

Michigan Department
of Community Health



Jennifer M. Granholm, Governor
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LabLink

Michigan Department of Community Health
Bureau of Laboratories

"Quality Laboratory Science for Healthier People and Communities"

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Celebration Time

Carlton Evans, B.S
Bacterial and Parasitic Serology

It is time to celebrate the 100th birthday of the Michigan Department of Community Health's (MDCH) Laboratory. MDCH is the fifth oldest state health agency in the nation. In 1907, the legislature passed Act 109, which authorized the appointment of a bacteriologist and the "necessary appliances and apparatus..." With a budget of \$3,665, the Lansing lab was established in the old State building near the current capitol building. The Act of 1915 created a separate unrelated bacteriological lab in the Upper Peninsula, in Houghton. Due to the demands of WWI and other considerations, the labs combined in 1919 as the Bureau of Laboratories (BOL).

From its creation, the BOL has been at the forefront of community health. In the early 1920's, Michigan's death rate from diphtheria was the highest in the world (1,200 per year). The BOL developed its own preventive drug and distributed it free to doctors resulting in the death rate dropping to 37 per year by 1940. In the mid 1940's, goiter was so prevalent that it was known as "Michigan's Disease." Once again, through the efforts of the Bureau, iodine was added to table salt and simple goiter is now history in Michigan. Past achievements include the development of the Khan test for syphilis, an effective pertussis vaccine and the best smallpox vaccine. The BOL was the first to offer free plasma, the first to establish a biophysics lab, the first to develop an acellular rabies vaccine and the first to use Pulse Field Gel Electrophoresis.

Today, the BOL is still a leader in the field of public health, continuing proven practices and addressing emerging health issues. Exercises and drills are regularly run in conjunction with the Centers for Disease Control and Prevention and other partners to

evaluate and improve laboratory preparedness across the state. The BOL has been working with the National Kidney Foundation of Michigan to get laboratories to report an estimated glomerular filtration rate on chemistry reports. These results will help identify early kidney disease in high-risk populations. To enhance local preparedness for chemical exposures, the Bureau has assembled a Chemical Terrorism Packaging and Shipping Kit. This kit has been distributed to hospital and regional laboratories across Michigan. The BOL has worked with state and local public health and clinical partners to steadily reduce the prevalence of tuberculosis in Michigan to 2.5 cases/ 100,000 population, approximately one-half the nation's case rate in 2005, in part, by improving laboratory technology and reducing test turn around time.

The BOL leadership has initiated a paradigm shift regarding strategic planning. For the first time the entire staff was asked for input in developing a strategic plan. The staff became responsible for not only the plan's development, but also its implementation. This plan is not a static tome, but a living document that will change to adapt to changing needs. From the first Director, M.L. Holm, to the current Director, Frances P. Downes, the Bureau of Laboratories continues to strive for excellence. Help us celebrate our achievements and our future. The celebration begins in April 2007. Your health is our mission.

Updates on activities and projects will be available on our website (www.michigan.gov/mdchlab).

**Bureau of Laboratories Welcomes
Bonita Taffe,
Analytical Chemistry Section
Manager**

Samuel Davis, B.S., RM(NRM)
Office of Quality Assurance

Bonita (Bonnie) Taffe graduated from the University of Connecticut in 1976 with a B.S in Biology and interest in carcinogenesis and developmental effects of environmental toxins. After working for two years as a research assistant at Yale University, her interests became focused in the Occupational and Environmental health field leading to New York to study Environmental and Occupational Health in the MPH program at Columbia School of Public Health, now the Mailman School of Public Health (MPH 1981).

While at Columbia, Taffe was hired by the Mt. Sinai School of Medicine Environmental Sciences Laboratory to perform sample preparation and analysis in human serum and fat for PCBs and PBBs for a collaborative population study of human exposure with the State of Michigan. She continued to work in this laboratory until being admitted to the doctoral program in toxicology at the Johns Hopkins School of Hygiene and Public Health, now the Bloomberg School of Public Health.

After receiving a Ph.D. in 1988, Dr. Taffe pursued postdoctoral training at the National Cancer Institute, at the National Institutes of Health (NIH), in the Laboratory of Human Carcinogenesis, assessing biomarkers of oxidative exposures. While at the NCI, she took a five-month leave to accept a fellowship offered by the National Cancer Institute in Tokyo, Japan in 1991. On returning to NIH, she moved to the Laboratory of Molecular Genetics, where she studied DNA damage and repair.

Dr. Taffe was recruited to Wayne State University in 1993, where she served as an Assistant Professor in Occupational and Environmental Sciences in the School of Pharmacy and Health Sciences. During her years at WSU, she taught toxicology, epidemiology, forensic science and clinical instrumentation, managed and ran a research laboratory, directed Graduate and Post-baccalaureate certificate programs and served as an academic advisor to students. She became a Diplomate of the American Board of Toxicology in 2002 and more recently passed the ASCP medical technology certification exam (2006).

During the past year, in addition to her academic duties, Dr. Taffe worked part time in the Chemistry and Toxicology laboratory at the Detroit Medical Center core clinical laboratory to gain clinical experience. The move to the Bureau of Laboratories provides her with a unique opportunity to combine her interests in human toxicology, exposure assessment and community public health.

Welcome Dr. Taffe!

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.

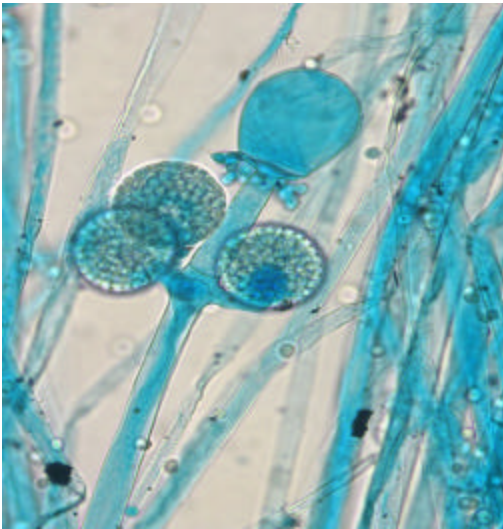
FUN FUNGI.....

Actinomucor species

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

The genus *Actinomucor* contains two species; *Actinomucor elegans* and *Actinomucor elegans* var. *meitauzae*. It is found worldwide, but is found primarily in cultivated soils of temperate and subtropical zones. *Actinomucor* has rarely been isolated from human sources. There has been one documented case of it causing maxillary sinusitis (2). MDCH isolated it from a sputum specimen.

Colonies are fast growing and cottony to wooly. Colony color is originally white becoming grey to olive buff with age. Sporangiohores arise from rhizoids. Stolons are also present and may be branched. Smaller, secondary sporangia form on short verticillate branchlets a short distance below the terminal sporangium. Primary sporangia are 60-80µm while secondary sporangia are only 20-50µm in size. Secondary sporangia often have a spiny wall, which ruptures near the columella. The sporangia then fall off with most of the spores still included. Sporangia contain elongate to oval columellae without apophyses. Sporangiospores are globose, smooth-walled to slightly roughened and are 6-8µm in diameter. Chlamyospores are occasionally produced and may be solitary or in chains.

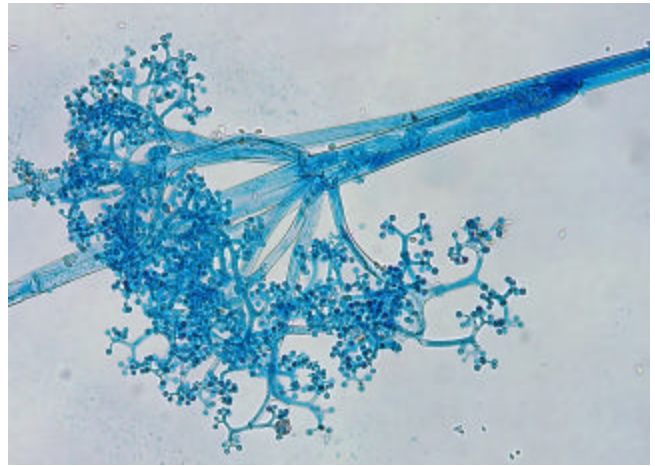


Actinomucor species

References:

1. Domsch, K.H., Gams, W., Anderson, T. 1993, *Compendium of Soil Fungi*. IHW-Verlag, Germany.
2. Davel, Graciela, et al., *Maxillary Sinusitis Caused by Actinomucor elegans*. 2001. *Journal of Clinical Microbiology*. Vol.39.2., pp.740-742, ASM.
3. www.zygomycetes.org

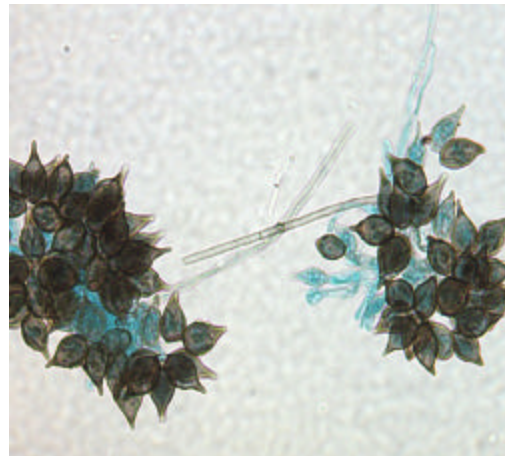
Last Issues Picture Quiz Answer:



Thamnidium species

Thamnidium species are commonly found in desert, forest and cultivated soils. Microscopically, sporangiohores have a terminal deliquescent (dissolving) sporangium with columella, resembling *Mucor* species. Present are several whorls of dichotomous branches (branching into two, more or less equal, arms) each bearing sporangioles. The size of the sporangioles decreases with an increase in temperature. Rhizoids are absent. Colonies are wooly, pale to dark olive-grey and have a yeast-like odor.

This Issues Picture Quiz: What Mould is this?



Quirky Bugs...

Dermatophilus congolensis

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

The MDCH Reference Bacteriology Unit commonly receives unusual microorganisms that are difficult to identify. These isolates are often atypical, fastidious, or rarely encountered in human clinical microbiology. Identification of these organisms presents special challenges that more common bacteria do not, because in vitro they grow slowly, or require specific temperatures, atmospheres, or substrates. Frequently, the submitter has made a presumptive identification and is seeking a confirmation of identification.

A suspect isolate of *Dermatophilus congolensis*, a rarely encountered organism was submitted to the MDCH laboratory for confirmation. The organism had been isolated from leg lesions on a young female patient. She reported riding a horse bareback while wearing shorts the week before the lesions developed.

Dermatophilus was first recognized as the causative agent of dermatophilosis in cattle by VanSaceghem around 1915, but was not identified in the United States until 1961. Dermatophilosis is a condition that usually presents as severe skin lesions, which form scabs. *Dermatophilus* infects both wild and domestic animals including sheep, cattle, horses, and goats. Dermatophilus-like infections have been reported in camels, crocodiles, beluga whales, and turtles.

Human infection is rare, and is dependent upon contact with diseased animal tissue. An occupation where exposure to infected animals is routine (e.g., butchers, dairy farmers, hunters, and veterinarians, etc.) increases the risk of infection. Outbreaks are more frequent in warm months. A severe chronic form of dermatophilosis has been associated with *Amblyomma variegatum* ticks bites.

Direct Gram stain revealed large gram positive branching filaments with transverse and longitudinal planes that tapered to fine hyphae. This was a significant clue to the organism's identity. Although other bacterium exhibit

branching, few have transverse and longitudinal planes. The Gram stain was consistent with the morphological characteristics of *Dermatophilus congolensis*. (See Figure 1).

Plate media was inoculated for growth and incubated for 24 hours at both 25°C and 35°C. The organism grew best at 35°C in 5% CO₂. Growth on 5% sheep blood agar was characterized as follows: small, molar tooth, adherent, Beta-hemolytic, glabrous, with verrucous-like topography. The organism grew well on chocolate agar, but did not grow on MacConkey agar. After 48 hours incubation the growth became drier and more adherent to the agar surface. This is consistent with the characteristic colony morphology of *Dermatophilus congolensis* (See Figure 2).

Biochemical test results were consistent with the confirmation of *D. congolensis*. Glucose fermentation and motility were positive while urea, starch, casein, and gelatin were all hydrolyzed. Xanthine and tyrosine were not hydrolyzed. Indole, nitrate reduction, MR, VP and growth in 6% NaCl broth were negative. Xylose, mannitol, lactose, sucrose, maltose, salicin were not fermented. (See Table 1).

High performance liquid chromatography testing did not detect mycolic acids in the cell wall of the organism. Fatty acid cell wall analyses by gas liquid chromatography were consistent with the expected fatty acid cell wall composition of *Dermatophilus congolensis*. (See Table 2) The identification of this organism was confirmed as *Dermatophilus congolensis*.

Figure 1 Gram stain of *Dermatophilus congolensis*

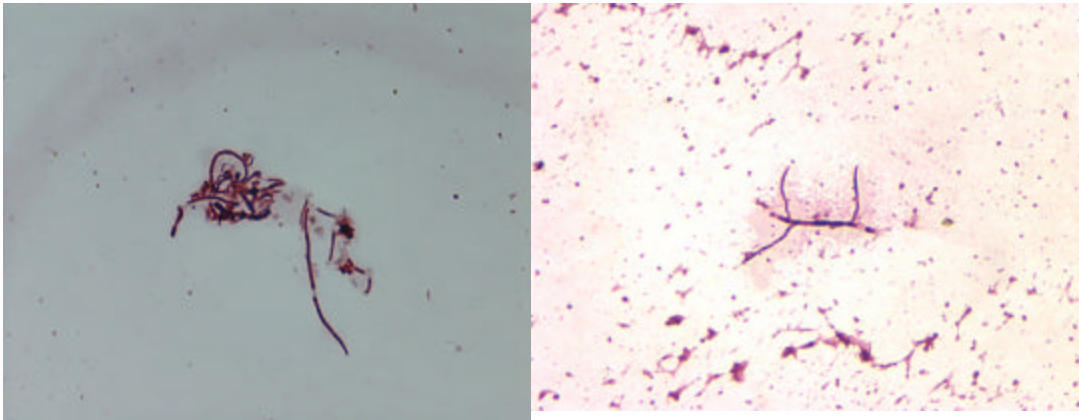


Figure 2 *Dermatophilus congolensis* on Sheep Blood Agar After 24 Hours.

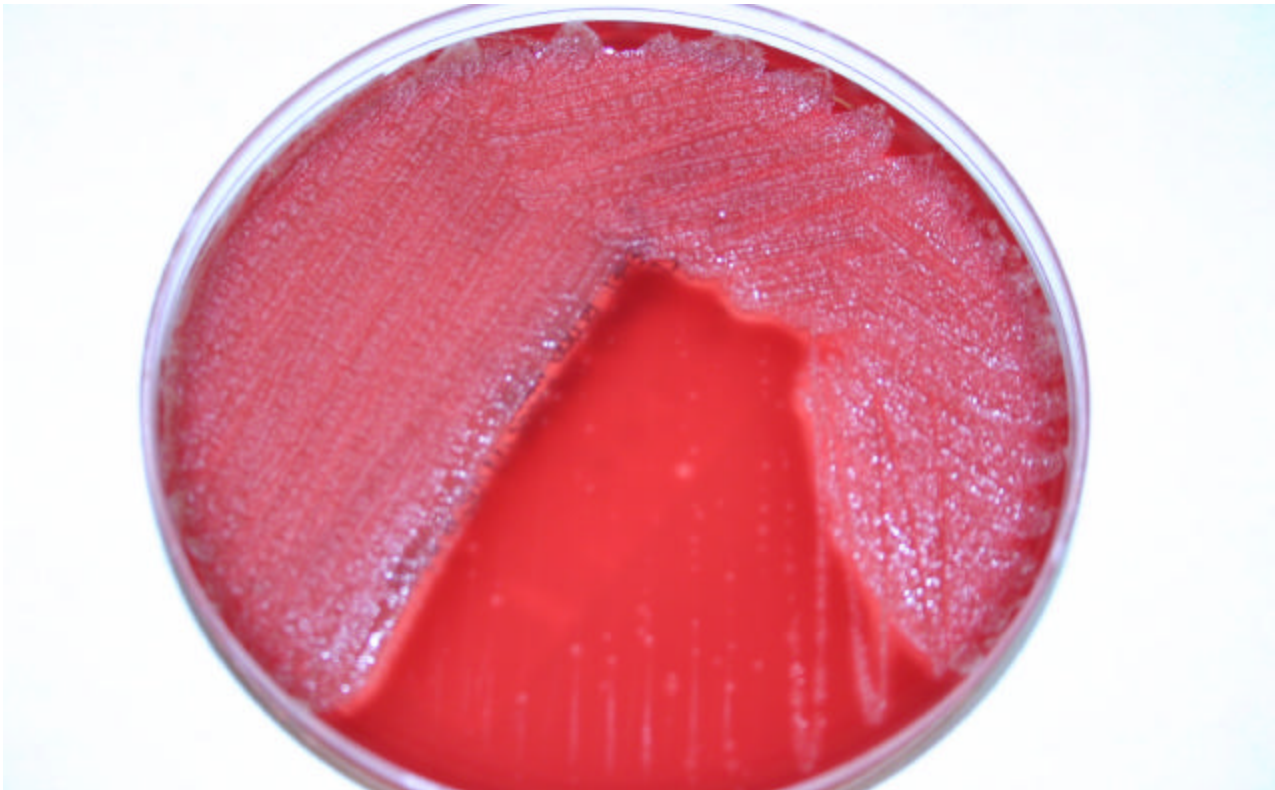


Table 1- Presumptive identification of medically important actinomycetes

Genus	Vegetative filaments		Conidia	Acid fast	Mycolic Acids	Glucose Metabolism	Growth At 50°C	Growth In Lysozyme
	Substrate	Aerial						
Actinomadura	+	V	V	-	-	O	-	-
Amycolatopsis	+	V	V	-	-	O	-	-
Corynebacterium	+	-	-	-	+	O,F	-	-
Dermatophilus	+	-	-	-	-	F	-	NT
Gordona	+	-	-	W	+	O	-	V
Micromonospora	+	+	+	-	-	O	-	-
Mycobacterium	+	-	-	+	+	O	-	-
Nocardia	+	+	V	W	+	O	-	+
Nocardiosis	+	+	+	-	-	O	-	-
Rhodococcus	+	-	-	-	+	O	-	V
Saccharomonospora	+	+	+	-	-	O	+	-
Saccharopolyspora	+	+	+	-	-	O	+	V
Streptoimycetes	+	+	+	-	-	O	-	-
Thermoactionmyces	+	+	+	-	-	O	+	+
Tsukamurella	+	-	-	W	+	O	-	+

Table 2 – Fatty acid cell wall content of *Dermatophilus congolensis*

Index	Feature Name Fatty acid	Percent Total
21	13:0	6.14
30	14:0	9.6
39	15:1 w8c	3.48
40	15:1 w6c	trace
51	16:1 w9c	3.68
53	16:0	11.72
64	17:1w8c	29.52
69	17:0	6.26
75	16:0 3OH	5.20
78	18:1 w9c	9.91
80	18:0	5.64

References:

1. Hemolytic interaction of *Dermatophilus congolensis*. www.medscape.com/medline/abstract/1621476?prt=true

2. Micromorphology of *Dermatophilus congolensis*. www.pubmedcentral.nih.gov/botrender.fcgi?blobtype=html&artid=278572

3 . J. Brown, M. McNeil. 2003. “*Nocardia, Rodococcus, Gordonia, Actinomadura, Streptomyces*, and Other Aerobic Actinomycetes.” pg 502-520. In Murray, et.al., Manual of Clinical Microbiology, 8th ed., American Society for Microbiology, Washington, D.C. pg 502-520.

4. MIS Whole cell fatty acid analysis by Gas Chromatography, copyright ©1999 MIDI, Inc. www.midi-inc.com

<p>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.</p>	
<p>Director, Bureau of Laboratories Frances Pouch Downes, Dr.P.H.</p>	<p>Editor Susan L. Shiflett</p>

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Newborn Screening Expanded Panel Includes GA1

Marilyn Boucher, C(ASCP)
Newborn Screening Section

Glutaric Acidemia (type 1) or GA1 is one in a constellation of new disorders in the recently expanded Newborn Screening test panel. An inborn error of organic acid metabolism, GA1 is caused by a deficiency in the activity of an enzyme, glutaryl CoA dehydrogenase (GCDH) required for the catabolism of the amino acids lysine, hydroxylysine and tryptophan. In affected babies, excessive levels of these amino acids and their breakdown products build up in the brain, particularly in the basal ganglia, a region of the brain controlling movement.

Clinical presentation of GA1 is highly variable, from asymptomatic at birth to a macrocephaly requiring caesarean delivery. Some infants are born with or develop a subdural hematoma and present with bleeding in the brain or eyes. These symptoms can be interpreted as child abuse and the parents are further subjected to criminal investigation and prosecution.

Affected babies with or without macrocephaly may develop normally until the first neurological crisis. Some infants may be hypotonic, spastic, fussy or jittery. The initial incident, preceded by a mild cold or fever, resembles acute encephalitis. Symptoms include convulsions and the loss of head control, sucking and swallowing reflexes and the ability to sit or grasp. Repeated episodes lead to progressive neurological deterioration.

GA1 is inherited as an autosomal recessive trait at a rate of 1 in 30,000 to 40,000 births. Higher frequency (1 in 300) occurs in the Old Order Amish of Lancaster County, Pennsylvania and the Ojibwe (Ojibway) population of Manitoba, Canada.

The gene encoding the enzyme defect has been cloned and sequenced: the gene is mapped to chromosome 19. There is no strict correlation between genotype and clinical severity since brain damage is more related to the number of encephalopathic crises rather than to any biochemical or molecular feature. Defective GCDH activity causes excretion of glutaric acid in urine, which was the basis of diagnosis before the

newborn screening section adopted use of tandem mass spectrometry (MS/MS). With timely screening, the severe effects of GA1 can be minimized.

The newborn screening laboratory utilizes MS/MS to screen for the presence of an abnormal amino acids or acylcarnitines. Analytes are extracted in methanol, derivatized with N-butanol, evaporated and reconstituted with acid-acetonitrile. The analysis relates concentration of the compound of interest proportionately to its stable-isotope labeled internal standard. A triple-quadrupole mass spectrometer separates and quantitates ions based on mass to charge ratio (m/z). Ions are further fragmented in the collision cell and again separated, then sent to a detector for signal recording. Several scan modes are operating which optimize the detection of amino acids and acylcarnitines, respectively, as shown in Figure 1.

A screen positive newborn is referred for medical follow-up. Further testing by gas chromatography mass spectrometry (GC-MS) to quantitate the actual enzyme activity level may be performed. Urine and plasma amino acids/acylcarnitine levels, cultured fibroblast and leukocyte testing and other confirmations are coordinated by the Children's Hospital of Michigan Metabolic Center along with comprehensive medical and nutritional follow-up.

Treatment consists of prompt and vigorous management of even mild illness with hospitalization and IV administration of glucose, water and electrolytes. A diet low in lysine and tryptophan is followed with supplemental use of carnitine. Some physicians advocate the use of insulin; others prescribe riboflavin (coenzyme of GCDH), or an anticonvulsant.

GA1 and other inborn errors of amino acid-acylcarnitine metabolism were poorly understood prior to 1970. In the past thirty years, screening, diagnosis, treatment and monitoring have progressed to improve the outcome of children who previously suffered profound neurological damage, leading to death in the first decade.

Reference:

1. Chase DH, TA Kalas, EW Naylor. 2003. Use of Tandem Mass Spectrometry for Multianalyte Screening of Dried Blood Specimens fro Newborns. *Clinical Chemistry*. 49(11):1797-1817.

Figure 1

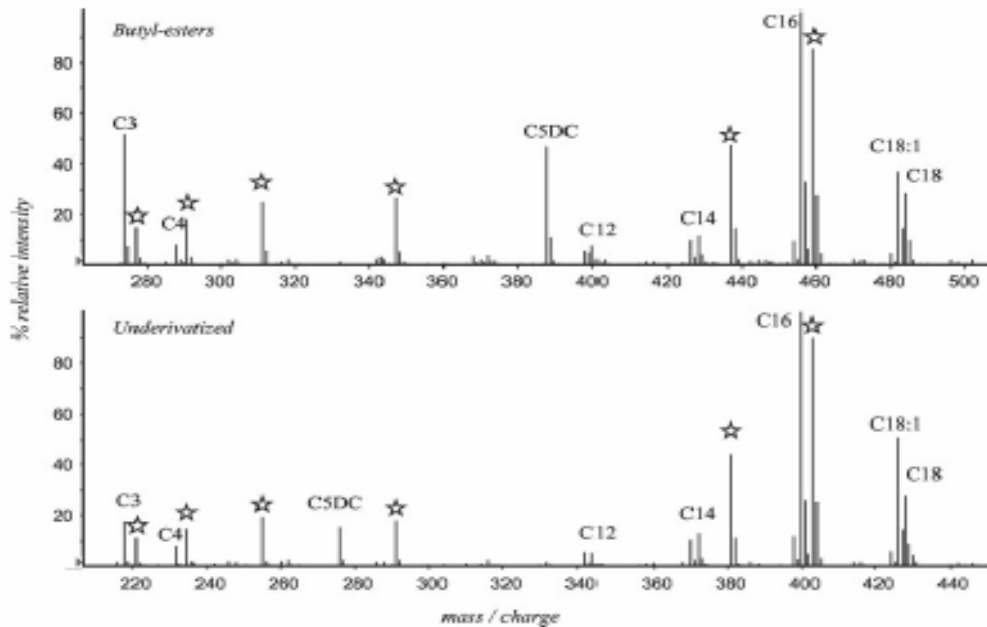


Fig. 2. Pre 85 MS/MS scans of acylcarnitines in a newborn confirmed to have GA-I. (Top), blood specimen prepared by butyl esterification. C5DC is detected at m/z 388. (Bottom), blood specimen prepared without derivatization. C5DC is detected at m/z 276.

Michigan to Twin with Mozambique

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

In January, the World Health Organization approved the Michigan Department of Community Health Bureau of Laboratories and the Department of Immunology of National Institute of Health of Mozambique to develop a twinning relationship. The Michigan application was submitted through the Association of Public Health Laboratories. The Michigan-Mozambique project was one of 11 approved from 27 applications.

The twinning program is intended to build laboratory capacity in developing countries. In comparison to a consultation, a twinning

relationship is intended to work for long- and short-term goals through an extended relationship. An initial visit will be planned to refine the project goals and performance indicators, prepare an action plan and meet with health leaders and funding agencies.

The state public health laboratory of Michigan has previously twinned with the Jamaican National Health laboratory and provided technical and quality assurance training to public health laboratories in Ethiopia, Botswana, Ghana, and Cote d'Ivoire.