Graduation Is Here...What's Next?

New technologies demand that you keep current with the field.

BY MARY ANN MCLANE, PHD, CLS(NCA)

Congratulations, Class of 2003! Welcome to the family of clinical laboratory practitioners. Your hard work and long hours are culminating in your academic degree and the ability to sit for your entry-level certification examination. You no doubt feel you could not possibly add any more knowledge to what you've already learned! However, I am sure that at some point in the festivities surrounding your graduation, you will hear the phrase “Commencement really means 'a beginning.'”

For clinical laboratory professionals, that could never be more true. One of the hallmarks of this profession is that advancements are made daily, and all of this new information is as much a part of your “Body of Knowledge” as that which you have just mastered. I can recall my surprise in 1976 when I read, just before I took my certification exam, that the genus and species of many of the organisms I’d worked so hard to master in clinical microbiology were being changed as a result of new findings about their DNA. I predict that your hard-won degree will be obsolete within 2 years if you don’t make the effort to learn and read continuously, and not with a faculty member dangling a grade in front of you!

Keeping current with advances in our field is called “continuing education,” and it will not only add to your skills and value as an employee, but also prevent that all-too-human phenomenon of boredom in the workplace. Your employer will pay you for your skills, and will assume that as a professional, you will do what is necessary to maintain those skills.

If support (e.g., financial, time) for continuing education comes with employment, then it’s a nice perk. Not getting that perk does not diminish the employee’s professional responsibility to do it. Emphasize during your interview, though, that you are interested in being a part of a facility that values continuing education as much as you do, and that you expect it to be a part of your benefits package... you will never know unless you ask, and you may be pleasantly surprised with the answer.

Opportunities for continuing education are as close as reading ADVANCE, including a “Sneak Peek at what’s in the market,” as well as listings of nationwide conferences and at articles for continuing education credit. Your professional society will also provide many activities toward updating your knowledge and skills. Continuing education seminars or “Webinars,” such as those offered by Beckman Coulter and the University of Washington, also are on the Web.

Now that you have made the commitment to continue your education after graduation, what are some of the advancements you will encounter within your first few years of practicing your profession? Not surprisingly, perhaps, they will center around testing menus, turnaround time and communicating test results.

Testing Menus

On the horizon of new diagnostic tests soon to be routinely available are the measurements of osteocalcin for osteoporosis and the use of an ostease method that will be specific for the bone isoform of alkaline phosphatase. While post-menopausal women are traditional patients tested for abnormalities in bone, men being treated with androgen deprivation therapy for prostate cancer will be a new population benefiting from these tests of bone remodeling.

Other cancer marker tests include fluorescence in situ hybridization (FISH) assays for HER-2 (breast cancer), deletion of the 9p21 locus (transitional cell bladder cancer) and molecular fingerprinting to identify patients with lung, breast, gastrointestinal or prostate cancer. Cystatin C shows promise as a replacement for creatinine measurements for renal function, while albumin cobalt binding is a highly negative predictor for cardiac ischemia.

Also, antibodies to myelin oligodendrocyte glycoprotein will be a new marker for multiple sclerosis, an improvement to the simple occult blood test has been made, making it more sensitive, and hemoglobin A1c can be determined by turbidometric immunoinhibition rather than by column chromatography.

Additionally, new phrases such as “mean sphered cell volume,”
"plateletcrit" and "high light scatter reticulocyte percent" will need to be added to your vocabulary, and DNA testing through specific oligonucleotide probes currently in use to detect *Chlamydia trachomatis* and *Neisseria gonorrhoeae* will expand to other organisms.

During your clinical rotations, you may not have experienced the following technologies, but you will! For example, near-infrared particle immunoassays increase the analytical sensitivity for chemistry analytes. Proteomics (the identification of new proteins from DNA sequences in the human genome, and then hunting for their function) will continue to provide new markers for cancer, nutrition and other specific diseases.

Microarray technology, which allows thousands of small sequences of DNA or protein to be placed on a chip, to be probed by cellular DNA/protein from the liver, heart and other tissues, eventually will be miniaturized for diagnostic use. And nuclear magnetic resonance profiling of 15 different subclasses of VLDL, LDL and HDL will more accurately predict a person's coronary heart disease risk.

Tetramer technology involves associating four major histocompatibility complex (MHC) molecules with a specific tagged peptide, and then mixing these tetramers with peripheral blood lymphocytes to detect, by flow cytometry, the T cells that are specific for a particular peptide. This technology can monitor CD8+ T cell responses to viruses, parasites, cancer and autoimmune diseases. Additionally, the rapidly expanding availability of monoclonal antibodies to CD markers will allow additional uses of flow cytometry to differentiate various lymphomas, leukemias, sarcomas and myelodysplastic syndromes.

**Turnaround Times**

Since the first true clinical laboratory tests were described in the 1930s, steps always have been taken to handle more patient samples at a time, and to decrease the time itself. A review of the latest information from major vendors shows a clinical chemistry system that can generate 2,000 test results per hour, and hematologic instrument linearity capable of detecting 3 million platelets/ul and 400,000 white blood cells/ul, as well as automatic enumeration of nucleated RBCs.

Increased reporting ranges of many assays, such as a D-dimer method improved from 1,000 ng/mL to 10,000 ng/mL, will eliminate the need for dilution and reflex testing. Direct measurement of low-density lipoprotein cholesterol will speed the analysis of this component of a lipid panel by eliminating pretreatment and centrifugation steps. Autovalidation of test results allows experienced personnel to center their attention on truly abnormal results or unusual troubleshooting situations.

Modular workstations will expand to handle all sample pre-analytical operations completely, even in the smallest laboratory setting. This especially is true in molecular diagnostics, where initial sample handling is still manual. Bar-coding systems will improve with scanning the patient's ID bracelet, printing a label for the test at the patient's bedside, and streamlining recognition of the sample when it reaches the lab.

Laboratory information systems will be replaced with process controllers (software to track and route specimens), know the status of each analyzer, perform autoradiation, repeat specimens and add tests to samples already in the system. The ultimate in miniaturization, using nanotechnology (microfabrication technology) will allow simultaneous analysis of hematology, chemistry, immunoassays and hemostasis.

**Communicating Test Results**

Communication of laboratory testing is undergoing immense change both within physician office laboratory and larger laboratory settings. The Health Insurance Portability and Accountability Act (HIPAA) has caused all levels of health care communication, from initial patient interview to specimen collection to final result reporting, to be re-evaluated in light of patient information privacy.

Electronic technology will allow ever-increasing use of e-mail, pagers and the Internet to provide test results to primary care providers. An increasing number of health-conscious consumers are demanding more ready access not only to testing itself, but also to user-friendly explanation of test results. Translate this as meaning interpretations in layman's terms and more than a cursory "you're fine."

Direct access testing is becoming more widely available, with a concurrent need for clinical laboratory professionals to accept the role of patient advocate, to provide the health care consumer (whether a client, family member, congresswoman or colleague) with objective interpretation of test results.

An example of where this is occurring now is through the consumer page of the American Society for Clinical Laboratory Science, where a team of more than 40 technologists from across the country receive questions online regarding lab test results. Each team consists of an expert in each major lab science discipline, and is assigned one day to respond to questions in its discipline. We provide not only answers to "What is a reference range?", but emphasize the importance of putting any single test into a whole context, encouraging them to ask follow-up questions the next time they visit their primary care provider. From January until September 2002, we processed more than 2,900 questions!

The public is hungry for this information, and as clinical laboratory professionals we are the best qualified to provide it because we understand not only clinical correlations, but also sources of method interference as well as general methodologies. Perhaps this particular opportunity brings us full circle in describing the importance of having a commitment to continuing education. All of the users of the data that we generate make the assumption that we care about that data: its acquisition, quality, interpretation and ultimate use for diagnosis or treatment. Only individuals who pursue knowledge and learning as a life-long quest will be in a position to move easily into the future of clinical laboratory science. I hope you will be among those who do!

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**Resources**

- http://www.medtraining.org/mts/default.asp