environmental and storage guidelines of time and temperature;
- collection techniques and suggestions for transportation;
- instructions for avoiding contamination;
- inappropriate or unacceptable specimens;
- handling of specimens likely to harbor unusual or fastidious microorganisms;
- handling pediatric specimens; and
- screening and media considerations.

### Specimen carriers: Note: Unless tubes or bottles are commercially prepared with specific preservatives (e.g., for urine or blood), addition of any preservative — other than saline — can destroy specimen integrity. The following are recommended:

1. Swab transport system, Aimes or Stuart’s (<1 mL of material; for superficial wounds).
2. Anaerobic transport system (<1 mL of material).
3. Sterile cup/container (for tissue, bone, necrotic material or fluid).
   **Note:** Large specimens must be cut to appropriate size for grinding and emulsifying.

4. Syringes preferred for \( \geq 1 \) mL of aspirated fluid.
   **Note:** A large volume is preferred. The lab will centrifuge and process an aliquot.

5. Examples of blood-culturing systems:
   - Bactec System, Becton-Dickinson Diagnostic Instrument Systems, Sparks, MD.
   - Microscan System, Dade-Behring, Deerfield, IL.
   - Lysis Centrifugation System, Wampole Laboratories, Cranberry, NJ.

6. Viral transport media.


**Transportation, handling, and storage**

The effects of time, temperature, and storage conditions can be detrimental even to common bacteria. Therefore, laboratory instructions must be strictly followed by all healthcare personnel who participate in the transit of specimens, particularly those from irreplaceable surgical sites. General guidelines given for culturing commonly isolated microorganisms from specific sites are given in Table 1.

Explicit guidelines for recovering fastidious bacteria and obligate anaerobic bacteria are also outlined in the *Manual of Clinical Microbiology*. Specimens that may harbor temperature-sensitive microorganisms can be held at room temperature (RT) (25°C) for up to 24 hours in appropriate holding medium, but never refrigerated. These include *Shigella* spp., *Neisseria gonorrhoeae*, *Neisseria meningitides*, *Haemophilus influenzae*, *Streptococcus pneumoniae*, *Cryptococcus* sp., *Francisella* sp., or *Bordetella* sp., and anaerobic bacteria.

When transportation is necessary between laboratories, materials and packaging must adhere to the safety regulations for “biohazardous materials” described by the CDC (www.cdc.gov/od/ohs/biosfty/shipdir.htm). U.S. Department of Transportation regulations also apply.

**Recovery of fungi and mycobacteria (acid-fast bacteria):** Handling specimens that may harbor mycobacteria or fungi is considered biohazardous because of the following potential pathogens: *Mycobacterium tuberculosis*; other *Mycobacterium* spp.; fungi such as *Coccidioides immitis*, *Histoplasma capsulatum*, *Cryptococcus neoformans*, or *Blastomyces dermatitidis*. Swabs submitted for recovery of these and similar microorganisms are not acceptable. Only sterile, leakproof containers, test tubes in leakproof bags are appropriate methods of transport. The Lysis Centrifugation System is suggested for blood and bloody fluids that may harbor these pathogens, and submission of detailed paperwork defining the patient’s case history is paramount to ensure correct specimen processing. Storage \( \leq 1 \) hour at 30°C or RT is appropriate for fungi such as *Histoplasma capsulatum*, *Blastomyces dermatitidis*, or *Cryptococcus neoformans*. For all other fungi, one to two hours at 4°C in specified containers is appropriate when delay is anticipated.

**Specimen processing**

Because of the wide variation in protocol used to process microbiology specimens among medical centers, private hospitals, and reference laboratories throughout the United States, this section will cover, only briefly, general considerations that apply to the subsequent detection of microorganisms. Detailed safety requirements can be found in Chapters 3 and 9 of the 8th edition of the *Manual of Clinical Microbiology*.

**Special considerations and procedures:** Microorganisms that are fastidious or labile require that culture processing, Gram stain, or antigen and nucleic-acid processing proceed in a timely manner. If specimen processing is delayed, adherence to strict regulations of temperature and environmental conditions must be followed.

Pathogenic organisms may be lost due to overgrowth with colonizing or indigent bacteria found in wounds or abscesses. On the other hand, presumed sterile fluids, such as cerebrospinal fluid, joint, and other body fluids are considered “infected,” regardless of species or quantity of microorganism present until proven otherwise. Anaerobic cultures may be ordered for appropriate specimens only; this decision is determined by the individual hospital or medical center’s infectious-disease service.
### Table 1. Collection and handling of surgical specimens for culture*

<table>
<thead>
<tr>
<th>Specimen (site)</th>
<th>Likely pathogen(s)</th>
<th>Likely contaminant(s)</th>
<th>Storage timeline</th>
<th>Acceptable</th>
<th>Usually rejected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abscess and Aspirates ≥1mL (pus, necrotic material, tissue)</td>
<td>MRSA, Group A strep, Enterobacteriaceae, Enterococcus spp., P aeruginosa, Candida spp., other fungi, AFB, anaerobes</td>
<td>Coagulase negative staphylococcus and corynebacteria, propionibacteria, saprophytic Neisseria spp.</td>
<td>Best: ≤2 hours in syringe, sterile tube 2“ best: ≤2 hours at RT (25°C) in holding media</td>
<td>Note: Do not refrigerate</td>
<td>Syringe; sterile tube or container; few drops of saline for ≤1 mL/mg or two swabs in Stuart’s, Aimes or anaerobe transport system</td>
</tr>
<tr>
<td>Blood (venous and arterial), tissue</td>
<td>Presence of any microorganism until proven otherwise (including AFB and fungus)</td>
<td>Coagulase-negative staphylococcus and corynebacteria, propionibacteria, saprophytic Neisseria spp.</td>
<td>≤24 hours at RT</td>
<td>Sterile screw-cap tube, blood-culture bottles; SPS and EDTA preservatives</td>
<td>Dry swabs; tubes without anticoagulant</td>
</tr>
<tr>
<td>Bone, bone marrow</td>
<td>Presence of any microorganism</td>
<td>Coagulase-negative staphylococcus and corynebacteria</td>
<td>≤24 hours at RT</td>
<td>As above</td>
<td>Dry swabs; tubes without anticoagulant</td>
</tr>
<tr>
<td>Cerebrospinal fluid or tissue</td>
<td>Presence of any microorganism</td>
<td>Coagulase-negative staphylococcus and corynebacteria</td>
<td>≤24 hours at RT</td>
<td>Sterile tube or anaerobic transport system</td>
<td>Dry swabs or swabs in holding media</td>
</tr>
<tr>
<td>Ear (inner fluid) (external)</td>
<td>S aureus, S pyogenes, P aeruginosa, Vibrio spp., S aureus, S pneumoniae, H influenza, M catarrhalis, rarely GNRS, and anaerobes</td>
<td>Coagulase-negative staphylococcus and corynebacteria</td>
<td>≤24 hours at RT (inner) ≤24 hours at 4°C (external)</td>
<td>Sterile tube, anaerobe, or swab transport system</td>
<td>Additives or preservatives</td>
</tr>
<tr>
<td>Eye</td>
<td>S pneumoniae, S aureus, H influenza, fungi, N meningitides, C trachomatis, AFB, and fungi</td>
<td>Coagulase-negative staphylococcus and corynebacteria</td>
<td>Plates: ≤15 min. RT, swabs ≤2 min. Note: Do not refrigerate</td>
<td>CA-SBA; sterile tube; saline drops OK; slide for C trachomatis</td>
<td>Dry swabs; additives or preservatives</td>
</tr>
<tr>
<td>Fluids (not CSF or blood) pleural, pericardial, synovial peritoneal</td>
<td>MRSA, Streptococcus spp., N meningitides, N gonorrhoeae, fungi, anaerobes, Mycobacteria spp.</td>
<td>Coagulase-negative staphylococcus and corynebacteria</td>
<td>≤24 hours at RT in holding media; 4°C (sterile tube and fungal)</td>
<td>Anaerobic transport; sterile tube, BC bottle, &gt;1 mL to centrifuge</td>
<td>Dry swabs; additives or preservatives</td>
</tr>
<tr>
<td>Gastric tissue/ulcer</td>
<td>H pylori</td>
<td>Coagulase-negative staphylococcus and corynebacteria</td>
<td>≤24 hours at 4°C</td>
<td>Sterile tube, container or HP transport-slide</td>
<td>Dry swabs</td>
</tr>
<tr>
<td>Genital tract (male and female)</td>
<td>N gonorrhoeae, C trachomatis, H ducreyi, T pallidum, U urealyticum</td>
<td>Coagulase-negative staphylococcus and corynebacteria</td>
<td>≤24 hours at RT Note: Do not refrigerate</td>
<td>Saline drops OK; swab transport, slide for antibody screen</td>
<td>Additives, preservatives</td>
</tr>
<tr>
<td>Pelvic abscess; perirectal abscess</td>
<td>Mixed aerobes and anaerobes</td>
<td>Coagulase-negative staphylococcus and corynebacteria</td>
<td>≤24 hours at RT or at 4°C (container)</td>
<td>Anaerobic transport; sterile container, slide for antibody screen</td>
<td>Additives/preservatives</td>
</tr>
<tr>
<td>Tissue</td>
<td>Presence of any microorganism until proven otherwise</td>
<td>Coagulase-negative staphylococcus and corynebacteria, propionibacteria, saprophytic Neisseria spp</td>
<td>≤24 hours at 4°C ≤24 hours at RT in anaerobe transport</td>
<td>Large: sterile container; Small: add saline to container or use anaerobe transport</td>
<td>Swabs; additives or preservatives</td>
</tr>
<tr>
<td>Wounds (see abscess and aspirates)</td>
<td>MRSA, Group A Strept, Enterobacteriaceae, Enterococcus and Candida spp. Clostridium, Bacteroides spp., P aeruginosa, AFB, and fungi</td>
<td>Coagulase-negative staphylococcus and corynebacteria</td>
<td>≤24 hours at RT Note: Do not refrigerate</td>
<td>Same as abscess</td>
<td>Same as abscess</td>
</tr>
<tr>
<td>Necrotizing fasciitis/ gas gangrene</td>
<td>Toxin-producing Group A beta streptococcus, MRSA, Clostridium spp., mixed aerobic and anaerobic bacteria</td>
<td>Coagulase-negative staphylococcus and corynebacteria</td>
<td>≤15 mins. at RT Sterile tube(s), container</td>
<td>Surgical debridement of necrotic material; STAT Gram stain and culture</td>
<td>Swabs</td>
</tr>
<tr>
<td>Bite (animal)</td>
<td>Pasteurella spp.</td>
<td></td>
<td>≤2 hours at RT for sterile tube ≤24 hours at RT</td>
<td>Sterile tube for holding media</td>
<td>Dry swabs</td>
</tr>
</tbody>
</table>

**Key:** MRSA = methicillin resistant *S aureus*; AFB = acid-fast bacillus

*Note: This table represents examples of specimen types and microorganisms but is not a complete listing. Viruses, protozoa, unusual bacteria, and so forth are not included.*

*Continues on page 16*
Instructions found in the anaerobic transport system materials address details of transportation and storage. The Lysis Centrifugation System can be used to isolate fastidious microorganisms (e.g., *Legionella* spp., *Francisella* spp., or *Bartonella* spp.) and for AFB and fungus. The blood specimen is concentrated by centrifugation to form a pellet, which is then inoculated to recommended culture media for enhanced recovery or used in rapid-testing procedures.

Specimen acceptability is based on various factors that apply to a particular source/site of sampling. The quality and/or volume of the specimen as well as its condition upon arrival at the microbiology laboratory are all important considerations. Immediate smear examination (e.g., Gram stain or acid-fast stain) can determine the need for further specimen-sampling. The presence of polymorphonuclear neutrophils, or PMNs, and the type and number of epithelial cells and microorganisms seen are among the criteria used to determine sample acceptability. 5,6 Table 1 lists surgical specimens suitable for culture with transportation and storage guidelines, and Table 2 lists specimens for processing with suggestions for stain and culture media.

**Quality assurance**

Guidelines to ensure patient safety and prevent hospital or laboratory error have been developed by various professional institutions. Additional protocol is available to aid physicians in clinical practice and antibiotic therapy. Aside from the CDC, others include the Infectious Disease Society of America (IDSA); the American Thoracic Society, or ATS; the American Society for Clinical Pathology, or ASCP; and the Clinical Laboratory Standards Institute, or CLSI, that provide an annual update of standards specific to the clinical microbiology laboratory. Laboratory accreditation by JCAHO and the CAP is also recommended. 7

Among the published guidelines for microbiology laboratories recommended in 2004 are the following examples:

1. Screening tests that are both specific and sensitive for a group of sexually-transmitted pathogens (STDs). A nucleic-acid amplification technique is available for the rapid detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae*, the two most common STDs in the United States. Other STDs to screen include Group B beta hemolytic streptococcus, or GBS — a deadly infection of the newborn — and human papillomavirus, or HPV, an agent of squamous cell carcinoma of the cervix. Guidelines for antibiotic therapy and vaccine recommendations are also provided. 7

2. Implementing culture, susceptibility, and molecular detection testing has resulted in a marked reduction in nosocomial infection with methicillin resistant *S. aureus*, or MRSA, and vancomycin-resistant *Enterococcus* spp., or VRE. The 2003 surveillance data from the Society for Healthcare Epidemiology of America indicate...
that screening cultures, contact, and other prevention measures are worth the added cost to decrease both morbidity and mortality from infection with these pathogens.7

3. Screening platelet units by culturing for bacterial contamination, usually done by the blood center collecting the platelets, is now required by the AABB (American Association of Blood Banks) and is considered a “Phase II laboratory deficiency” by the CAP (TRM 44955) when not performed.7

State and local regulations, and in-house quality-control monitoring apply to all U.S. clinical laboratories. Professional organizations provide accreditation following on-site laboratory inspection. That inspection applies to the three phases: pre-analytic, analytic, and post-analytic. The first step, or pre-analytic, has been demonstrated here. The second step, analytic, requires quality assurance of all steps in the automated, semi-automated, and manual methods of culture, susceptibility, and molecular-detection testing. The third phase, or post-analytic, is the important area of reporting, where accuracy of performance and communication of results to the provider are reviewed. Electronic reporting may reduce errors, but there is no substitute for monitoring computer entry and system accuracy that is provided by the critical eyes of medical technologists, their supervisors, and managers.3,7

Present and future challenges

The familiar “bugs” — *S aureus* and *Enterococcus* spp., which are known causes of nosocomial infection — have evolved to include the hyper-resistant strains, MRSA, vancomycin-intermediate *S aureus* (VISA), vancomycin-resistant *S aureus* (VRSA), and VRE. MRSA has further evolved to become the community health hazard, community-acquired methicillin resistant *S aureus* (CA-MRSA).

Other microorganisms in the newly emerging group include the food contaminating *E coli* serotype 0157:H7, known for its devastation to children from fast-food hamburgers and, more recently, fresh produce. Combined with the emerging antibiotic resistance in both Gram-negative and Gram-positive pathogens, the challenge to medical technologists in microbiology has become an increasing burden.8

Unfortunately, non-compliance among laboratories with the recommended guidelines for error prevention is common. The reasons are varied but include lack of resources, lack of agreement to a timeline for updates (e.g., IDSA says two years; in reality, it may be three to six years before changes are enacted), fear of legal liability, and disagreement among professional groups. The ever-increasing number of guidelines recommended (e.g., more than 1,000 in the National Guidelines Clearinghouse 2001 database) requires more time to implement.7

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Stain</th>
<th>Aerobic media</th>
<th>Anaerobic media</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abscess Aspirates</td>
<td>Gram</td>
<td>SBA, CA, Mac, Add AFB and fungus media</td>
<td>Not for swab BBA, LKV, BBE, CNA</td>
</tr>
<tr>
<td>Blood, bone mar-</td>
<td>Gram</td>
<td>BC bottles, SBA, BBA, CA, AFB and fungus media</td>
<td>BBA</td>
</tr>
<tr>
<td>row</td>
<td>AFB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSF</td>
<td>Gram</td>
<td>SBA, CA, Thioglycolate broth, AFB and fungus media</td>
<td>BBA</td>
</tr>
<tr>
<td>Ear (external)</td>
<td>Gram</td>
<td>SBA, CA, Add Mac</td>
<td>BBA</td>
</tr>
<tr>
<td>(internal)</td>
<td>AFB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye</td>
<td>Gram</td>
<td>SBA, CA</td>
<td>Not done</td>
</tr>
<tr>
<td>Fluids (not CSF)</td>
<td>Gram</td>
<td>SBA, CA, Mac, BC bottles, Thioglycolate broth, AFB, and fungus media</td>
<td>BBA</td>
</tr>
<tr>
<td>Genital Pelvic or</td>
<td>Gram</td>
<td>SBA, TM, broth for Group B strep screen</td>
<td>BBA, LKV, BBE, CNA</td>
</tr>
<tr>
<td>perirectal</td>
<td>AFB</td>
<td>SBA, CA, Mac, TM</td>
<td></td>
</tr>
<tr>
<td>Tissue</td>
<td>Gram</td>
<td>SBA, CA, Mac, BC bottles, Thioglycolate broth, AFB, and fungus media</td>
<td>BBA, LKV, BBE, CNA</td>
</tr>
<tr>
<td>Wound/abscess</td>
<td>Gram</td>
<td>SBA, CA, Mac, Add AFB and fungus media</td>
<td>Not for swab BBA, LKV, BBE, CNA</td>
</tr>
<tr>
<td>aspirate(see above)</td>
<td>AFB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Media Key: SBA = sheep agar, CA = chocolate agar, Mac = MacConkey agar, BC = blood culture, TM = Thayer-Martin, BBA = brucella-blood agar, LVA = laked vancomycin agar, BBE = bile esculin agar, CAN = colistin-nalidixic agar

*Note: This table represents examples of specimen types, stains and culture media, but is not a complete listing.58

Clinical microbiology came under unprecedented public scrutiny when anthrax spores threatened the U.S. postal system in 2001. A view of less than state-of-art laboratories desperately needing funding was only too apparent. Fortunately, the biotechnology field was able to answer the demand for rapid testing with nucleic-acid amplification and the latest molecular technology for identifying emerging viruses such as SARS and avian influenza.8

Suggestions have been made that the American Society of Microbiology (ASM) play a greater role in developing and updating quality-assurance guidelines for microbiology practice as they did in response to the anthrax attacks. Collaboration with the Association of Public Health Laboratories, or APHL, and the CDC helped establish regulations and guidelines for the control of possible etiologic agents of bioterrorism. Updating the ASM publication series, *Cumitech*, initiated as clinical-practice guidelines to address on-going problems of error prevention, is a pressing need. Its suggestions for creating a more systematic approach in the microbiology lab are invaluable.3,5

Leadership may be on the horizon with a newly formed organization entitled the Institute for Quality in Laboratory Medicine (IQLM). Under the auspices of CDC, the IQLM is not another regulatory agency but a group of experts dedicated to the single purpose of ongoing quality improvement in laboratory testing and services. The organization’s first conference was held in Atlanta in 2005.9

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Candidates should be able to list:
- clinical laboratory experience; professional organizational memberships; continuing education participation; and contributions to teamwork to advance the clinical laboratory profession, including customer service and contribution to patient care.

Candidates should be able to describe:
- why they want this scholarship and how the scholarship will help them contribute more to the profession;
- how they will share with others in innovative and creative ways the information they get from this award; and
- the qualities they possess that they believe are necessary to be a successful laboratory.

Apply for the new Executive War College Scholarship

With paid registration, travel expenses, and hotel, you can attend the 2007 Executive War College on Laboratory and Pathology Management at the Intercontinental Hotel in Miami, FL, on May 10-11, 2007 (plus the optional program on May 9).

Go to www.mlo-online.com to register, and click on the "Executive War College Scholarship" button. This award coincides with National Medical Laboratory Professionals Week (April 22-28, 2007) and allows medical laboratorians nationwide to demonstrate their contributions to quality patient care. The winner and two runners-up will be featured in the April 2007 issue of Medical Laboratory Observer.

The new deadline for applications is 12:01 AM EST on Feb. 1, 2007.

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References