

# Michigan Department of Community Health Bureau of Laboratories 2012 Annual Report





STATE OF MICHIGAN

DEPARTMENT OF COMMUNITY HEALTH  
LANSING

RICK SNYDER  
GOVERNOR

JAMES K. HAVEMAN  
DIRECTOR

The Bureau of Laboratories (BOL) experienced profound and ground breaking changes in 2012. The prevailing economic pressures, technology upgrades and leadership changes brought about many cost cutting or LEAN measures and strategic advancements. The bureau also experienced:

1. State surcharges on all fee based programs (newborn screening, trace metals testing, e.g., lead) and fish advisory testing to support pension and health care costs for retirees.
2. Federal funding cuts to state emergency preparedness, preventative block grant, newborn screening program and various infectious disease programs, including molecular epidemiological testing.

These increased indirect charges and funding reductions combined with LEAN measures and staff changes are expected to continue into the foreseeable future and are sure to bring new challenges! The challenges will be faced with a strong commitment to continuously provide top quality laboratory service and leadership for healthier people and communities in Michigan, well past 2020.

Investments in Michigan's future healthcare needs

With enormous investment in state-of-the-art technology, infrastructure and highly-skilled staff with a strong knowledge base, we are even more energized than ever before. Not only to excel in what we do, but we strive to be the benchmark for public health laboratories in the nation. The Bureau will continue to pursue modern emerging technologies and evolving testing platforms that are superior to current methods. During previous years, we replaced the conventional biochemical and chromatographic identification of bacteria with gene sequencing. With the acquisition and subsequent validation of a MALDI-TOF instrument in 2012, we are now fully equipped to replace gene sequencing with Mass Spectrometry (MS). This instrument is poised to "revolutionize" clinical microbiology as it is capable of identifying most of the medically important microorganisms, some directly from clinical specimens, within a few minutes and at a fraction of the cost of other methods! We are beginning to consider newer laboratory technology for future healthcare needs, e.g., whole genome or exome sequencing to confirm genetic or metabolic disorders in newborns that are screened "positive" during Newborn Screening. This technology, in certain situations, could reduce both "false positive" results and the unnecessary worry for families that goes along with these results. The Bureau is also moving ahead with implementation of an electronic test ordering and resulting platform associated with the two Laboratory Information Systems and are expected to be live in 2013.

As with technology, we are equally committed to investing in our most valued human capital. Recognizing, developing and continuously training our highly skilled and competent workforce is priority one for the bureau. We strive to continuously find ways to improve the work environment and spare no learning options to help our staff excel in their field of work, quality systems, safety practices and laboratory science in general.

Sandip Shah, Ph.D., HCLD(ABB)  
State Public Health Laboratory Director

# Table of Contents

2012 Accomplishments.....	2
Grants Received in 2012 .....	4
FY 2012 Funding Sources .....	5
Emergency Response and Environmental Health .....	6
Trainings and Tours.....	7
BOL Scientist’s Photographs Published.....	7
Personnel Changes .....	8
Efficiency and Quality Enhancements .....	8
Publications and Abstracts .....	9
Testing Enhancements .....	10
By The Numbers.....	11

*Our Mission:* We are dedicated to continuing leadership in providing quality laboratory science for healthier people and communities through partnerships, communication, and technical innovation.

*Our Vision:* The Bureau of Laboratories is a stronger, more diverse team within an integrated public health system. We utilize advanced technology and innovative leadership to provide comprehensive public health services in our dynamic global community.

## 2012 Accomplishments

- The Bureau of Laboratories Vision Priority Team 6, “Healthy Living Group,” received a Hometown Hero Award at the State Capitol in recognition of creating the volunteer-based annual community garden.
- The Bureau of Laboratories’ Vision Priority Team 6 received a “Special Tribute” from the Michigan 96th Legislature as representative of the work of state employees for achievement “symbolic of commitment to hard work, dedication to health, and tireless commitment to excellence that brings awareness to critical public health efforts in Michigan.”
- The Virology Section introduced new serologic assays for Measles IgM and Mumps IgM detection.
- The Microbiology Section introduced a new multiplex assay for pertussis testing that increased testing capacity and improved specificity.
- The Laboratory Systems Section upgraded the Laboratory Information System HL7 message for all Michigan Reportable Diseases going to the Michigan Disease Surveillance System from 2.3.z to 2.5.1 to comply with the Meaningful Use final rule.
- The Laboratory Systems Section implemented electronic transmission of laboratory results on food tested as a part of outbreak investigations to the Food Emergency Response Network (FERN).
- The Mycobacteriology/Mycology Unit validated and implemented the use of the Bactec MGIT system for rapid susceptibility testing of Mtb complex isolates. This system replaces the Bactec 460 that was discontinued by the manufacturer.
- Reference Bacteriology purchased a MALDI TOF instrument and is in the process of validating it for identification of bacterial isolates. This technology represents state-of-the-art technology in Microbiology. The instrument is able to identify microorganisms within minutes and at a fraction of the cost of molecular and conventional methods.
- Mr. Steve Dietrich of the Microbiology Section received the Pulse Star award presented by PulseNet for outstanding achievement and contributions to the PulseNet mission. This is the second time he has received the award and he is the only person to receive the award twice.
- Closing of the Detroit Public Health Laboratory resulted in the referral of all syphilis testing to the Bureau of Laboratories. Unheated serum reagin (USR) testing increased from 11,361 in 2011 to 16,436 in 2012 (44.7% increase) and *Treponema pallidum* particle agglutination (TP-PA) testing increased from 997 in 2011 to 1,719 in 2012 (72.4% increase). Despite this tremendous increase in volume and the loss of an experience employee due to retirement, turnaround time and customer service was unaffected. This increase in workload also resulted in more inquiries from public health nurses, physicians inquiring about test results and interpretation.
- West Nile testing increased from 172 in 2011 to 496 in 2012 (188% increase). Despite this substantial increase turnaround time was not affected. This increase also resulted in more inquiries from public health nurses, physicians inquiring about test results and interpretation.

- Virology is finalizing a syphilis testing LEAN project that began in 2012. When completed, the implementation will result in an annual saving of \$15,000 and a two day decrease in turnaround time for USR reactive/ TP-PA non-reactive specimen results.
- Employee work shifts were adjusted in the Virology Section through flexible scheduling to accommodate more afternoon testing (Hepatitis C, immune status, arbovirus, etc.). We currently have staff coverage from 6:30 am – 6:30 pm resulting in decreased testing turnaround time and better phone coverage and customer service. In some cases, specimens are received, tested, and reported on the same day.
- The Virology laboratory collaborated with several state laboratories (Indiana, Wisconsin, and Iowa) along with the Centers for Disease Control and Prevention (CDC) in the validation/verification of IgM Mumps and Measles test methods. Results were acceptable and testing was implemented with a resulting decrease test turnaround time of 4 weeks.
- The Virology Section participated in an LRN study to determine the effect of various diluents on the stability of ricin toxin. Results obtained from suspect powder placed in phosphate buffered saline (PBS) were compared to results obtained using PBS with the addition of various concentrations of bovine serum albumin (BSA). The aim of the study was to determine the optimal solution to stabilizing ricin toxin during shipping and transport to the testing laboratory.
- The Virology laboratory collaborated with Dr. Jean Tsao, Assistant Professor, Department of Fisheries & Wildlife at Michigan State University, on a Lyme antibody study. “Implications of newly found, uncharacterized genetic diversity of *Borrelia burgdorferi* for Lyme borreliosis serum test performance in the Upper Midwest.” The lab performed *Borrelia* antibody testing and data analysis on approximately 100 mouse sera by enzyme immunoassay (EIA) and IgM & IgG Western Blot analysis.
- Kevin Cavanagh, PhD was appointed members of the CDC/APHL Newborn Screening Molecular Subcommittee.
- Eleanor Stanley, BS (MT, ASCP) was appointed to the APHL Quality Assurance/Quality Control Subcommittee.
- Mary Seeterlin, PhD was appointed to the CDC committee on Newborn Screening Quality Assurance MS/MS Program Review.

## Grants Received in 2012

- The Laboratory Systems Section received a \$20,000 grant from the Association of Public Health Laboratories (APHL) for K-12 Outreach. This funding was used to design a web portal ([www.michigan.gov/explorelabscience](http://www.michigan.gov/explorelabscience)) and for school visits, two university events, and science fairs where school-aged children were given the opportunity to do hands-on science experiments.
- The Laboratory Systems Section completed the second and final year of the CDC Infrastructure and Interoperability grant to implement HL7 messaging of viral respiratory results to CDC; upgrade our HL7 message from 2.3.z to 2.5.1; and enroll two additional hospital laboratories into electronic messaging of Michigan Reportable Diseases to the Michigan Disease Surveillance System. This grant provided \$588,000 over two years.
- The Microbiology Section completed the third year of a five-year TB genotyping contract with CDC. In FY 2012, over 4,750 TB isolates from 27 cities and states were tested. The contract, worth approximately \$2.7 million, will seek to type 25,000 TB isolates between 2009 and 2014. This is the second time MDCH has been awarded this competitive five-year contract.
- The Microbiology Section was awarded a \$175,000 cooperative agreement for 2012 from the Food Emergency Response Network (FERN). This was the second year of an agreement that may provide annual funding for up to five years. Funding is shared with the Michigan Department of Agriculture and Rural Development and is used to develop surge capacity for food borne outbreaks and to develop new rapid methods to detect food borne organisms.
- The Microbiology Section completed the first two years of participation in the Enteric Research Investigational Network study with Michigan State University. The project funded by NIH will investigate the impact that four common diarrheal pathogens, *Salmonella*, *Shigella*, *Campylobacter*, and shiga toxin-producing *E. coli*, have on the composition and function of the intestinal microbiome. Over the five-year project MDCH will receive over \$250,000 in funding.

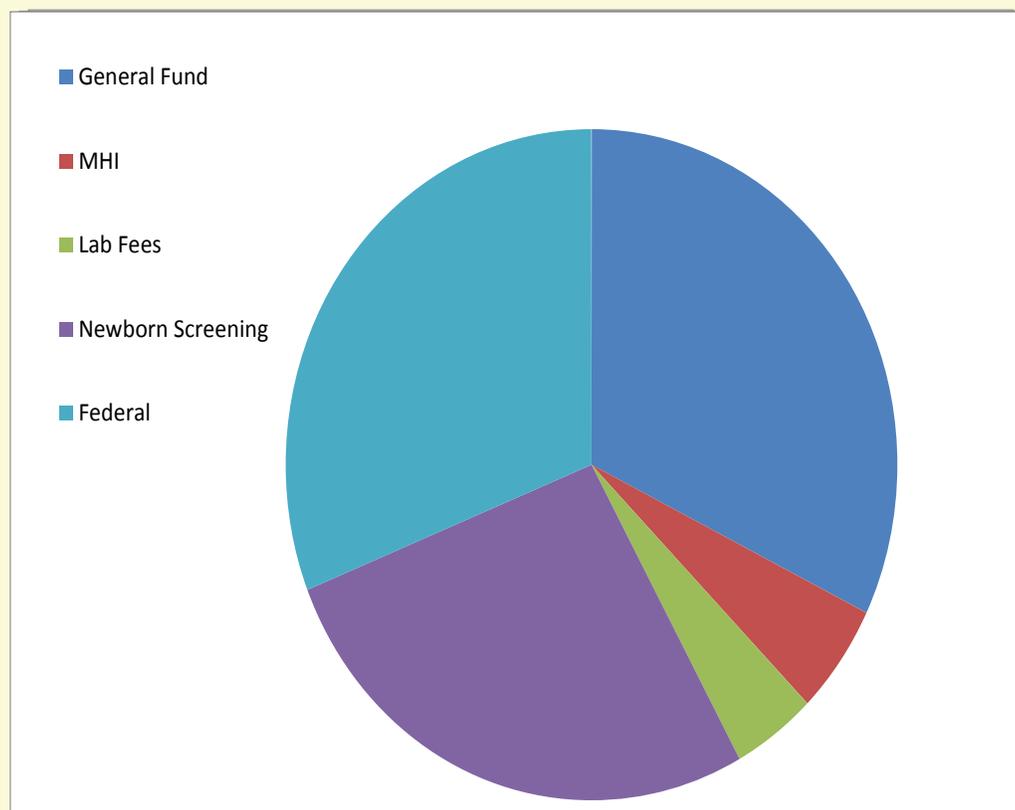


Explore Lab Science

- The Microbiology laboratory received a \$50,000 grant through APHL to develop capacity to perform testing to confirm the presence of carbapenemases in *Enterobacteriaceae* using molecular and phenotypic tests. The laboratory will also develop the capacity to confirm the genetic mechanism for high-level vancomycin resistance in *Staphylococcus aureus*.
- The Chemistry & Toxicology Division received a \$950,000 Public Health Emergency Preparedness grant to support the Chemistry Laboratory Response Network.
- The Newborn Screening program received \$388,000 from CDC for technology enhancement and implementation of Michigan SCID screening.
- The Newborn Screening program received \$216,000 as an NIH subcontract for novel technologies in Newborn Screening for Spinal Muscular Atrophy.
- The Newborn Screening program received funding to support method validation for Bart's Hemoglobin (alpha thalassemia) from the Registry & Surveillance Program for Hemoglobinopathies.

---

## *FY 2012 Funding Sources*



## *Emergency Response and Environmental Health*

- Analytical Chemistry participated in two Emergency Response exercises coordinated by CDC, EPA, FBI and other federal agencies. 500 urine specimens for each exercise were provided to document the capabilities of Chemistry Laboratory Response Network. For more information on Laboratory Emergency Preparedness, see <http://www.bt.cdc.gov/lrn/>
- Analytical Chemistry's Colin Johnson, BS completed the 2nd year of APHL Environmental Health two year Fellowship award.
- Two new gas chromatographs with electron capture detectors were acquired that support testing for the Fish Advisory program. The equipment replaced 15 year old systems.
- An HPLC-MS/MS method was developed for perfluorinated organic compounds (PFCs) in fish tissue. Analytical Chemistry provide critical laboratory results on fish sampled from Clarkston Marsh, Iosco County. For more details, see <http://www.michigan.gov/mdch/0,4612,7-132-8347-277156--,00.html>
- Analytical Chemistry has a contract to perform biomonitoring studies in collaboration with the Minnesota Public Health Laboratory. Testing is funded by Agency for Toxic Substances Registry (ATSDR) to quantitatively determine PCBs, toxaphene, and pesticides in 500 serum specimens in 2013-14.
- Trace Metals and Analytical Chemistry continued to provide fish testing in response to the Enbridge Oil spill on the Kalamazoo River. Testing included polyaromatic hydrocarbons, nickel and vanadium.
- A new inductively coupled plasma mass spectrometer technology was set up and validated in the Trace Metals laboratory. This system replaced the 10 year old system used for blood lead testing.
- Trace Metals Section performed blood testing for cadmium, mercury, lead, arsenic and manganese in Jamaican children's study. Dr Rahbar, Univ of Texas at Houston was the Principal Investigator. Reference: Blood mercury in Jamaican children with and without autism. *Neuro. Res* 23, 22-38, 2013. Blood arsenic of Jamaican children with and without autism. *Sci Total Environ* 433, 362-70, 2012.

## Trainings and Tours

### ***K-12 Outreach***

Exhibitions/Science Fairs	880 students participated
Univeristy Events	125 students participated
School Visits	586 students participated
Michigan Science Teacher Conference	1200 teachers were present

### ***Training***

BT Packaging and Shipping - 12 training events across the state with 296 attendees  
 Parasitology training for the Regional Laboratories  
 Molecular training for one Michigan State University student  
 Mycobacteriology training for a Grand Valley State Medical Technology instructor

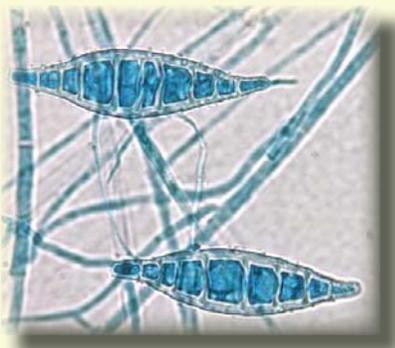
### ***Tours/Presentations/Miscellaneous***

96 hours of time donated by volunteer interns  
 23 hours in tours and visitor meet and greets  
 10 hours of off-site presentations

---

## *BOL Scientist's Photographs Published*

Sandy Arduin, Microbiologist in the Microbiology Section of the Bureau of Laboratories (BOL) had photographs published in two reference books. These photos are of fungal isolates and were taken in the BOL Mycology laboratory. Sixty of Sandy's photos were published in "Mycologia Avançada Volume IIIA, Taxonomia de fungos Anamórficos-I. Hifomicetos, editor Wilmar Cório Da Luz," published in 2011 by RAPP in Brazil. Fifteen of Sandy's photos were published in "Dermatology: Illustrated Study Guide and Comprehensive Board Review. Author Sima Jain," published in 2012 by Springer, NY, USA. Both authors found a sampling of Sandy's photos on-line through the BOL web page or LabLink articles and asked if she could provide photographs for the above listed books.



Microsporium canis



Epicoccum species

## *Personnel Changes*

- Carlton Evans, Microbiologist in the Virology Laboratory, retired from State Service after 35 years.
  - Dr. Frances Pouch Downes stepped down as Bureau of Laboratories Laboratory Director to join the Michigan State University faculty training and inspiring future scientists.
  - Dr. Sandip Shah promoted to Bureau of Laboratories Laboratory Director.
  - David Arnold, Chemical Threat Response Training Coordinator, left for a position as a forensic scientist with the Michigan State Police.
  - Tim Zwolak, Laboratory Information System Specialist, left to take his “dream job” in Nevada.
  - Hired in 2012:
    - Eric Romein as a Microbiologist in the Virology Section
    - Renae Schnepf in the Chemistry Toxicology Division
    - Michael Sarzynski in the Chemistry and Toxicology Division
    - Ryan Stephen in the Chemistry and Toxicology Division
- 

## *Efficiency and Quality Enhancements*

Our Quality Assurance Office started implementation of Quality Systems Essentials (QSE) to enhance our quality assurance program as we move towards College of American Pathology (CAP) accreditation for BOL. A commercial digital document control software system (iPassport) was also acquired to move towards paperless document management and storage for greater efficiency and cost savings. Everyone in the Bureau received training on using this new system – a LEAN initiative. The Data and Specimen Handling Unit (DASH) revamped and completely remodeled their work space resulting in better and efficient workflow with faster and effective data coding. With our commitment to LEAN initiatives, we plan to continue to eliminate waste and inefficiencies.

## Publications and Abstracts

Nystrom, S.C., E.V. Wells, H.S. Pokharna, L.E. Johnson, M.A. Najjar, F.M. Mamou, J.T. Rudrik, C.E. Miller, and M.L. Boulton. 2012. Botulism toxemia following laparoscopic appendectomy. *Clin. Infect. Dis.* Feb 15;54(4):e32-4. Epub 2011 Dec 5.

Cowan L.S., D.P. Hooks, S. Christianson, M.K. Sharma, D.C. Alexander, J.L. Guthrie, F.B. Jamieson, P. Supply, C. Allix-Béguec, L. Cruz, E. Desmond, R. Kramer, S. Lugo, and J. Rudrik. 2012. Evaluation of mycobacterial interspersed repetitive-unit-variable-number tandem-repeat genotyping as performed in laboratories in Canada, France, and the United States. *J. Clin. Microbiol.* 50:1830-1.

Al Safadi R., G.S. Abu-Ali, R.E. Sloup, J.T. Rudrik, C.M. Waters, K.A. Eaton, and S.D. Manning. 2012. Correlation between *in vivo* biofilm formation and virulence gene expression in *Escherichia coli* O104:H4. *PLoS One.* 2012;7(7):e41628. Epub 2012 Jul 25.

Tyrrell F.C., G.E. Budnick, T. Elliott, L. Gillim-Ross, M.V. Hildred, P. Mahlmeister, N. Parrish, M. Pentella, J. Vanneste, Y.F. Wang, and A.M. Starks. 2012. Probability of negative *Mycobacterium tuberculosis* complex cultures based on time to detection of positive cultures: a multicenter evaluation of commercial-broth-based culture systems. *J. Clin. Microbiol.* 50:3275-82. Epub 2012 Jul 25.

Al Safadi, R., G. Abu-Ali, R.E. Sloup, J.T. Rudrik, C.M. Waters, K.A. Eaton, and S.D. Manning. 2012. Biofilm-Associated Pathogenesis of *Escherichia coli* O104:H4. American Society for Microbiology Annual Meeting, San Francisco, CA.

Eaton K.A., C. Fontaine, S. Poe, R. Al Safadi, J.T. Rudrik, S.D. Manning. 2012. Acute colitis and hemolytic uremic syndrome in germ free mice colonized by shigatoxigenic *Escherichia coli* O104:H4. American College of Veterinary Pathologists. Seattle, WA.

St. Charles, J.L., R. Mosci, J.T. Rudrik, S.D. Manning, L.S. Mansfield. 2012. *Campylobacter jejuni* isolates from calves have A, B and C lipooligosaccharide (LOS) biosynthetic locus classes similar to human Guillain Barré syndrome associated strains. CRWAD. Chicago, IL. December.

Crafts, W. Evans, C. Kestila, J. Muyombwe, A. Shah, S. Downes, F. P., 2012. Evaluation of Long Term Non-treponemal and Treponemal Antibody Stability at Varying Temperatures. APHL Annual Meeting, Seattle, WA.

Goodness S, Cavanagh K, et. al., 2012. Relationship between neonatal screening results by HPLC and alpha thalassemia mutations. *J Med Screen* 19, 157.

Seeterlin M, Stanley E, et. al., 2013. Case Report of Argininemia: Utility of Arg/Orn ratio for Newborn Screening. *JIMD* 9, 121.

Seeterlin M, Stanley E, et. al., 2012. Enhanced Interpretation of Newborn Screening Results without Analyte Cutoffs. *Genet Med* 14, 648.

Johnson C, Loconto P, O'Keefe M, Taffe B, 2012. PBDE Analysis in Human Blood Serum by Gerstel Twister SBSE Technique and GC/MS-ECNI-SIM, poster, MSACL, San Diego, January 14-18.

## *Testing Enhancements*

Our Virology staff collaborated with several state laboratories (Indiana, Wisconsin, and Iowa) along with the Center for Disease Control and Prevention (CDC) to obtain specimens for validation/verification studies of the Microimmune LTD and successfully implemented Mumps and Measles IgM EIA assays in June, 2012. This resulted in a remarkable decrease in test turnaround time from 4 or 5 weeks (previously performed at CDC) to 48 hours which allows a much earlier diagnosis leading to earlier treatment and epidemiological interventions to arrest possible outbreaks.

Virology also completed validation and verification of a new HIV antigen/antibody Combo EIA assay (BioRad) and we began offering testing in April, 2012. Simultaneous detection of HIV p24 antigen as well as antibodies to HIV-1 (Groups M and O) and HIV-2 in serum or plasma is performed on an automated instrument (Evolis), resulting in greater testing efficiency and earlier detection, saving many lives with rapid intervention!

Another validation study in Virology implemented pyrosequencing technology to detect antiviral resistance in influenza viruses. The emergence of influenza viruses resistant to the antiviral drugs has led to a need for surveillance of molecular markers associated with antiviral resistance. Michigan is one of eleven states using pyrosequencing, an emerging rapid and high-throughput method for the detection of these molecular markers, to provide valuable information to make appropriate therapeutic decisions.

In August 2012, our Microbiology Section adopted the MGIT system to perform rapid susceptibility testing on isolates of *Mycobacterium tuberculosis*, replacing an old and outdated system (Bactec 460), which was removed from the market by the manufacturer after almost 40 years of service. Results are now available within one week compared to traditional methods that require two to three weeks, allowing an appropriate treatment modality earlier!

MDCH continues to work with CDC as one of two laboratories in the country to provide genotyping on all new isolates of *Mycobacterium tuberculosis*. This information allows TB Control programs in each state to confirm related clusters of infection, detect unsuspected clusters, and identify cases of laboratory contamination that lead to unnecessary patient treatment and use of resources by TB Controller programs.

## By The Numbers

Bureau of Laboratory Services provided to Michigan Residents	7.2 Million services provided to 356,339 individuals
Infectious Disease	101,675 specimens with 121,883 tests completed, serving 100,750 individuals
Newborn Screening	121,026 tests completed, serving 111,370 individuals
Blood Lead/Environmental Lead	40,006 tests completed, serving 34,886 individuals
Chemical and Toxicological Testing	1,409 specimens with 48,160 tests completed
Fish Monitoring Program	17,319 web page hits with 6,419 Fish Advisory Report downloads
Emergency Notifications	>1,000,000 message-recipients