ASCLS Annual Meeting 2009: Official Abstracts of Submitted Papers, Case Studies and Posters

CHICAGO, IL

The following abstracts have been accepted for presentation at the 2009 American Society for Clinical Laboratory Science (ASCLS) Annual Meeting and Clinical Laboratory Exposition to be held July 21 through 25 in Chicago, IL. Abstracts are reviewed by appropriate representatives of the ASCLS Abstract Review Committee. They are the final authority in selecting or rejecting an abstract.

Papers, case studies and posters will be presented during the following times at the annual meeting. Room assignments will be listed in the final program.

ORAL RESEARCH AND CASE STUDY PRESENTATIONS

Friday, July 24, 9:15-10:15am and 3:00-4:00pm at the Renaissance Chicago Hotel

POSTER PRESENTATIONS

Tuesday and Wednesday, July 21 and 22, 10:00am-4:30pm; Thursday, July 23, 9:30am-Noon at the McCormick Place Convention Center; *Authors will be present on Wednesday, July 22, 2009 from 10:30-11:30am to discuss their work and answer questions.*

ORAL RESEARCH ABSTRACTS

A Comparison Study of Scholarly Research of Clinical Laboratory Science Faculty – 1985, 1996, 2008

Kathy V. Waller, PhD, CLS(NCA), Jill Clutter, PhD, The Ohio State University, Columbus, OH; Karen R. Karni, PhD, CLS(NCA), University of Minnesota, Minneapolis, MN

To what extent are CLS faculty fulfilling a research mission of their institutions and contributing to and advancing the body of knowledge of the profession? In 2008, an electronic questionnaire was distributed to 448 faculty members from 106 colleges and universities offering CLS baccalaureate programs. Responses were received from 275 faculty members(61%). This study (2008) compares CLS faculty members' research and scholarship data to that obtained in similar studies conducted in 1985 and 1996. Since 1985, numbers of faculty holding doctorates have increased (26% in 1985, 46% in 1996, and 52% in 2008). By rank, senior faculty (associate and full professors)increased from 38% to 49% and 54%, respectively. The numbers of presentations have increased from 10% presenting four or more times in 1985; to 25% presenting 11 or more times in 1996; and 34% in 2008. Number of publications in refereed journals has increased over time from only 2% publishing seven or more times in 1985; to 14% publishing 11 or more times in 1996; and 33% publishing in 2008. Total grant funding increased from $23 million in 1996 to $62 million in 2008. However, teaching remains a primary responsibility, which for all faculty averaged 22 hours per week both in 1996 and 2008. Time in a faculty position of more than 16 years rose from 44% in 1996 to 53% in 2008, suggesting further graying of the professoriate. Since 1985, CLS faculty have made progress in fulfilling the academic missions of their institutions and moving forward the profession.

Glucosamine Joint Supplement Suppresses Platelet Aggregation

David L. McGlasson, MS, CLS/NCA, Wilford Hall Medical Center, Lackland AFB, TX; George A. Fritsma MS MT (ASCP), The Fritsma Factor, Birmingham, AL

A healthy 47-year old female has frequently donated blood to provide normal platelet aggregometry controls for aspirin response studies. Aggregometry results using her platelets were consistently normal. On two occasions, ADP-induced light transmittance (LTA) and whole blood aggregometry (WBA)results were suppressed, yielding the following results: LTA with ADP 20µM, 43.0% (Normal:60.0-100.0%); WBA with ADP 10.0µM and 5.0µM, 0.0 and 5.0 ohms aggregation (Normal: >8.0 ohms). The aggregation results on the second date gave an LTA with ADP 20µM of 51.0% and the WBA with 10.0µM and 5.0µM were 0.0 ohms, respectively. Response to collagen was normal (>8.0 ohms). A CBC with platelet counts were normal. For both dates the PFA-100 ADP/COLL and EPI/COLL results were normal and the Accumetrics cartridges had a normal response for detection of aspirin and Plavix response. The subject reported she had begun taking a daily dose of 1500 mg of glucosamine with 1500 mg celadrin approximately 4 weeks prior to the first testing. A literature search generated one article involving human subjects demonstrating that glucosamine suppressed

platelet ADP receptors, but not collagen or thrombin receptors. Two articles using guinea pigs and dogs, respectively, also showed effects of glucosamine on platelet function. The subject stopped the supplement and was reanalyzed after two weeks. The results were ADP 20µm, 73.0% LTA and 8.0 and 0.0 ohms WBA aggregation. We concluded that glucosamine supplements suppress ADP-induced platelet aggregation. A population study may help establish risk for glucosamine supplements when taking anti-platelet functional drugs such as Plavix or aspirin.

Inhibition of Thromboxane Synthase Leads to Cell Cycle Arrest and Apoptosis in Lung Cancer Cells

George G. Chen, PhD, Kin C. Leung, PhD, Michael K.Y. Hsin, MB, Malcolm J Underwood, MD, Department of Surgery, The Chinese University of Hong Kong, Hong Kong

Thromboxane synthase inhibitors are involved in apoptosis and tumor metastasis. This study investigated whether and how 1-Benzylimidazole (1-BI), a thromboxane synthase inhibitor, influenced the growth of lung cancer cells. Three lung cell lines were used in the study, NCI-H460, NCI-H23 and CRL-2066. p53 in NCI-460 is wild type but in the other two cell lines are mutated. The result showed that 1-BI arrested the cells in G0/G1 in two p53-muated cell lines, and significantly induced apoptosis in wild-type p53 NCI-H460. 1-BI induced the expression of p53 and BAX in NCI-H460 but not in the other two. p27 was elevated in all three cell lines tested. In NCI-H460, I-BI-mediate p53 upregulation was suppressed by PFT-alpha, a p53 inhibitor. Levels of the nuclear p27 and the cytosolic BAX induced by I-BI were further increased in the presence of PFT-alpha and such an increase was accompanied by the enhanced G0/G1 cell cycle arrest, suggesting that the cell cycle arrest caused by 1-BI may be mediated by p27. Although caspase-3 was activated by 1-BI, cell death was not abolished by caspase inhibitors (Z-VAD-FMK and DEVD-CHO), suggesting that the anti-tumor effect triggered by 1-BI is independent of caspase. Collectively, our data demonstrated that 1-BI could significantly arrest lung cancer cells in G0/G1 stage and induced apoptosis by a caspase-independent mechanism which is associated the p53 status, increased p27 and BAX. (This work was supported by a direct grant from the Chinese University of Hong Kong, No: 2007.2.045).

Methicillin Resistant *Staphylococcus aureus*: Carriage Rates and Characterization of Students in a Texas University

Rodney E. Rohde, MS, SV, SM, MP(ASCP), Rebecca Denham, MT(ASCP), Aaron Brannon, Texas State University-San Marcos, CLS Program, San Marcos, TX

OBJECTIVE: To evaluate the carriage rates of *Staphylococcus aureus* and methicillin resistant *Staphylococcus aureus* (MRSA) in a university student population and describe associated risk factors.
DESIGN: Cross-sectional study. (IRB approval)
SETTING: Texas State University-San Marcos, San Marcos, TX.
PARTICIPANTS: Two-hundred and three samples - December 2007 to July 2008.
RESULTS: Of the 203 participants who were screened, 60 (29.6%) carried *S. aureus*. Univariate analysis found that only hospitalization in the past 12 months was significantly associated with the risk of being a *S. aureus* carrier (OR=3.0, 95% CI 1.28-7.03). Of the 60 participants that carried *S. aureus*, 15(7.4%) were identified as MRSA carriers. Hospitalization in the past 12 months (OR = 4.2, 95% CI 1.29-13.36) and recent skin infection (OR = 4.4, 95% CI 1.07-18.24) were significantly associated with the risk of being a MRSA carrier. No unique antibiotic susceptibility patterns were identified with MRSA isolates.
CONCLUSIONS: This is one of the first documented studies of *S. aureus* and MRSA in a university population. While the carriage rate of *S. aureus* is consistent with similar studies, MRSA carriage in this study appears high as compared to the general population. The investigators identified a strong association with past hospitalization for *S. aureus* colonization; past hospitalization and recent skin infection with MRSA colonization. Surprisingly, no significance for MRSA carriage was identified between dormitory and non-dormitory students but university officials need be aware of potential transmission risks in this population.

ORAL CASE STUDY ABSTRACTS

Hindsight into Chronic Vitamin A Toxicity

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This retrospective case study concerns a 67 year-old male, concerned with losing his eyesight, with a presumptive diagnosis of chronic Vitamin A toxicity. Seven years prior to his present condition, he had received a liver transplant due to an alpha-1-antitrypsin deficiency. Eight to ten weeks prior to the on-set of his present condition, he had implant lens surgery in both eyes. This active and medically stable live-alone man began to experience extreme photosensitivity, migraine-like pain, and other neuropathic pain syndrome manifestations occurring 2 to 3 times daily. Despite medical examination by 2 ophthalmologists, a neurosurgeon, and

an internist, no diagnosis nor satisfactory treatment was identified. At this point, he contacted this author to review his medical laboratory results and medications in hope of finding something to explain his increasingly worsening symptoms. Upon verbal examination about his meds and over-the-counter (OTC) supplements, it was determined that he likely had Vit. A toxicity. Laboratory testing of his blood revealed an elevated level. Within weeks of stopping intake of all multivitamins and supplemental Vitamin A, his episodes of pain began to diminish until completely resolved. Chronic Vitamin A toxicity in individuals should be considered as a potential risk given that there is no warning provided on the OTC vitamin.

The Impact of I>clickers™ on Student Performance
Eileen Carreiro-Lewandowski, MS, Department of Medical Laboratory Science, University of Massachusetts Dartmouth, N Dartmouth, MA

Studies indicate that individual classroom response systems, such as i>clicker™, employed during large lecture courses improves student engagement and active learning. This case study explores the impact of such a system on student participation, satisfaction, and performance in a medium size (approximately 50 students) Medical Laboratory Science analytical instrumentation class. Participation is tracked, electronically, using a web-based on-line course site. Student satisfaction was assessed using a standard teacher evaluation form, anecdotal comments, and completion of an on-line survey. The results showed that ninety-seven percent of the respondents thought i>clicker™ use was a useful lecture tool and one hundred percent agreed that it helped in their understanding key concepts and keeping them actively involved in the class. Class participation was very high for those in attendance (ninety-nine percent, on average) compared to a traditional lecture class response to questions (approximately twenty-five percent on average). Ninety-seven percent of the respondents felt that this system improved their grade. Student performance on graded work compared to that of students enrolled in another section of this class not using the i>clicker™ system, showed no significant differences. The instructor found that the additional required technology could be problematic and question inclusion needed careful pre-planning. Both students and instructor appreciated seeing the answer display for immediate feedback purposes and further clarification as needed. I>clicker™ use improved student in-class performance and participation, but did not increase overall course grades.

POSTER PRESENTATION ABSTRACTS

ASCLS Members' Perceptions Regarding Research
Kristy Shanahan, MS, CLS(NCA), **Lillian Mundt**, EdD, CLS(NCA)SpH, Rosalind Franklin University of Medicine and Science, North Chicago, IL

Research is one of the benchmarks of a profession. However, in the Clinical Laboratory Science (CLS) profession, few manuscripts are submitted to the American Society for Clinical Laboratory Science (ASCLS) journal, *Clinical Laboratory Science*, on a regular basis. The problem is that perceptions regarding research, and the role of laboratory professionals as researchers, held by ASCLS members may be contributing to the low number of manuscript submissions. To assess these perceptions, an anonymous Likert-scale survey was developed and delivered online using Survey Monkey. Members of ASCLS, with email addresses, were chosen to participate in this survey because they may be most likely to contribute manuscripts for a journal by their own society. About 10% of the 7,000 members who were invited by email chose to participate in this study. Most participants agreed that 1) there is important information to be gathered from research on clinical laboratory specimen results (99.6%), 2) research contributes valuable information to the body of CLS knowledge (99.2%), and 3) conducting research is one of the benchmarks of a profession (92.4%). The majority of participants felt that there are inadequate resources (68.8%) and not enough time (83%) available to conduct research in the clinical laboratory setting. Most participants recognize that many laboratory activities constitute research (86.2%), but only a few are willing to publish research findings on their own (29.2%). These results show an opportunity exists for ASCLS to foster collaborations between bench technologists and educators willing to assist with the publication process.

Bid Promotes Apoptosis of Hepatocellular Carcinoma Cells and Is a Potential Agent to Treat This Malignancy in-vivo
George G Chen, PhD, Shihong Ma, Mphil, Gang Song, PhD, Davor Chau, BS, Paul BS Lai, MD, Department of Surgery, The Chinese University of Hong Kong, Shatin, NT, Hong Kong

Bid is a pro-apoptotic molecule which bridges the death receptor and the mitochondrial pathways amplifying the apoptotic signals. Our previous study has shown that Bid is decreased in hepatocellular carcinoma (HCC) and that the

enhancement of Bid level induces apoptosis in HCC cells in culture models and in the subcutaneous tumor model. However, it is unclear how Bid travels to its functional site – mitochondria and whether Bid can inhibit the growth of tumor in liver. We thus monitored how Bid translocated from the nucleus to the mitochondria and how this process affected cell death. We also tested the effect of Bid in an orthotopic hepatic tumor model. The result showed that Bid itself was unable to relocate from the nucleus to the mitochondria in p53-deleted HCC cells. However, Bid traveled together with p53 from the nucleus to the mitochondria when HCC cells were transfected with a wild-type p53 and stimulated by DNA damage agents. Bid translocation sensitized HCC cells to apoptosis. In the mouse model of liver tumor, we found the administration of adenoviral Bid significantly inhibited the growth of liver tumor. Further, such an inhibitory effect of Bid was negatively paralleled to the level of alpha-fetoprotein. In conclusion, our data support that Bid inhibits the growth of HCC cells by promoting apoptosis. Bid is a potential agent for treatment of HCC. (This work was supported by the Research Grants Council of the Hong Kong Special Administrative Region, No: CUHK 4534/06M).

Biofilm Evaluation in Bacteria from Clinical Isolates

Rita M. Heuertz, PhD, MT(ASCP), Uthayashanker R. Ezekiel, PhD, Saint Louis University, St. Louis, MO

Bacterial biofilms are increasingly important in the medical community due to their increased resistance to antimicrobic treatment and increasing presence in intensive care patients. Medically important biofilms include those from indwelling medical devices, dental plaque and the respiratory system, to mention a few. It is crucial that reliable and consistent protocols be developed to identify biofilm-producing bacteria, quantitate the amount of biofilm present and identify/develop therapeutics effective in treating biofilm-producing bacterial infections. A reliable method for biofilm quantitation is under development. Preliminary results indicate that clinical bacterial isolates have varying abilities to produce biofilm. Preliminary data also suggest that 50% of *Pseudomonas aeruginosa* tested (n=8) and 40% of *Klebsiella pneumoniae* tested (n=10) produce large, demonstrable amounts of biofilm. A preliminary assay has been developed that quantitates biofilm accumulation on glass tube surfaces when grown in tryptic soy broth, incubated (overnight, 37°C), stained with crystal violet and then measured at A590 after dye elution. These results indicate that further studies are necessary to elucidate the role of biofilm-producing capabilities of bacterial isolates from hospitalized patients. Experiments are currently being conducted to further refine the methodology, ascertain physiological requirements for biofilm development, assess different types of clinical isolates for biofilm-producing capability and evaluate different agents for therapeutic effects on biofilm prevention.

Comparison of Four Methods for Fluconazole Susceptibility in *Candida species*

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Candida species is the fourth most common cause of bloodstream infections and causes 40-60% mortality in some patient populations. *Candida* resistance to fluconazole has been reported to range from one to sixteen percent depending on the species and patient population. Because fluconazole is a safe, effective treatment for *Candida* infections in hemodynamically-stable, non-neutropenic patients and is available generically, we wanted to know if fluconazole resistance was a problem in our patient population. If resistance was not high, pharmacy costs could be saved by using fluconazole instead of more expensive antifungal drugs. We also wanted to determine which FDA-approved method would be most easily, accurately and economically performed in our laboratory. We identified 79 viable *Candida sp.* isolated from blood cultures from patients treated with antifungal drugs. Each isolate was tested by CLSI disk diffusion (DD), E-test (ET), Sensititre YeastOne (YO), and Vitek 2 (V) methods. Results were read and interpreted by two experienced technologists and photographed. Agreement between readers was 97.3%. Categorical agreement between methods was 91.1% for ET versus V and DD versus V, 92.4% between YO versus V, and 93.7% between DD versus ET, DD versus YO, and DD versus YO. Discrepancies and reduced susceptibility were seen only in tests for *Candida glabrata* with 11.4% demonstrating susceptible-dose dependent results. We concluded that resistance to fluconazole was negligible in our institution and accuracy of the four methods was acceptable although each method has technological and economic advantages and disadvantages.

Comparison of Methods Used to Detect Antinuclear Antibodies

Janelle M. Chiasera, PhD, Audrey D. Baker, MS, Linda H. Jeff, MA, The University of Alabama at Birmingham, Birmingham, Alabama

The gold standard and most common method used to detect antinuclear antibodies (ANAs) is the indirect fluorescent an-

tibody assay (IFA). The IFA is a subjective screening method that provides only limited information about the ANAs present. The recent development of fluorescent, flow cytometric bead-based assays provides the simultaneous screening and detection of multiple ANAs eliminating the need for reflex testing. Few studies have compared these new systems with IFA to detect ANAs. The purpose of this study was to compare AtheNA Multi-Lyte ANA, AtheNA Multi-Lyte ANA II, and AUTOFLUOR systems for the detection of antinuclear antibodies. Four hundred and forty-four serum specimens were assayed by all methods. The percent agreement between each method and sensitivities and specificities were calculated using the IFA (AUTOFLUOR) as the reference method. Highest overall agreement (73%) was seen between the AtheNA Multi-Lyte and AUTOFLUOR systems with the AtheNA Multi-Lyte system showing better specificity (95%) in detecting ANAs. Based on the high specificity, The AtheNA Multi-Lyte ANA system would be ideal for reflex testing once a more sensitive screening method, such as IFA reveals a positive ANA result. However, the AtheNA Multi-Lyte ANA system might be an acceptable substitute for an IFA method for simultaneous screening and reflex testing in laboratories that perform large volumes of ANA testing.

Comparison of Multiple Methods for Monitoring Tobacco Smoke Exposure

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Reliable tools are needed to evaluate exposure to environmental tobacco smoke and to verify the smoking status of an individual. The only significant source of nicotine in man is from the tobacco plant, *Nicotiana tabacum*. When the leaves are smoked or chewed, nicotine is rapidly absorbed and metabolized to cotinine and nicotine-N-oxide. Unlike other determinations, such as carboxyhemoglobin and thiocyanate, nicotine and cotinine are both specific to tobacco; however, cotinine is a more reliable biomarker because it has a longer half-life. Using archived urine samples for which smoking histories were also reported, we examined the cotinine values as measured by TobacAlert™, a semi-quantitative lateral flow based dipstick, the Immulite® 2000 nicotine metabolite assay, the cotinine enzyme linked immunosorbant assay (ELISA) kit from Bio-Quant, and gas chromatography-mass spectrometry (GC-MS) cotinine determinations. Laboratory based tests were compared to one another and to the point of care dipstick. The immuno-based methods show good correlation with one another. The correlation between the Immulite® 2000 and the Bio-Quant assay was R= 0.970, p>0.001. The correlation between the Immulite® 2000 and the GC-MS method was R=0.954, p>0.001, and they had similar diagnostic sensitivity and specificity; however, the absolute values by GC-MS were lower. The correlation between the Immulite® 2000 and the TobacAlert™ was R=0.997, p>0.001. Even though the different methods have different criteria to distinguish smokers and non smokers, cotinine measurements do predict exposure to environmental tobacco smoke and/or the smoking status of individuals.

The findings and conclusions in this abstract have not been formally disseminated by the National Institute for Occupational Safety and Health and should not be construed to represent any agency determination or policy.

Curriculum Strengthening for Kenya Medical Training College

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This research details how the Kenya Medical Training College system (KMTC), CDC-Kenya, and the ASCP identified curriculum and training deficiencies at KTMC schools of medical technology and then developed a plan to correct them. The first phase of collaboration between ASCP and CDC-Kenya focused on improving training for laboratory professionals with emphasis on better quality assurance/quality control (QA/QC) and stressed the importance of implementing such standards countrywide. For example, based on observations and interviews with both incumbent professionals and laboratory students it was evident QA/QC implementation and instruction were, at best, woefully insufficient – and in many cases simply nonexistent. Given this deficiency, the second phase of collaboration, requested by KMTC leaders, focused on standardizing the curriculum for medical technology training at KTMC's eleven campuses. Through a series of workshops with senior KTMC faculty members, courses, lab training, and standards were reviewed. ASCP consultants presented information on writing learning objectives and various methods for teaching. Workshop participants agreed on content revision needs and placement of courses. Requested content, including lesson plans developed by ASCP consultants, was delivered at the Curriculum Finalization Workshop which also provided an opportunity for

KMTC faculty to practice new teaching methodologies. The resulting unification and clarity of materials is expected to improve teaching and learning outcomes. Based on the new standardized content and decisions made at the Finalization Workshop, new syllabi were developed which KMTC implemented countrywide in September 2008. Looking forward, KMTC hopes to gain ASCP International Certification for graduates of its revamped medical technology programs.

Does VAMP-8 Play A Role in the Development of Atherosclerosis?

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Atherosclerosis is a leading cause of death in western countries and the major cause of cardiovascular diseases. A plethora of cells are involved in atherosclerosis such as, endothelial cells, leukocytes, and platelets. Beyond their vital role in hemostasis and occlusive thrombosis, platelets appear to play a role in the initiation of atherosclerosis through the secretion of various pro-inflammatory and pro-thrombotic substances. Platelet secretion is mediated by the integral membrane proteins called SNAREs. Our laboratory has previously shown that vesicle-associated membrane protein 8 (VAMP-8/endobrevin) is the primary vesicle SNARE required for all platelet secretion events. Given the known role of platelets in hemostasis and the proposed role of platelets in atherosclerosis, we sought to determine whether the deletion of VAMP-8 affects the development of atherosclerosis. For these studies, $ApoE^{-/-}$ mice, which are susceptible to atherosclerosis, were crossed with $VAMP\text{-}8^{-/-}$ mice to obtain $VAMP\text{-}8^{-/-}/ApoE^{-/-}$ animals. Consistent with our hypothesis, the 50 weeks old $VAMP\text{-}8^{-/-}/ApoE^{-/-}$ mice showed a reduction in lesion size compared to the control. This was measured by the Oil Red-O staining of the plaques in the aortic sinus and the *en face* analysis of the plaque size seen in the aortic arch. **Conclusion:** These data show that the loss of VAMP-8 reduces development of atherosclerotic plaques and suggests that platelet secretion may play a role not only in thrombosis but also in the initiation of atherosclerosis.

Duration of *Loxosceles reclusa* (Brown Recluse Spider) Venom Detection by ELISA from Swabs

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Diagnosis of *Loxosceles reclusa* envenomations is currently based upon clinical presentation. It is difficult to distinguish a spider bite from other disorders without finding the spider for identification. An enzyme-linked immunosorbent assay (ELISA) can detect surface *Loxosceles* venom at the envenomation site, allowing diagnostic confirmation. The earlier the diagnosis of a spider bite, the better the clinical outcome. To investigate duration of recoverable venom antigen, whole venom and fractionated sphingomyelinase D venoms were injected subcutaneously in New Zealand White rabbits. Cotton swabs were compared for venom recovery over a 21-day period using a surface swab technique. Significant amounts of *Loxosceles reclusa* antigen were found on the surface of the individual rabbits skin. The sensitivity of the ELISA for the whole venom with the cotton swabs for 7, 10, 14, and 21 days were 67%, 65%, 62%, and 60%, respectively. For the sphingomyelinase D, the sensitivity of the ELISA was 95%, 90%, 83%, and 77%. The overall specificity remained high through out the tests, at 95%, 96%, 93%, and 92% on days 7, 10, 14, and 21, respectively. The duration of recoverable antigen using this experimental model appears to be at least two weeks and as long as 21 days. Because the duration of the recoverable antigen is at least two weeks, the ELISA venom test appears capable of detecting venom on patients presenting with *Loxosceles* envenomations. We now have the ability of being able to definitely say that an area of necrosis is caused by a brown recluse spider bite.

Effect of a Blood Center Tour on Student Recruitment: Case Study on Austin Peay State University

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Clinical laboratory science is one profession that is not known to many college students because the visibility of the profession is not as obvious when compared to other health professions. As recently observed by Austin Peay State University, student excursions to a laboratory can be an effective avenue in educating students about the clinical laboratory profession.. As an educational and recruitment endeavor, fifteen Medical Technology (MT/CLS) senior students and five students currently enrolled in biology courses with undeclared majors participated in a tour of the Red Cross facility in Nashville, TN. The tour involved observing the following areas: blood donation, component preparations, storage, distribution and quarantine of blood.

After the tour, the five students with undeclared majors inquired more about the profession and picked up the MT/CLS program brochures. Thereafter, three of the five students declared Medical Technology as their field of study. Learning about the profession while watching laboratory professionals perform their jobs as well as interaction with senior MT/CLS students had a positive effect on these students. Students with undeclared majors and those taking science courses can potentially be attracted into the clinical laboratory science profession through planned clinical laboratory visits.

Novel Diagnostic Applications of an Available Technology
Keely Pierzchalski, MT(ASCP), CLS(NCA), Dalal Tonb, PhD, Tracey Nadal, BS, Laura Bolling, BS, AI DuPont Hospital for Children, Wilmington, DE

Thermocyclers are typically used for PCR reactions to control temperature and enzymatic reaction time. In this study, the thermocycler was adapted to perform an enzymatic assay of disaccharidases, normally carried out in 1.5 ml micro-tubes using a water-bath and heating block to meet temperature requirements. The objective was to increase assay efficiency by utilizing a 96-well PCR plate format. The thermocycler method was validated by assaying twenty-four samples, in four runs, in parallel with the standard manual method. Briefly, in the manual method, 20 or 40 µl of sample and 100 ul of substrate were placed in micro-tubes and incubated in a 37°C water-bath for 15 or 60 minutes, and transferred to a 100°C heating block to stop the reaction. For the thermocycler method, 5 or 10 µl of sample and 25 ul of substrate were directly placed in the well of the PCR plate. The thermocycler was programmed for the appropriate time and temperature for reaction incubation and termination. Validation results showed the correlation coefficients of the disaccharidases to be 0.98(lactase), 0.93(maltase), 0.95(sucrase), 0.86(Palatinase), and 0.88(Glucoamylase). No statistical or clinically diagnostic differences were observed between the two methods, confirming that the thermocycler method was reliable. From start to finish, personnel were reduced from two to one and time from four to two hours. In addition, less sample volume and materials are required. Due to the efficiency and accuracy we consider the thermocycler method a success. We hope to apply this novel application of PCR technology to other enzymatic assays.

Phospholipase D1 Analysis During Biofilm Formation of *Candida albicans*
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In this study, we examined the change in phospholipase D1 (PLD1) activity during hyphal induction and biofilm formation of *Candida albicans* strains that were isolated from multiple human host sites. Previous studies have shown the involvement of PLD1 during hyphae production and disseminated candidiasis in mouse models. The clinical isolates used were maintained in standard growth media and induced to form hyphae in the presence of fetal bovine serum and a shift in incubation temperature. Biofilm formation was performed by the inoculation of *Candida* strains into polystyrene wells. The metabolic activity of the biofilm was measured using a colorimetric XTT [2,3-bis(2-methoxy-4-nitro-5-sulfophenyl)-2H-tetrazolium-5-carboxanilide] reduction assay. The results showed that strains of *Candida* isolated from disseminated infections were able to form hyphae and biofilms more rapidly. PLD1 activity increased with both hyphae formation and biofilm formation, showing the involvement of this lipid mediator during these virulent processes. Revealing the proteins and lipids involved in hyphae and biofilm formation will help in identifying novel therapeutic targets for improved antifungal action against *C. albicans* biofilms that are 1,000-fold more resistant to many major classes of antifungals.

The Status of Michigan's Physician Office Laboratory Workforce
Sharon Bobryk, MSA, CLS(NCA), MT(ASCP), Beaumont Laboratory Services, Royal Oak, MI; **Linda Goossen,** Ph.D, MT(ASCP), Grand Valley State University, Grand Rapids, MI

Physician's offices comprise the largest portion of the clinical laboratory personnel sector (The Lewin Group, 2008; Cherry, Hing, Woodwell, & Rechtsteiner, 2008); however, literature describing the testing personnel in these laboratories is scarce. The purpose of this study was to describe the workforce status in Michigan's physician office laboratories (POL) by quantifying the number of professionals performing laboratory testing, establishing a baseline description of their educational level and credentials, and exploring current vacancy trends. Both a telephone and written survey were employed to elicit responses from 127 CLIA-licensed physician office laboratories throughout the state of Michigan. The major findings conclude that there are approximately 15,837 full-time employees performing laboratory testing in the POLs in Michigan. Eleven percent of testing personnel hold certifications in MLT/CLT or MT/CLS; eighty-nine

percent of testing personnel lack any laboratory-related credentials. Vacancies in which CLT/MLT degrees were desired remained unfilled longer than any other types of vacancies. A trend to note is that in this study medical assistant schooling is the most prevalent form of specific training for testing personnel. These findings indicate that many POL workers lack formal education in laboratory science. As a result, the educational needs of these groups should be explored by laboratory accreditation agencies, educational programs, and state personnel licensing requirements.

Transforming Laboratory Medicine with the College of American Pathologists Electronic Cancer Checklists
Andrea R. Pitkus, MT(ASCP), CLS(NCA), College of American Pathologists, Deerfield, IL

Standards are lacking for the collection and structuring of laboratory reporting elements for use by downstream entities. Although HL-7 messaging standards are utilized for laboratory data transmission, the structure of laboratory data varies among information systems. Interoperability of laboratory data from disparate information systems is a barrier to Health Information Exchange (HIE), especially with cancer or public health reporting.

Standardization of both the collection and communication of laboratory information in a checklist format has been shown to increase the completeness of information collected and reported, reduce costs, improve patient care and safety, and allow for quality assurance. The College of American Pathologists Electronic Cancer Checklists (CAP eCC), which ensure the collection of necessary data elements for cancer reporting, is one example of this.

The CAP eCC utilizes two strategies to resolve interoperability barriers. One is the creation of cancer checklists by pathology experts designed to collect the essential data elements necessary for cancer reporting. The checklists integrate laboratory information such as serum tumor and molecular markers, and elements utilized by cancer registrars downstream. Secondly, the checklists have been transformed into XML file format, an international data exchange standard endorsed by standards organizations like HL-7.

The resulting checklist facilitates the electronic collection and interoperability of laboratory data among various information systems. XML fosters worldwide adoption and utilization of a structured pathology reporting format. Future uses of this format include standardized lab order sets, requisitions, and laboratory data integration, interpretation, and reporting for improving patient care.

Using a Phlebotomy Audit to Ensure Compliance in your Hospital
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The purpose of this audit is to pinpoint areas of the pre-analytical phase of care that may have adverse effect on patients care. Proper patient identification is a Joint Commission patient safety concern that needs to be monitored. This audit evaluates processes that may have an impact on possible misidentification issues as well as serving as a learning tool for ways to improve and continue quality care at your facility. The audit is performed using predetermined criteria focusing on patient identification, proper phlebotomy, ensuring privacy, hand hygiene and proper labeling. Phlebotomies are observed and processes are documented as acceptable, not acceptable, and non-applicable. Circumstances are noted since each situation may be slightly different. Compiling and reviewing data gives a better understanding to where phlebotomists may need additional training to meet compliance standards. This audit also provides a feedback opportunity for the phlebotomists, also allowing time to reinforce their importance in the pre-analytical process. Results from the audit performed at the Veterans Affairs Medical Center in Iowa City, IA showed that employees with a routine to their phlebotomy process were more likely to follow procedure, whereas those who did not have a consistent routine did not always comply with procedure. The results have been presented to our hospital Performance Improvement Committee and notice sent to the departments in which additional follow-up is needed. The findings of the phlebotomy audit suggest that basic re-observation and training should be added to annual competencies of all phlebotomy staff. This audit could be modified to fit the processes of most institutions.

Why Technologists in Illinois Do Not Join ASCLS
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Clinical laboratory educators routinely introduce students to professionalism and the importance of membership in one's professional society. In the clinical setting, technologists and laboratory personnel are so busy that they may not feel

like volunteering for the professional society after work. The process of increasing membership in ASCLS for the State of Illinois seems to be ever challenging. ASCLS-IL leadership engaged students on rotation from several CLT/CLS programs to anonymously survey laboratory personnel to discover aspects of ASCLS membership. The actual response rate is not known but of the 59 surveys returned, 52 were from individuals not members of ASCLS. Reasons given for not joining ASCLS include the following responses; 46% -lack of information about ASCLS, 10% -ASCLS does not meet their needs, 12% -unnecessary to join any professional society, and 32% -other. Responses to additional survey questions revealed that not all benefits offered through membership in a professional society are important to potential members. It is difficult to identify which "perks" are deemed valuable by current and future organization members. Although the number responding to the survey was small, their responses may reflect the cause for Illinois' low membership numbers. Because of the rather large percent indicating lack of information about ASCLS, a campaign to improve marketing and visibility of ASCLS at the grassroots level may be the answer. Certainly there are many initiatives to engage laboratory personnel in the profession, such as Labs are Vital. We need to find a way to bring our "excitement" about what ASCLS means to all professionals.