

## ***E. coli* STX Toxin Testing**

William Schneider, RM(AAM)  
Enteric/STD/Chromatography Unit

The Microbiology laboratory has been examining *Escherichia coli* isolates for the ability to produce Shiga-like toxins one and two (Stx1 and Stx2) since January 1, 1997. These toxin-producing organisms are associated with hemorrhagic colitis and hemolytic uremic syndrome (HUS), particularly in children. HUS, characterized by renal failure and anemia, may be fatal.

During November 2002, the MDCH Microbiology Laboratory upgraded this service from a DNA probe assay to a polymerase chain reaction (PCR) assay. This technology change increased sensitivity and provided the ability to detect mutations in the toxin genes through melting temperature changes in the target DNA.

All *E. coli* isolates submitted for serotyping are examined, by PCR, for the presence of Stx1 and/or Stx2 genes. Those isolates positive for either toxin are serotyped. MDCH only has O157 and H7 antisera available. Isolates, unable to be typed at MDCH are sent to the Centers for Disease Control and Prevention (CDC) for complete serotyping. Isolates negative for Stx1 and Stx2 are reported

“serotype unknown.” *E. coli* culture reports will appear the same as with DNA probe results.

Table 1 shows the results of *E. coli* serotyping and toxin testing performed for Michigan for the last five years. Note that a majority of O157 isolates, but not all, produce Stx toxins. Several other serotypes produce Stx toxins but are detected less frequently than the O157 serotype.

Some O157 and most non-O157 isolates are able to utilize sorbitol making them more difficult to distinguish from normal flora using typical stool culture procedures.

A more recent development has increased the detection of non-O157 stains by the use of EIA testing from culture broths (usually MacConkey or GN Broth). Utilizing the STX-EIA has helped to find several sorbitol positive *E. coli* isolates that would not have been recovered using traditional stool culture methods.

Pulse Field Gel Electrophoresis (PFGE) is performed on all isolates positive for STX using the PCR assay. The PFGE patterns are used to determine relatedness of isolates and are added to the national PFGE database to identify local, regional or national outbreaks.

**Toxin by Serotype**  
Jan. 1, 2003 – Dec. 31, 2007

Serotype	Stx1 and Stx2 Pos.	Stx1 Pos. Stx2 Neg.	Stx1 Neg. Stx2 Pos.	Stx1 and Stx2 Neg.
O157:H7	195	2	151	2
O157:NM	11	0	8	1
O157:H16	0	0	0	2
O26:H11	0	6	0	0
O45:H2	1	20	0	0
O45:H Undetermined	0	0	0	1
O103:H2	0	7	0	0
O111: NM	0	2	0	0
O145:Nonmotile	1	1	0	0
O165:Nonmotile	0	0	1	0
O76:H7	0	0	0	2
O117:H7	0	1	0	0
O118:H16	0	2	0	0
O Rough: NM	0	0	1	0
O Undetermined :H11	0	1	0	0
O Undetermined :NM	0	1	0	0
Unknown	12*	16*	11*	880
<b>TOTAL</b>	<b>220</b>	<b>58</b>	<b>172</b>	<b>888</b>

NM=nonmotile

\* These STX positive cultures have been sent to CDC and we are waiting for serotype identifications.

**“Chemical Threat Events –  
Collection and Handling of  
Clinical Specimens” Training CD  
Now Available**

Martha Boehme, MT(ASCP)  
Division of Chemistry and Toxicology

The MDCH laboratory recently practiced what to do during a large-scale chemical emergency event (see the following article on CT Chemical Surge Exercises). Will your hospital laboratory and Emergency Department staff know how to handle clinical specimens if an event should

occur? An audio-visual tool is now available and demonstrates the basics of collection, packaging and shipping of clinical specimens related to a chemical exposure. It is designed to complement the in-house or on-line training offered by MDCH. It can also be used for just-in-time training or as a refresher course.

The CDs were produced by the Office of Public Health Preparedness, and are designed to fit in the front pocket of the CT training manual contained in the red “Chemical Terrorism (CT) Response Kit” (available from MDCH as Laboratory Unit 23).

MDCH will ship a CD to your laboratory, (if your facility already has a CT Response Kit), or a complete CT Response Kit if your laboratory does not yet have one. If you do not receive a shipment within the next month, or if your facility would like to schedule an in-house training, please contact Martha Boehme, Chemical Terrorism Response laboratory educator at 517-335-9654 or [boehmem@michigan.gov](mailto:boehmem@michigan.gov), or Ninah Sasy at [Sasyn@michigan.gov](mailto:Sasyn@michigan.gov).

**Chemical Surge Capacity  
Exercises**

Ninah Sasy, MT  
Division of Chemistry and Toxicology

The MDCH Bureau of Laboratories, Chemistry and Toxicology Division, is designated by the Centers for Disease Control and Prevention (CDC) as one of ten state public health agency laboratories to be a regional, top-level, surge-capacity laboratory for CDC's chemical terrorism laboratory response program. What is surge capacity? Surge capacity is the ability to expand testing capabilities in response to prolonged demand. During a chemical exposure event, the MDCH laboratory anticipates receiving hundreds, maybe thousands, of specimens. The lab is expected

to rapidly test these specimens. MDCH regularly participates in proficiency testing, validation studies administered by CDC and conducts internal exercises in order to evaluate laboratory response.

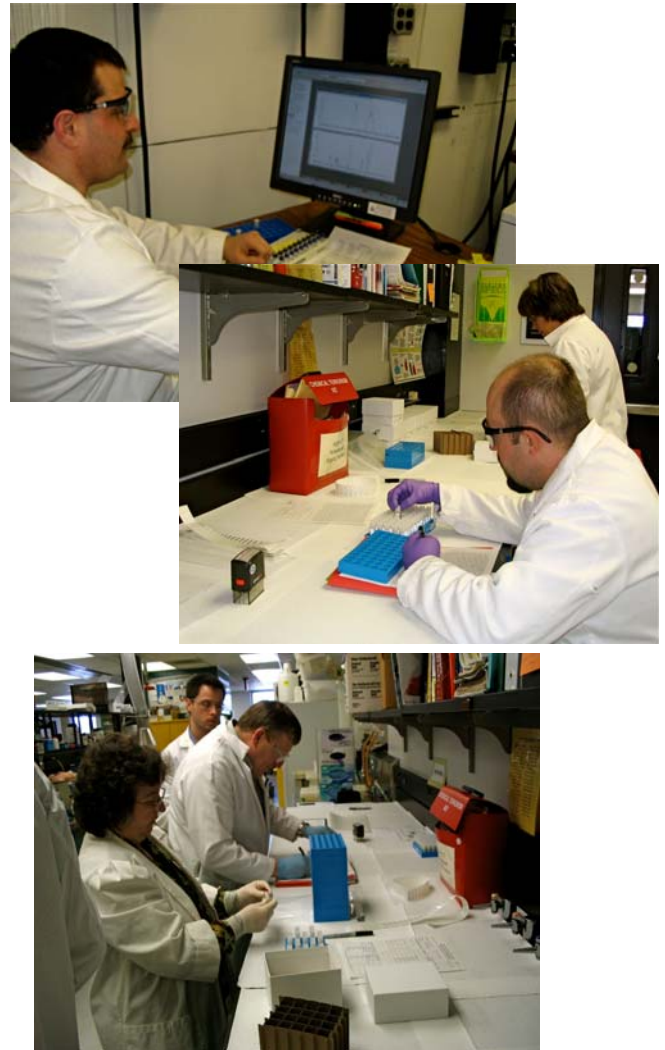
Last month, MDCH conducted an internal surge drill to assess the Trace Metal Section's ability to process and test ninety-nine specimens. Objectives for this exercise included reviewing the chain of custody procedure, logistics of specimen handling, workflow and staff assignments as well as the ability to leave instruments unattended overnight for testing.

On March 21, 2008, Chemistry and Toxicology Division began its internal surge capacity exercise. A series of emails were sent from the division director to the scientists, CT coordinators and managers. Each day more information was disclosed about the exercise, eventually indicating that it was a potential thallium exposure and the lab should expect ninety-nine specimens. Specimens arrived at the lab on March 26, 2008. The specimens were verified against the shipping manifest. The information was transcribed onto the chain of custody form and logged into the lab information system (StarLIMS). A team, consisting of one LRN scientist and one laboratory technician, using inductively coupled plasma mass spectrometry (ICPMS), performed testing procedures. Results were transferred to the CDC reporting template and ready for reporting the same day.

While completing the internal surge exercise, a CDC Surge Capacity Drill began. The Analytical Chemistry section received 500 urine specimens for nerve agent metabolite testing on March 28, 2008. Handling 500 specimens with chain of custody documentation was challenging. Testing by LC/MS/MS took about eight days and results reported to CDC as completed each day, over a period of six days. Scientists worked weekends and evenings to accommodate the

workload. The valuable experience gained from participating in the internal surge drill helped tremendously in the CDC exercise.

The Analytical Chemistry and Trace Metal Sections displayed excellent teamwork and were able to complete two surge capacity exercises the same week!

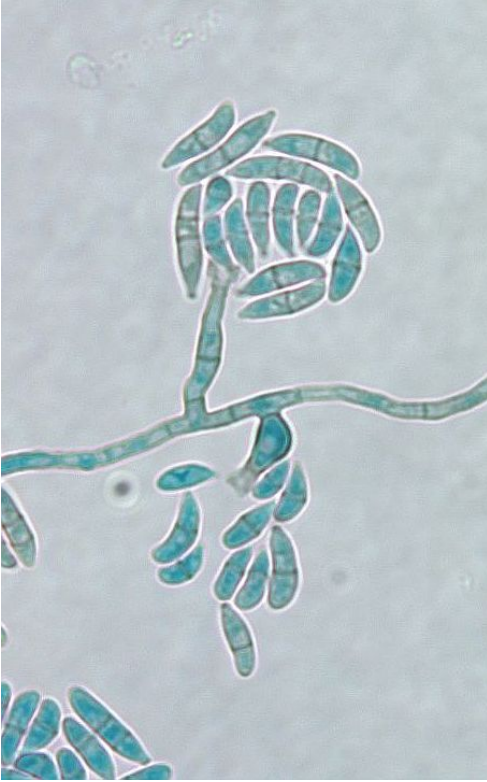


# ***FUN FUNGI.....***

## ***Cyphellophora pluriseptata***

Sandy Arduin MT(ASCP) & Bruce Palma MT(ASCP) - Mycobacteriology/Mycology Unit

### **Last Issues Picture Quiz Answer:**

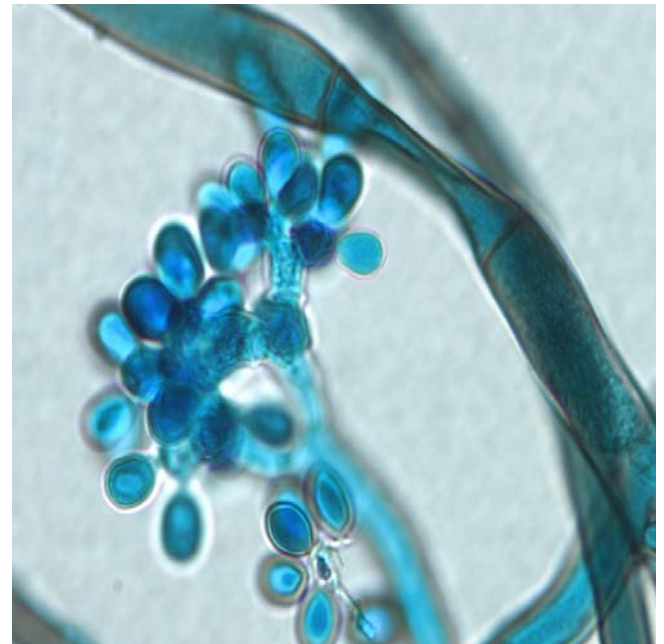


hyphae and phialides are also dematiaceous. The phialides typically have a swollen basal section with a conspicuous, flared collarette at the tip.

### **References:**

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2. De Hoog, G.S., Walz, A., 1987. *A new species of Cyphellophora*, in *Antonie van Leeuwenhoek Mycology* 53:143-146.
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### **Picture Quiz: What Mould is this?**



### ***Cyphellophora pluriseptata***

*Cyphellophora* species are dematiaceous hyphomycetes. *C. vermisporea* has been found on wheat and barley roots whereas *C. pluriseptata* and *C. laciniata* have primarily been found on human skin and nails. These are just a few of the *Cyphellophora* species. *Cyphellophora* species are differentiated by the size and shape of their conidia, the number of septa found in the conidia and by the shape of the phialides.

*Cyphellophora pluriseptata* has dark grey to brown-black velvety colonies. Microscopically, the conidia are dematiaceous, have 1-3 septa, and are straight to slightly fusiform. The

# Newborn Screening Update

Kevin Cavanagh, Ph.D.  
Division of Chemistry & Toxicology

## Change in Services

Beginning Saturday, June 21, 2008, the Newborn Screening Laboratory and the Data and Specimen Handling (DASH) unit will expand to Saturday operations. These expanded services were approved by the MDCH Newborn Screening Quality Assurance committee from November 2006 that went into effect March 2007. (Note: SB 794 amended the 1978 Public Act 368 by adding sections 5430 and 5432.)

In the first phase of these expanded lab services, testing will focus on those medical conditions with acute onset that can be life-threatening and/or significant morbidity in the first days of life (metabolic diseases and congenital adrenal hyperplasia, CAH). Additional conditions tested for on Saturday will be added as new staff are hired and trained.

Other measures to improve turn around time for delivery of Newborn Screening Lab results include the use of courier services for specimen pickup and delivery and next day delivery of mail for those hospitals where providing a courier pickup is cost prohibitive. For questions about courier services, please contact Sam Davis at 517-335-8074.

The availability of receiving Newborn Screening Lab results via the Michigan Care Improvement Registry (MCIR) is scheduled for 2008. More details will be available in the future.

## Staff News

**Eleanor Stanley**, Manager for the Metabolic Unit in the Newborn Screening Lab, was appointed to a subcommittee of the Clinical & Laboratory Standards Institute (CLSI) project

entitled: **Newborn Screening by Tandem Mass Spectrometry.**

This distinguished group will bring together expertise from various MS/MS method protocols to work towards a consensus document that will assure that babies tested using MS/MS are getting equal service throughout the US and the world. The document will guide newborn screening laboratory personnel in the daily use of tandem mass spectrometry for the detection of metabolic disorders. It will describe the best practices in preparation procedures for reagents, specimens, standards, and controls, calibration (both instrument and analyte), standardization, control acceptance criteria, disorder profiles (interpretation of MS/MS spectra), affects of transfusion and TPN, result reporting, and follow up recommendations.

In other news, **Marilyn Boucher**, Manager for the Endocrine Unit, recently retired after 20 years of service. Congratulations, Marilyn! **Caron Burns** was appointed interim Manager of the Endocrine Unit. Caron has been in the Newborn Screening Lab for more than 17 years. MDCH is very fortunate that she is willing to take on this leadership role along with her other duties.

**Kelly TenEyck** represented Michigan at Newborn Screening Issues and Answer Series: Cystic Fibrosis held on January 16, 2008, in Bethesda, Maryland. She has provided the following comments.

This meeting was a one-day event hosted by the National Newborn Screening and Genetics Resource Center with approximately 100 people in attendance. The purpose of the meeting was to address important issues facing cystic fibrosis newborn screening (CFNBS) programs. According to a Cystic Fibrosis Foundation representative, all but three states in the U.S. have CF NBS programs in place or will start screening in 2008. In 2005, there were only five states

screening for CF. Michigan began screening Newborns for cystic fibrosis on October 1, 2007.

The meeting focused on different screening algorithms in place for cystic fibrosis, including the pros and cons of each algorithm. Find a table explaining the cystic fibrosis testing algorithms for each newborn screening program, including Michigan's at: <http://www2.uthscsa.edu/nnsis/>.

## So Long, Farewell!

Patricia Somsel, Dr. P.H.  
Division of Infectious Diseases

The Bureau of Laboratories will be bidding fair winds and following seas to a long time colleague who has worked directly with us for the past seven years. Dr John Dyke will be leaving his position as Laboratory Program Advisor to spend full time on his real love, fishing on the Great Lakes.

Dr. Dyke completed his training in Medical Technology at Michigan State University, and went on to complete his doctoral degree in Medical Microbiology at Wayne State University, researching *Pseudomonas* endotoxin. During the years at WSU, he obtained clinical experience working in the Virology and Bacteriology Departments of Henry Ford Hospital.

John began his long association with Sparrow Hospital in Lansing in 1971, spending 22 years providing clinical microbiology services for Sparrow as Director of Microbiology, Laboratory of Clinical Medicine, and Mid-Michigan Reference Laboratory. John then served for six years as Director of Infection Control, and ended his tenure at Sparrow serving for three years as Safety Officer and OSHA Compliance Officer.

During these years, John contributed significantly to the fabric of clinical microbiology and laboratory medicine in general through his teaching of medical students and residents, and Medical Technology students at Michigan State University, Western Michigan University and Lansing Community College. While Associate Professor at MSU, he was a three-time recipient of an award for his teaching of Family Practice and twice for his teaching of OB/GYN residents. Likewise, he received the Sparrow Hospital House Staff Teaching Award for two years. In his spare time, he was a consultant to numerous area hospitals on microbiology and infection control matters.

John retired from Sparrow in 2001 to join the BOL as laboratory program advisor to a demonstration project for CDC, the National Laboratory System (NLS). His assignment was to assist in building a network to better link the state public health lab with clinical and commercial labs in Michigan. As NLS Program Advisor, and later Program Advisor to the Michigan Laboratory System, John contributed to the development of a state network that has been nationally recognized as a model for integration of laboratory services.

You can expect to find John, his wife, Teri, and their Australian terrier, Solo, trolling the inland seas of Michigan, searching for that one monster fish that still eludes him.



## Things That Make You Squirm.....

Alison Chadwick (MT-Microbiology)  
Student Intern  
Division of Infectious Disease

Every so often MDCH will receive a phone call regarding some *unexpected* "finding" that will need to be further identified. That was the case with this little squirmy bug. A twenty something female with a recent travel history to an undisclosed location in Africa had gone to her local doctor complaining of what seemed to be an infected right arm lesion. After some prodding a small white larva was pulled from the patient's arm and placed into proper specimen transport media. Upon reaching MDCH, the specimen was examined and identified from the family Oestridae as *Dermatobia hominis* larvae known as the common botfly (figure 1) by MDCH microbiologists<sup>1</sup>. Cases like this are extremely rare in Michigan so the impending question is: *how could an infection like this occur?*

*D. hominis* is the only known species of Oestridae (botfly) that will attack humans. Approximately 150 known species of botfly are found throughout the globe and tend to be more commonly associated with other mammals such as horses. The botfly will deposit eggs using a mammalian host (or use an intermediate vector such as a housefly) typically directly onto the skin (or the larvae will fall from the egg). Body heat (a natural immune defense of mammals) will actually enable the hatching of the egg upon contact. Myiasis occurs when the larvae burrow into the skin using their mouth hooks (figure 2) which creates a painful cutaneous swelling similar to a boil. After the swelling occurs, an opening will typically develop that can become susceptible to secondary bacterial infection (figure 3). This is what happened to the traveling young woman, except her infection was most likely caused by the larvae trying to escape. Oestridae are true parasites. They do not kill their mammalian hosts. Once larvae have

matured they escape their incubators to complete the pupal stage in soil. *D. hominis* seems to prefer the scalp, face, and extremities. Rarely will the larvae migrate to other body sites. This type of parasitic infection usually creates problems in other mammals when numerous amounts are licked off the skin and deposited in the digestive tract.

*D. hominis* is not indigenous to this part of the world. However, with the ease of foreign travel, laboratories must be vigilant for these unusual cases.

Figure 1 Typical *Dermatobia hominis* larvae



Figure 2 Close up of *Dermatobia hominis* mouth hooks

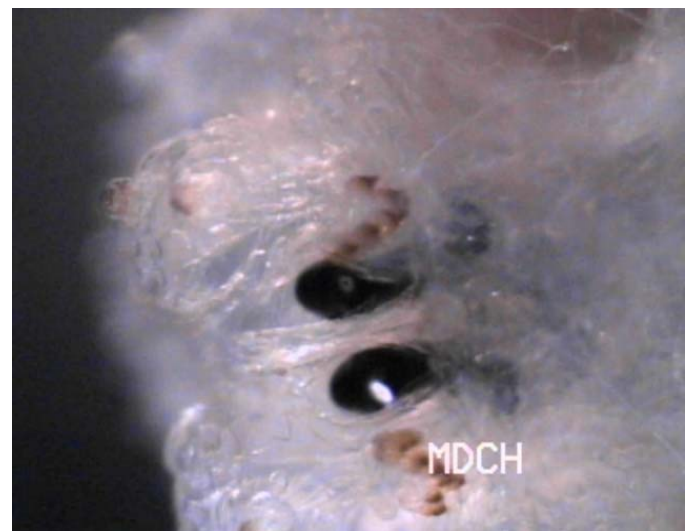
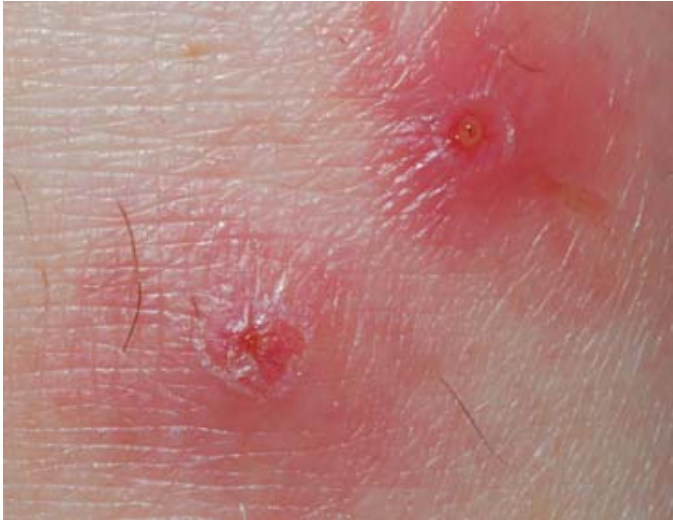


Figure 3 Typical clinical presentation of cutaneous skin lesion caused by *D. hominis*<sup>2</sup>



<sup>1</sup> Identification of parasite made by: Hao Trinh, Microbiologist, Enteric/STD/Chromatography Unit & Stephen Haskell, BS, SM (ASCP) Reference Bacteriology Unit

<sup>2</sup> Figure taken from: Ghaffar, A., & Hunt, R. (September 21, 2007). *Microbiology and Immunology On-line, University of South Carolina School of medicine*. Retrieved April, 2008, from <http://pathmicro.med.sc.edu/parasitology/arthropods.htm>

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### Bureau of Laboratories 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.

### Bureau of Laboratories Mission

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

**LabLink** is published quarterly by the Michigan Department of Community Health, Bureau of Laboratories, to provide laboratory information to Michigan health professionals and the public health community.

**Director, Bureau of Laboratories**  
Frances Pouch Downes, Dr.P.H.

**Editor**  
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# Quirky Bugs.....

Stephen L. Haskell, SM(ASCP)  
Reference Bacteriology Unit

The MDCH, Reference Bacteriology Unit received an unidentified, tiny, gram negative coccobacillus isolated from whole blood of a 15 year-old male who had undergone splenectomy. The organism was identified, by conventional biochemical patterns and cellular fatty acid analysis, as *Bordetella holmesii*. This organism was formerly known as CDC group NO-2. It is a slow growing gram negative rod that was first identified in 1995. *B. holmesii* consists of at least 15 biochemically similar strains of oxidase negative, asaccharolytic, brown soluble pigment producing aerobic gram negative rods. Its role as a respiratory pathogen has not been completely established; however, it has been implicated as an infrequent cause of pertussis syndrome and is known to be associated with septicemia in patients with underlying immunological conditions. *Bordetella holmesii* contains insertion sequence IS481 that is the target for the polymerase chain reaction (PCR) assay for *Bordetella pertussis* used by many laboratories including MDCH. While *B. holmesii* is rarely found in nasopharyngeal specimens, a positive result for *B. pertussis* by PCR should be correlated with clinical findings.

**Table 1 MDCH Testing Results**

Test Performed	Result	Test Performed	Result	Test Performed	Result
Gram-reaction, Cell Morphology	G-neg. CB	Simmons citrate	-	Growth on: MacConkey	[+ or (+)]
Motility	[nm]	Urea, Christensens	[-]	Growth on: SS	-
Action on Blood	-	Nitrate reduction	[-]	Growth on: Cetrimide	-
Fermentative or oxidative	Ox	Gas from nitrate	-	Simmons citrate	-
Carbohydrate base Acid from	[-]	Nitrite reduction	-	Pigment	Brown soluble
Glucose	-	Indole	-	Gelatin	-
Xylose	-	Esculin hydrolysis	-	Nutrient broth 0% NaCl	v
Mannitol	-	Gelatin	-	TSI	-
Lactose	-	LDC	-		
Sucrose	-	ADH	-	Growth at: 25°C	-
Maltose	-	ODC	-	Growth at: 35°C	+
Oxidase	-	Catalase	w	Growth at: 42°C	-

- Negative  
+ Positive  
nm, non-motile  
V, variable  
CB, coccobacilli  
w, weak  
[ ]. key reaction

**Table 2 Cell Wall Fatty Acid Composition by GLC**

GLC Peak	Chemical name	Type of Fatty acid
16:0	Palmitic	Saturated Fatty Acid
17:0 cyclo	$\Delta$ -cis-9,10Methylenhexadecanoic	Cyclopropane Fatty Acid
3-OH-14:0	$\alpha$ Hydroxymyristic	Hydroxy Fatty Acid

The Genus *Bordetella* was named after Jules Bordet. It consists of obligate aerobes that are small, gram negative coccobacilli (0.2 – 0.7  $\mu$ m), of the order Burkholderiales in the family of Alcaligenaceae. Three species are important human pathogens; *B. pertussis*, *B. parapertussis* and *B. bronchiseptica*. These bacterial agents cause respiratory diseases in humans. *B. pertussis* is the etiological agent of whooping cough, *B. parapertussis* causes a less severe form of the disease and *B. bronchiseptica* is the main agent of kennel cough in dogs and is pathogenic to a wide variety of animals, but is less pathogenic to humans.

*Bordetella* is transmitted via direct contact with aerosols or droplets. Upon inhalation, the bacteria adhere to ciliated epithelial cells in the nasopharynx. This interaction is mediated by filamentous haemagglutinin, pertactin, fimbriae, and pertussis toxin (unique to *B. pertussis*). The initial catarrhal phase of pertussis infection produces common cold like symptoms. During this period large numbers of bacteria can be recovered from the nasopharynx.

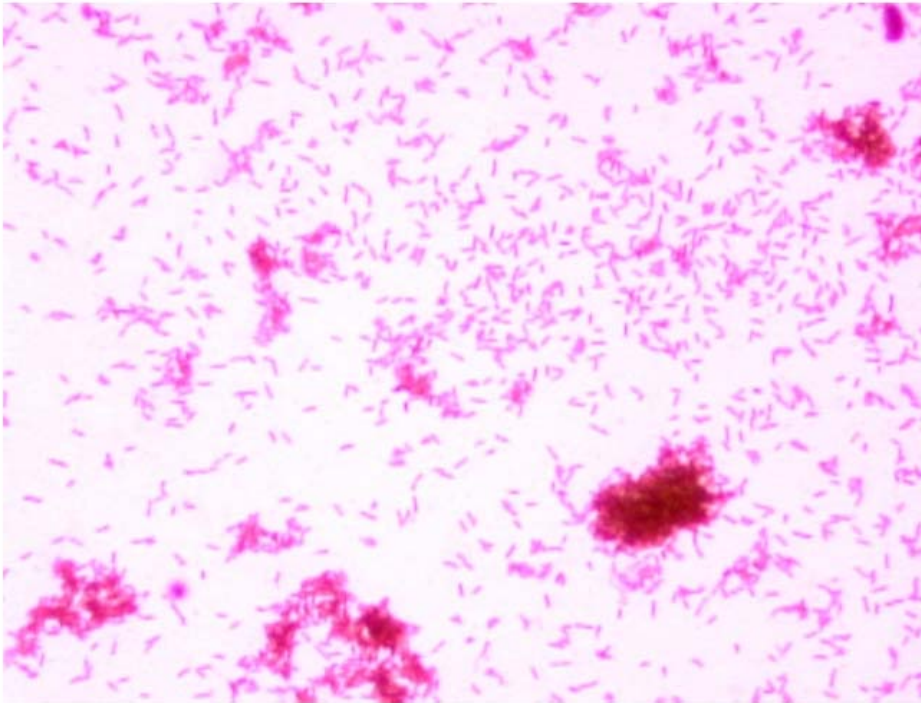
**Table 3 Differential Characteristics of Select *Bordetella* species**

Characteristic	<i>B. pertussis</i>	<i>B. parapertussis</i>	<i>B. bronchiseptica</i>	<i>B. avium</i>	<i>B. holmesii</i>
Oxidase	+	-	+	+	-
Nitrate reduction	-	-	+	-	-
Urease production	-	+	+	-	-
Motility	-	-	+	+	-
Growth on: Blood agar	-	+	+	+	+
MacConkey agar	-	v	+	+	+

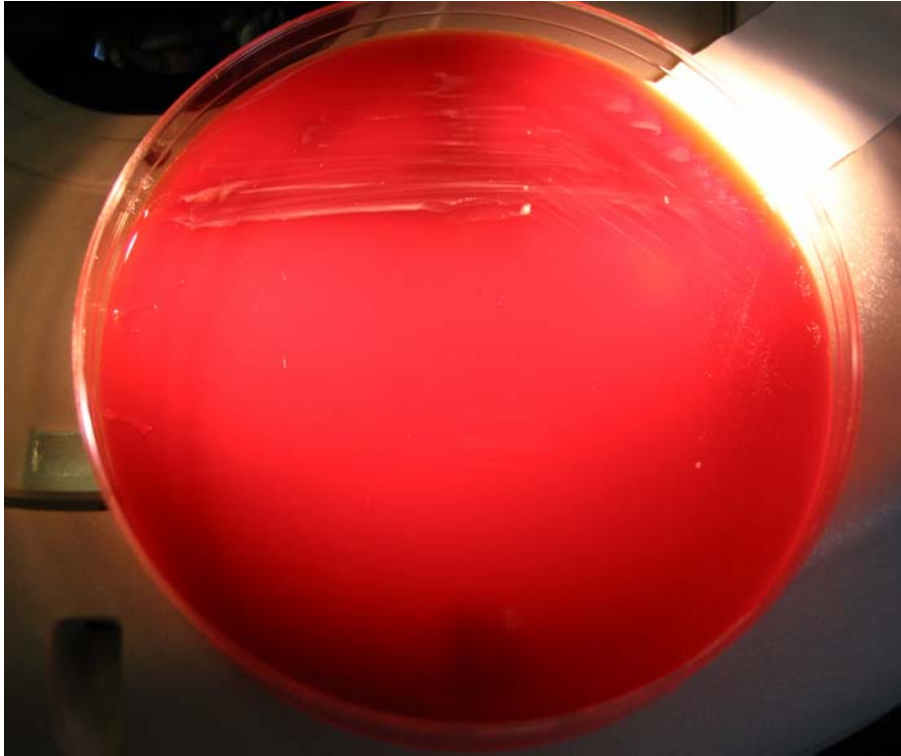
Figure 1 *B . holmesii* (X 25) on 5% Sheep's Blood Agar (BAP); 24 hours incubation at 35°C



Figure 2 *B . holmesii*; Gram Stain (1000X)



**Figure 3** *B. holmesii* 48 hours on BAP incubated at 35°C. (Very light growth in the first quadrant, colonies are not visible to the human eye)



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## **Bureau of Laboratories Centennial Celebration**

The Bureau of Laboratories culminated its centennial celebration with a symposium and public forum on April 21, 2008. Attended by over 200 public health and healthcare professionals, students and advocates, the symposium entitled, *The Evolution of Public Health Laboratories*, examined the past and future roles of public health laboratories.

Michigan Department of Community Health Director Janet Olszewski, welcomed the audience by reviewing the earliest charges to the laboratory and citing the greatest accomplishments of the laboratory over the past century.

Dr. Kenneth Warner, Dean of the University of Michigan School of Public Health discussed the public health laboratory and Michigan's exceptional contribution to the ten great public health achievements of the past century (MMWR 48(50) 1141-7). Not one to rest on the laurels of the past, Dean Warner challenged the audience to consider ways to address the ten great public health challenges of the next century.

Dr. Robert Martin, Acting Director of the National Center for Public Health Informatics, at the Centers of Disease Control and Prevention and former Michigan public health laboratory director, provided an insightful assessment of the challenges of globalization's impact on health. The development of public health laboratory systems will be essential in meeting international health regulations and recognizing and controlling emerging and pandemic infectious diseases.

The keynote address was provided by Ronald M. Davis, MD, President of the American Medical Association and former MDCH Chief Medical Executive. Dr. Davis reviewed the genesis of the split of public health and medical care. He also provided engaging examples of social barriers to health.

Recognizing the future of the laboratory profession, Paul L. Epner, Director of Health Care Improvement Initiatives at Abbott Laboratories, provided an overview of the LabsAreVital™ program. This program is a collaboration of many laboratory professional organizations and individuals with the goals of elevate the status of the laboratory profession, address the laboratory workforce shortage, and explore and interact. Visit [labsarevital.com](http://labsarevital.com) to learn more and enroll as a supporter.

The evolving roles of public health laboratories beyond technology and to leadership and public policy were addressed. Dr. Frances Pouch Downes, current MDCH laboratory director, used historical and contemporary examples to discuss how vision, communication of the vision and action are characteristics of leaders and encouraged the audience to realize their professional, community and personal leadership potential. Mr. Scott Becker, Executive Director of the Association of Public Health Laboratories of Silver Springs, Maryland, presented

examples of how public health laboratory professionals have impacted policy through advocacy and evaluation of proposed government legislation and rules using an unbiased position and foundation of technical expertise and quality.

An anthropologist's view of the evolution of human and microbial populations was presented by Dr. George J. Armelagos, Chair of the Department of Anthropology at Emory University in Atlanta, GA. The way people have interacted with their environment has resulted in shifts in human disease patterns. The first shift from sporadic cases of infectious disease to outbreaks occurred when nomadic hunter-gatherers living in small groups started clearing land and maintaining animals in larger groups. The industrial revolution brought greater access to food, the development of sanitation, vaccination and other public health interventions and chronic diseases. We are currently in the third transition where global travel, deforestation, global warming, dense urban populations and political instabilities have resulted in the third epidemiological transition to emerging infectious disease. (The Science, Jan/Feb 1998)

Closing remarks were provided by Ms. Jean Chabut, Deputy Director, MDCH Public Health Administration. Dr. Matthew Boulton, University of Michigan School of Public Health and Dr. Duane Newton, Director, Clinical Microbiology & Virology Laboratories, University of Michigan Health Systems, served as moderators for the symposium.

A public forum, *Meeting Future Challenges Facing Public Health: Multiple Perspectives* was offered in the evening of the symposium day. A panel of health leaders was assembled to respond to public questions and concerns about the future of health care and prevention. Participants included Bobby Pestronk, Health Officer of the Genesee County Health Department and President of the National Association of County and City Health Officials, Janet Olszewski, Director of the Michigan Department of Community Health, Secretary-Treasurer of the Association of State and Territorial Health Officials, Frances P. Downes, Michigan Public Health Laboratory Director and President of the Association of Public Health Laboratories, Kenneth Warner, Dean of the University of Michigan School of Public Health, William D. Strampel, Dean of the Michigan State University College of Osteopathic Medicine and Ronald M. Davis, Director of the Center for Health Promotion and Disease Prevention, Henry Ford Health Systems and President of the American Medical Association. The session was moderated by Gretchen Millich, a radio journalist with WKAR Public Radio, East Lansing. The stimulating and provocative discussion provided ample agreement that radical changes to the health care system in the United States are needed.

The symposium and public forum were planned by Bureau employees. The planning committee wishes to extend thanks to the speakers, attendees and sponsors.



Dr. Ronald Davis addresses symposium attendees.



Evening panel discussion