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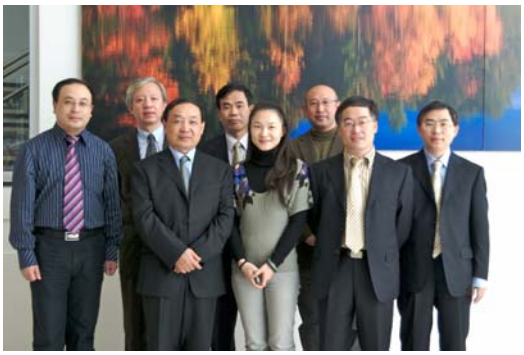
Shanghai Delegates Select ISDH Laboratories To Tour

By: Lixia Liu, Robin Bruner, Ellie Carter, Tom Cronau

In November 2009, ISDH Laboratories were honored to host delegates from the Shanghai Institute of Food and Drug Control (SIFDC), China, an equivalent of FDA in Shanghai, led by their Executive Deputy Director, Yuming Fang. The SIFDC delegates consisted of eight members, including administrative, finance, budgeting officers, PhD scientist, chief pharmacists and chemist. The delegates were accompanied by three staff from CANNONDESIGN for the visit.



The ISDH Laboratories were among the four laboratories that the SIFDC delegates visited during their 11-day trip to the U.S. Their goal for this trip was to visualize laboratory building structures that could accommodate the needs of food microbiology testing detection of organic and inorganic compounds in food, drug and cosmetics products.

The SIFDC delegates arrived at the ISDH Laboratories on the morning of November 10. Dr. Judith Lovchik, the Director of ISDH Laboratories, along with four Division Directors, Robin Bruner, Tom Cronau, Dave Dotson, Dr. Lixia Liu, Laboratory Program Advisor Elizabeth Carter, and Chemist Miao Xu, welcomed the delegates. The overviews of the building structures and testing services that different divisions provide were presented by Daniel Niewoehner an architect of CANNONDESIGN who worked on the ISDH Lab building, and the division directors of the ISDH Laboratories respectively.

After the presentations, the delegates toured the second floor and focused on the Food and Dairy Laboratory area. The supervisor of the area, Dr. Hesham Elgaali, explained to the delegates the testing process, the instruments used and the lighting design of the plating room. Dr. Weidong Xu, the Head of Food and Antibiotic Division, asked many specific questions regarding food testing methods. Information about the electronic access to the official food microbiology methods such as the Bacteriological Analytical manual (BAM) prepared by the FDA and the AOAC International Official Methods was provided to Dr. Xu. The delegates continued their tour in the Chemistry Laboratories after lunch break. The design that uses movable laboratory benches and ceiling mounted data lines caught the eyes of the delegates and triggered many discussions among themselves. The delegates were also fascinated by the rapid detection method of

protein digestion in the Food Chemistry area, which was demonstrated by Chemist, Pradip Patel and the Supervisor of Food Chemistry Laboratory, Ken Hill.

Another main focus of the visit was to tour the mechanical and inner workings of the building. This part of the tour was guided by Bill White, the Director of Administrative Services, and Darrell Day of REI Real Estate Services. The group was led up to the penthouse where the HEPA and

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Inside this issue: Special Projects and New Employees

Our Mission: The Indiana State Department of Health Laboratories partners with other public health agencies to provide timely and accurate information needed for surveillance and outbreak investigations to protect and improve Hoosier health.

Indiana Laboratory System Improvement Program

By Ellie Carter

Sixty public health stakeholders and laboratorians from around the state met at the Indiana Government Conference Center on October 23rd to wrestle with the question: What IS the Indiana State Public Health Laboratory System, what does it do, how well does it perform, and what should it do better?

The Association of Public Health Laboratories (APHL) has created the L-SIP (Laboratory System Improvement Program), a tool similar to the CDC's National Public Health Performance Standards Program (NPHPSP) which is being used by ISDH and other state departments of health, in assessing state public health laboratory systems. The process evaluates laboratory system performance within the framework of the 10 Essential Public Health Services. Indiana was the 20th state to conduct the assessment event, inviting stakeholders from all over the state and from various disciplines that impact or are impacted by laboratory services in Indiana, reflective of what the Indiana Laboratory system is comprised of (i.e. including but also beyond the ISDH Lab's role in the system). The project was spearheaded by Dr. Judy Lovchik, ISDH Assistant Commissioner and Laboratory Services Director, after learning about the program from APHL. As an enticement for states to participate, APHL has offered support and resources available to assist states interested in participating. There was also substantial support, facilitation services and expertise made available to the ISDH Lab planning team from the Purdue Healthcare Technical Assistance Program (TAP), which has been contracted by ISDH to coordinate and conduct local level Public Health System assessments in Indiana.

The 10 Essential Public Health Services that the assessment was based on are:

1. Monitor health status to identify and solve community health problems.
2. Diagnose and investigate health problems and health hazards in the community.
3. Inform, educate, and empower people about health issues.
4. Mobilize community partnerships and action to identify and solve health problems.
5. Develop policies and plans that support individual and community health efforts.
6. Enforce laws and regulations that protect health and ensure safety.
7. Link people to needed personal health services and assure the provision of health care when otherwise unavailable.
8. Assure competent public and personal health care workforce.
9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services.
10. Research for new insights and innovative solutions to health problems.

Ellie Carter works the registration table at the Government Center for the L-SIP meeting.

Each Essential Service was broken down into related discussion points so that a quantitative score could be given to each discussion point which resulted in a weighted score for each Essential Service.

At this point, the results of the L-SIP assessment have not been fully summarized, but it was clear on the day of the assessment that the participants hold high standards for lab system performance in Indiana. The assessment itself is a way to help partners

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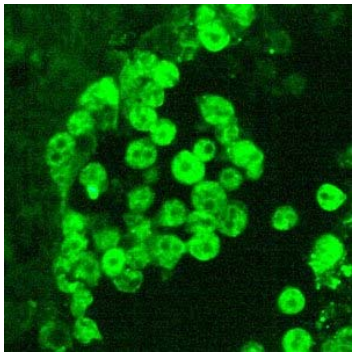
Development Of New Assays To Aid Microbiologists In Detection Of Old Diseases

By: Katie Masterson, Jamie Hadley, Lyndsey Hansler and Kara Hammes



Over the last few months, the virology lab has been busy validating two new vaccine preventable disease assays. First, the virologists worked to bring on-board a measles indirect immunofluorescence assay. This assay will allow the virus isolation lab to confirm the presence of measles virus in infected cell cultures. In this assay, specific antibodies are added to the infected cells to bind to the measles antigens present. When a secondary, fluorescent-labeled antibody is added, a bright apple-green fluorescence is seen throughout the nucleus and cytoplasm of the measles virus infected cells when viewed under a fluorescent microscope. In addition to the measles assay, the lab just recently finished validating a varicella-zoster virus (VZV) direct immunofluorescence assay. This assay allows for the rapid detection of VZV in cell culture when a fluorescent-labeled monoclonal antibody binds to VZV antigen, if present, in the specimen. When this happens, the antigen-antibody complex illuminates as a bright apple-green fluorescence when viewed under a fluorescent microscope. Both assay validations were conducted by three qualified

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A New Face On The Block

By: Renee Dreher

Meet Dr. John Mathewson, B.A., M.S., Ph.D. the new Deputy Director for Indiana State Department of Health Laboratories. Dr. Mathewson comes to us with a rich back ground in high complexity laboratory management, infectious disease, clinical microbiology, disease control, food-borne disease/food safety, and detection of agents of bioterrorism.

Dr. Mathewson was formerly Director of the State Public Health Laboratory of Missouri Department of Health and Senior Services. Before that, he served as Chief of the State Public Health Laboratory for Oklahoma.

Dr. Mathewson earned his Ph.D. in Microbiology with a minor in Public Health at Texas A&M University, his M.S. at Angelo State University in San Angelo, TX and his B.A. at Northwestern University, Evanston, Illinois. He has published extensively on enteric infections.

Dr. Mathewson and his wife Karen have a son, Wes who attends Oklahoma State University. When not at work he enjoys visiting his farm in Illinois. Dr. Mathewson is also an avid angler and hunter and recently purchased his first orchid so he can begin dabbling in horticulture.

Among other projects this year Dr. Mathewson will work on bringing Newborn Screening into the ISDH Labs, initiating billing for some of our testing, and facilitating our courier service. His new office is located on the first floor of the laboratory building in the administrative area. Please stop by, introduce yourself to him, and welcome him to our team.

Shanghai Delegates Visit-continued

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HEGA filter manifold, and the supply and exhaust air handling systems are located and down to the basement where the electrical controls and data control boards reside. Bill White gave thorough explanations on how each system works, which included the air filter system, RO water, electrical redundancy, UPS, and many more. The delegates were impressed by the complexity and the safety considerations of the building design. On the lower floors, the delegates also toured Glassware and Central Accessioning areas. The tour was concluded in the Training Laboratory, where the delegates had first hand experience of a BSL3 laboratory setting and they were amazed by the "ping pong ball" air flow indicator. At the end of the visit, the SIFDC delegates, the CANNONDESIGN staff and the ISDH senior staff had a closing discussion of the visit. The delegates expressed their appreciation for the time, the information, and the thorough laboratory tour that ISDH had provided. The SIFDC delegates also expressed their interest in sending a staff member to the ISDH Laboratories for training in the future. A common interest in establishing long term collaboration was reached.

Angena Chang from CANNONDESIGN, Miao Xu, and Dr. Lixia Liu from ISDH Laboratories served as interpreters for the delegates. Dr. James Hogan from ISDH Laboratories helped in setting up the power point presentations.

Photos for this articles were provided by Dan Axler

The ISDH Laboratories were among the four laboratories that the SIFDC delegates visited during their 11 day trip to the U.S.

Improved Methodology for Metals Analysis in Food by ICP/MS

By: Mike Oberthur, Robin Burner, Phil Zillinger, Ken Hill, Jeff Shepard and Aaron Bolner

The ISDH Food Chemistry Laboratory analyzes samples from the Indiana Lead and Healthy Homes Program (ILHHP), a division of ISDH. These samples are primarily food and medicinal products. The samples are prepared by the Food Chemistry Laboratory and then transferred to the Metals Laboratory for quantitative analysis via ICP/MS. The project focused on refinements of the 'Metals in Food' procedure, AOAC Method 999.11, employed in the sample preparation by the Food Chemistry Laboratory. Testing was conducted in three phases during August and September of 2009 and was a collaborative effort of the Food Chemistry and Metals Laboratory staff. The two phases of the project addressed here utilized powdered food-sources, medicinal creams, shampoo and jelly with a modified AOAC Method 999.11.

Adjustments to the preparation method…

In the original method, samples were dried on a hot plate in multiple steps. Each step required a temperature adjustment by the analyst based on the relative volatility of the samples. After the samples had reached the maximum temperature of the hot plate, they were transferred to a programmable furnace to finish ashing. Changing the furnace's programming to ramp at 1° C per minute instead of 5° C per minute allowed the samples to be placed in the oven when dry as opposed to partially ashed. The reduced ashing rate lessened volatilization of the samples, result-

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Alternative Influenza Testing Method Validation

By Liz Church and Lyndsey Hensler

In response to the public health emergency involving the novel H1N1 strain of influenza, the Food and Drug Administration issued several Emergency Use Authorizations in April 2009 so that the public health community could effectively deal with the situation on a national scale. One of the Emergency Use Authorizations allowed the laboratory to use a real-time reverse-transcriptase PCR Swine Flu Panel. These panels have been distributed to state public health laboratories by the Centers for Disease Control and Prevention (CDC) and include reagents needed to perform nucleic acid extractions and polymerase chain reaction (PCR). In conjunction, these two methods are essential to detect influenza in patient specimens using molecular techniques. During the nucleic acid extraction, influenza RNA (ribonucleic acid) is extracted from patient samples. A small amount of this RNA is then used to perform PCR, which is the method used to identify the type of influenza in the specimen. Between the start of the pandemic in April and the end of 2009, the laboratory used this kit to test 3064 specimens for influenza. Of the specimens tested, over 26% were determined to be the novel H1N1 strain of influenza while less than 4% were seasonal strains. Several months ago, two additional reagent kits were added by the CDC to the PCR Swine Flu Panel in order to accommodate the world-wide demand for similar molecular diagnostic products. Applied Biosystems Ambion AgPath-ID One-step RT-PCR Master Mix Kit has been provided as the alternative PCR kit to use in the case of shortages. Total nucleic acid isolation kits for the MagNAPure Compact and the MagNA Pure LC automated extraction instruments are also now provided. Once these alternative reagents arrived, the staff needed to confirm that these new components produce accurate influenza results within the ISDH laboratory. Using previously tested positive and negative influenza samples, the molecular virology lab verified that the two updated extraction kits and alternative PCR kit successfully detect seasonal flu viruses and the 2009 pandemic H1N1 flu virus.

Influenza specimen submission has continued to decline in 2010. Only 21 specimens were tested for influenza in January, however all specimens that tested positive for influenza were determined to be the novel H1N1 strain. The Virology/Emergency Preparedness Division remains prepared to detect influenza in patient specimens as regular flu season approaches and throughout 2010.

Left to right: Lyndsey, Katie and Jamie review measles validation data.

New Assay Development-continued

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analysts, with each analyst setting up seven previously tested "known" samples in cell culture and staining them according to established procedures. With the addition of these new assays, it is the goal of both the laboratory and epidemiology to increase viral surveillance. This goal is critical considering both the measles virus and VZV still cause disease in Indiana. According to the most recent information available from ISDH, there were 34 confirmed measles cases between 2003 and 2007 in Indiana, and in 2007, there were 317 cases of chicken pox—the disease caused by VZV. Increased viral surveillance capabilities will allow the laboratory to identify potential vaccine failures, also known as "break-through" cases, of both measles and varicella that are identified through normal and school-based outbreak surveillance.

Molecular Test Development In The Year Of Pandemic Flu

By: Robert Pawlak

Year 2009 will always stick in our memories as the year of pandemic flu. The novel strain of the influenza virus rapidly swept through the world immediately claiming a celebrity status with the media and taking control of the public health testing and research priorities. However, during this time other pathogens remained at least as busy as they were before the new sheriff arrived in town and, as before, necessitated development of new, fast identification methods to efficiently keep track of their activities. One of those never resting pathogens is *Bordetella pertussis* - an obligatory human bacterium responsible for one of the most common vaccine preventable diseases - pertussis (also known as a "whooping cough"). Infections with this pathogen have been on a steady increase since 1980s causing a respiratory havoc primarily among infected newborns but recently also resurging in adolescent population possible due to a genetic selection phenomenon known as a vaccine-driven antigenic evasion.

ISDH molecular test development laboratory staff has been interested in developing a rapid, real time multiplex PCR based detection method for *Bordetella pertussis* for quite some time – a decade or so. In contrast to traditional pertussis detection techniques like direct fluorescent antibody (DFA) and culture which, although highly specific, do not provide an adequate sensitivity and speed, PCR is highly sensitive (up to 70% more than the culture) and results are rapidly available making this method particularly suitable for the fast paced clinical testing environment. However, to implement this wuderwaffe at the labs we had to circumnavigate two major obstacles; First, an adequate number (minimum 20) of *B. pertussis* positive specimens had to be collected and processed by both PCR and culture to validate the new method. Second, to facilitate the first goal, a new, two nasopharyngeal (NP) swab PCR and culture compatible specimen collection kit had to be distributed among and implemented by the submitters. Both tasks historically proved to be uneasy considering that the ISDH labs had been receiving only a few positive specimens a year, all of them collected with the culture oriented, PCR inhibitory kits and, in consequence, multiple attempts to validate the assay have failed. This situation has radically changed in the spring of 2009 when a joint effort between the ERC and the Labs resulted in the implementation of the new collection kit by at least some of the submitters (who somehow managed to convince patients that two NP swabs are much more fun than one), and in consequence an influx of PCR compatible *B. pertussis* specimens into the ISDH Labs. The bacteria seemed to be busier than usually that year too, possibly competing with the flu virus, since more than 20 pertussis positive specimens have been collected over the 12 months period – just enough to allow for a meaningful culture and PCR results comparison. Additional and very welcomed help came from 24 brave ISDH staff members who volunteered their NP specimen for the spiking experiments necessary to determine the sensitivity, linearity and the dynamic range of the new PCR method, all in the context of human natural bacterial flora. All of the above successful *pro* and *eukaryotic* collaborations allowed us to finalize the *B. pertussis* real time PCR validation package and implement the method with the end of the last year thus concluding a several year long quest.

Overall year 2009 was quite good not only for the influenza virus but for the molecular test development as well. In addition to pertussis PCR, members of the molecular laboratory were busy with the implementation of other molecular detection and typing tests but that's a story for the next time.

Methodology for Metals Analysis-continued

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ing in improved spike recoveries. This improvement allows the analyst to set up the hot plates at 100° C to remove all moisture from the samples and leave them unattended during much of the drying process. The analyst is then free to perform other concurrent analyses with only periodic inspection of the samples.

Conclusions…

The improved spike recoveries revealed that the changes to the furnace program for a temperature ramp at 1° C per minute did indeed allow the samples to ash more slowly with less volatility. This method allows for the analyst to set up the hot plates at a lower temperature and leave the samples unattended during much of the drying process. The analyst is then free to perform other concurrent analyses with only periodic inspection of the samples.

Pictured here is the programmable furnace used in this procedure.

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The Indiana State Department of Health supports Indiana's economic prosperity and quality of life by promoting, protecting and providing for the health of Hoosiers in their communities.

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The editorial staff of The LAByrinth Newsletter would like to take this opportunity to personally congratulate Hesham Elgaali for winning the Virgin HealthMiles State Leadership Walking Challenge put forth by Dr. Monroe in May 2009.

Indiana Laboratory System Improvement Program-continued

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recognize WHAT the laboratory system is and to kick off improvement projects for the future. The raw, quantitative data and notes taken during the discussions held on the day of the assessment have been gathered and are still in the process of being assembled and analyzed. All together, the information will be used to help focus efforts in the areas in need of improvement.

In December ISDH Lab team held a webinar to recap the event and share some of the data with event participants. The next steps in this process will be to plan for system improvement projects including forming a core group of individuals (system partners) who want to contribute to future efforts and determining which areas are the highest priority for quality improvement. An ISDH Lab team will serve as a hub for communication and coordination, but we envision that Laboratory System Improvement projects will be a collaborative process where all system partners will be directly involved. We will continue to report on the progress and results of this group's efforts.

If you are interested in learning more about state-level public health laboratory systems, here is a link to a helpful document from APHL: http://www.aphl.org/aphlprograms/lss/projects/performance/Documents/LSpdf0607_definition.pdf

If you are interested in leaning more about APHL's Laboratory System Improvement Program: http://www.aphl.org/aphlprograms/lss/projects/performance/Pages/default.aspx

Dr. Lovchik address two participants of the LSIP meeting.