CRITICAL LINK

John M. Colmers
Secretary

A Publication of the Maryland Department of Health and Mental Hygiene

The Laboratories Administration—Maryland's State Public Health Laboratory

Examination of Foodborne Pathogens in Raw Milk in Maryland

Why Maryland prohibits the sale for consumption

Introduction

For years, there has been debate over the health risks and benefits of the consumption of raw milk. On August 10, 1987, the FDA published a regulation mandating the pasteurization of all milk and milk products in final package form for direct human consumption (21 CFR 1240.61). A state may adopt regulations permitting the sale of raw milk for consumption. Twenty eight states have legalized the intrastate sale of raw milk for human consumption.[1] In some states, such as Colorado, Virginia, and Wisconsin, raw milk is available through cow share programs. However, in

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Photo 1: Documenting existing equipment and work spaces, Mark Fitzgerald of HDR/ CUH2A takes photos, while scientist Diane Walker of the Mycobacteriology Laboratory tests specimens at the bench.
Photo: Georgia Corso

New Central Public Health Laboratory

Design phase of new laboratory begins

On February 6th of this year, representatives from the Maryland Economic Development Corporation (MEDCO), Forest City-New East Baltimore Partnership (FC-NEBP), and the Maryland Department of Health and Mental Hygiene (DHMH) began the process of selecting a laboratory planning and architectural firm to design the Laboratories Administration's new central public health laboratory. The new laboratory will be located on Ashland and Rutland Avenues in East

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Inside: Direct Fluorescent Antibody *Treponema Pallidum* (DFA-TP) test to be discontinued effective 7/1/10

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Examination of Foodborne Pathogens in Raw Milk in Maryland

Maryland the sale of raw milk for consumption is neither lawful nor available through such programs.

The Survey

A survey (bacteriological examination) of foodborne pathogens and indicator bacteria was performed on 56 raw milk samples from randomly selected dairy herds in Maryland. The aim of this survey was to detect foodborne pathogens of significant public health importance in the raw milk samples collected in Maryland dairy farms. The results obtained from this survey may provide useful data for risk assessment regarding the consumption of raw milk.

Results

A total of 56 raw milk samples were examined in this study (Table 1).

Listeria - detected by BAX® PCR (polymerase chain reaction) screening in four samples. Culture methods confirmed one positive sample from these four samples, which was further identified as *L. monocytogenes* (1.8%).

Campylobacter spp. - detected in a total of four samples (7%).

***Salmonella* and *Eschericia coli* O157:H7** - not detected by culture methods or BAX® PCR in any samples.

Staphylococcus aureus - 29 (52%) samples were positive. Of these, 24 samples were in the range between 10 to 500 CFU/mL (colony forming units per milliliter.) The remaining five positive samples were in the range between 501 to 3,820 CFU/mL.

Fecal coliform including *E. coli* - found in 46 samples (82%) ranging from 36 to 2.4 x 107/100 mL. In most cases, they were determined to be *E. coli* using selective medium and biochemical reactions.

Correlation between the presence of identified pathogens and the level of indicator bacteria. Pathogens (*Listeria* or *Campylobacter*) were not detected in samples when indicator bacteria (coliform or *E. coli*) were under the test limit (<30 MPN/100mL). These pathogens were found only in samples yielding more than 430 MPN/100mL for coliform or 210 MPN/100mL for *E. coli*. A correlation between indicator bacteria and the level of *S. aureus* was not seen.

Discussion

Bacterial populations, specific pathogens or indicator bacteria (coliforms and *E. coli*), are important parameters as measures of raw milk hygiene. Although a number of research papers reported the survey on the bacteriological examination of raw milk, very little information is known concerning the parameters of raw milk produced in Maryland. Raw milk samples collected in Maryland were examined for *Listeria*, *Salmonella*, *E. coli* O157:H7,

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Table 1. Summary of bacterial examination of raw milk samples in Maryland.

Organisms	*Listeria Mono-cytogenes* [a,b]	*Campylobac-ter* [a]	*Salmonella* [a,b,c]	*E. coli* O157:H7 [a,b]	*S. aureus* [a,d]	Fecal coli-forms (MPN/100ml)	*E. coli* (MPN/100ml)
Positive	1	4	0	0	29	46	46
Negative [e]	55	52	56	56	27	10	10
Mean (Median)					213 (10)	1,699 (230)	1,362 (230)
Positive rate	1.8%	7%	0	0	52%	82%	82%

[a] Examination as specified in BAM. 2003. FDA. [b] Examination by BAX-PCR. [c] Confirmation by TECRA. [d] N=24, 10-500 MPN/ml; N=5, 501-3,820 MPN/ml. [e] Below detectable level.
Source: DHMH Laboratories Administration

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Campylobacter, *S. aureus*, as well as fecal coliforms and *E. coli*.

Listeria was detected in one milk sample and was subsequently identified as *L. monocytogenes*. The presence of *Listeria*, as demonstrated in this study, is in agreement with previous studies.[2,3] Van Kessel observed a higher isolation rate for *L. monocytogenes* (6.5%).[3] The presence of *Listeria* poses a great health concern considering that *L. monocytogenes* is often found in the intestines of healthy animals (including humans) and in the environment, e.g., in soil, water, vegetation, and on the surfaces of equipment, floors, and walls. In addition, the tolerance of *L. monocytogenes* to diverse environmental conditions, including low pH and high sodium chloride (NaCl), and the ability to grow slowly at refrigerated temperatures, are of concern. Listeriosis is of major public health importance because of the severity of the disease (meningitis, septicemia, and abortion), a high fatality rate (approximately 20-30%), a long incubation time, and a predilection for immunocompromised patients, pregnant women, neonates and the elderly.

Campylobacter was detected in four samples representing 7% of the total samples tested. The species of *Campylobacter* was not determined in this survey. Thus, additional tests are needed to further identify *Campylobacter*. In fact, illnesses associated with *Campylobacter* were predominant in a study period (1973-1992) for raw milk-related outbreaks in states where the intrastate sale of raw milk was legal.[1]

Each year, over two million estimated cases of human campylobacteriosis occur, making it the most commonly reported foodborne bacterial infections in the United States.[4, 5] *Campylobacter* species can cause mild to severe diarrhea, with loose, watery stools often followed by bloody diarrhea.[5, 6] *C. jejuni*, *C. coli*, and *C. lari* account for more than 99% of the human isolates (*C. jejuni* 90%). Dairy products appear to be the main vehicle of transmission of *Campylobacter*.[6]

S. aureus was detected in 52% of the raw milk samples. The contamination source may be either the milking environment or mastitis in dairy cows. *S. aureus* is an important udder pathogen often associated with subclinical mastitis.[7] The total number of *S. aureus* seen in this survey was similar to the findings by Rea et al. who reported a mean of 1,200 to 3,500 cells/mL in all samples.[2] Quantitative microbial risk assessment for *S. aureus* and *Staphylococcus enterotoxin* A in raw milk predicted that *S. aureus* levels could surpass the 10^5 CFU/ml level of concern at the 99.9th or 99.99th percentile of servings, and therefore may represent a potential consumer risk.[8] In a recent study, *S. aureus* was detected in 34.6% (46 of 133) of milk samples representing 73% of dairy farms (8 out of 11).[9]

Staphylococcus aureus is a leading cause of foodborne gastroenteritis because it can contaminate food products during preparation and processing. *S. aureus* is widely distributed in warm-blooded animals and up to 30-50% of the human population are carriers.[7] *S. aureus* is able to grow in a wide range of temperatures (7° to 48.5°C with an optimum of 30 to 37°C; Schmitt et al., 1990), as well as a wide range of pH levels (4.2 to 9.3, with an optimum of 7 to 7.5) and NaCl concentrations (up to 15%).[10, 11] These characteristics enable *S. aureus* to grow in a wide variety of foods. Staphylococcal food poisoning is due to the absorption of staphylococcal enterotoxins produced in the food.[7] Outbreaks associated with *Staphylococcus* and staphylococcal enteroxotins in raw milk, raw milk cheese, and other dairy products have been reported.[7,12] Further examination of *S. aureus* phenotypes (i.e., toxin production) may provide useful information on the significance of these organisms related to human health in Maryland.

All the samples tested in this survey were negative for *Salmonella* and *E. coli* O157:H7. The occurrence of *E. coli* O157:H7 in dairy farms varies in different studies. Negative results were reported in some studies,[13, 14] however, others reported *E. coli* O157:H7 in 4% of the samples tested.[15, 16] Caution must be taken to draw a conclusion that the raw milk in Maryland is free of these two foodborne pathogens. Additional sampling is needed to expand upon these tests. *E. coli* O157:H7 poses a high risk with low infectious doses for humans.[4] Consumption of raw milk has been implicated as the cause in several *E. coli* O157:H7 outbreaks.[17, 18, 19, 20]

Dairy farms are considered reservoirs for many foodborne pathogens, including *Salmonella*, *Listeria*, *Campylobacter*, and enterohemorrhagic *E. Coli*.[17, 21] The presence of these and other pathogens in raw milk is the result of fecal contamination on teats, udder surfaces, and milking machines.[18] Scientists from the U.S. Department of Agriculture reported test results for raw milk collected from 861 farms in 21 states.[3] Nearly a quarter contained bacteria linked to human illness, including *Listeria* (5%), *Salmonella* (3%), and types of *E. coli* (4%) that can cause diarrhea and other gastrointestinal illnesses. Less than 1% of samples had *E. coli* O157:H7.

One striking feature of this survey is the correlation between the presence of *Listeria* and *Campylobacter* with regard to the level of contamination. This might

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The services and facilities of the Maryland Department of Health and Mental Hygiene (DHMH) are operated on a non-discriminatory basis. This policy prohibits discrimination on the basis of age; ancestry; color; creed; marital status; mental or physical disability; national origin; race; religious affiliation, belief, or opinion; sex; or sexual orientation and plies to the provisions of employment and granting of advantages, privileges and accommodations.

The Department, in compliance with the Americans with Disabilities Act, ensures that qualified individuals with disabilities are given an opportunity to participate in and benefit from DHMH services, programs, benefits, and employment opportunities.

Photo 2: Reviewing current work flows in the Public Health Microbiology Division. From left to right; Will Andalora (DHMH Office of Capital Planning, Budgeting and Engineering Services), Mark Fitzgerald and Warren Hendrickson (HDR/CUH2A), Dr. Jafar Razeq, and Michele Plehn (Laboratories Administration.) Photo: Georgia Corso

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indicate that the presence of these organisms is most likely the result of contamination of the raw milk following milking. A previous investigation found milking facilities to be contaminated with a variety of bacterial pathogens, including *Listeria*, *Salmonella*, *E. coli* O157:H7, and *Campylobacter*.[21, 22] *Listeria* is ubiquitous on dairy farms and present in cows' feces, feed, and milk.[23] In a recent study, *L. monocytogenes* was isolated from 6 of 40 (15%) sampling sites in the milking parlor and on the milking equipment.[24] The presence of infectious agents in milk is due to direct contact with contaminated sources in the dairy farm environment and to excretion from the udder of an infected animal.[21, 22] Therefore, raw milk can be a significant source of foodborne pathogens.

This article was written by the collective efforts of Dr. C. Zhu, B. Jolbitado, B. Chandler, J. Kiluk, S. Kogan, T. Elkin, and L. Bucher.

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New Central Public Health Laboratory

Baltimore, just a few blocks from the Johns Hopkins Medical Institutions and the Bloomberg School of Public Health.

This process began with a review of preliminary proposals submitted by 18 architectural firms. Over the next few weeks this number was narrowed, first to nine qualified firms, and then further narrowed to three firms invited to make formal, in-person proposals on March 10th. A final review of proposals by the Selection Committee on March 1 resulted in the selection of the architectural firm, HDR/CUH2A.

HDR/CUH2A has an excellent track record of designing over a dozen state public health laboratories over the past 20 years. Most recently these include the state laboratories (with completion dates) in IA (Apr. 2010), NC (Feb. 2012), UT (Apr. 2010), VT (Fall 2013), WY (Nov. 2010), and now MD (Summer 2013). In addition HDR/CUH2A is providing their first team of architects, laboratory planners, and others on whom the project will depend.

Project oversight consists of a Steering Committee made up of representatives from MEDCO, FC-NEBC, and DHMH. There is also a Users' Group consisting of a dozen Laboratories Administration staff that will coordinate technical input and work closely with HDR/CUH2A's laboratory design team. HDR/CUH2A is providing a leadership team (Project Director, Senior Project Manager, Principal Laboratory Planner, Project Manager, and Lead Engineer).

Additional key HDR/CUH2A team members include the Project Architects, Laboratory Planners, Engineers (mechanical, electrical, plumbing, fire, and civil), Interior Designer, and a number of specialty consultants in sustainability, lighting, audio visuals, telecommunications, security, and cost estimation.

On April 5th this project officially began with a kick-off meeting of stakeholders in the existing J. Mehsen Joseph Public Health Laboratory. That same afternoon the laboratory planners initiated the first part of the Design Phase, by meeting with members of the Users' Group and other laboratory staff, lab section by lab section, to review and update the new facility's program of requirements (POR). Over six weeks this review and updating is going through three two-week iterations in which data is obtained to make updates in the first week and reviews and approvals of updates are sought in the second week. By the end of the six weeks the planners expect to not only have the POR updated and approved but also will have sufficient information to begin the second part of the design phase. This will consist of proposing floor plan locations for laboratories to maximize workflow efficiencies and determine how the various floors of laboratories can be stacked.

At the same time the laboratory planners are updating the POR, the architects and engineers will begin to design the building's shell and infrastructure. The new laboratory facility is expected to produce both a cutting-edge laboratory design and a Leed Silver building that projects an inspiring design in an urban environment. Meeting all these requirements will be a very challenging achievement, but one that all involved in the project are working hard to meet.

DFA-TP Test to be Discontinued Effective 7/1/10

The Laboratories Administration' Division of Virology/Immunology will discontinue the Direct Fluorescent Antibody *Treponema pallidum* (DFA-TP) test effective July 1, 2010. This original request was initiated in 2009 by the previous supervisor of the Syphilis Serology Laboratory, Mr. John Gurney, who cited numerous justifications for the test's discontinuation. The current Chief of the Division of Virology/Immunology, Dr. Maria Carlos, agrees that given the following technical considerations, discontinuation of the assay is warranted.

The Syphilis Serology Laboratory receives a limited number of DFA-TP test requests (five to six weekly) from only two submitters within the Baltimore City Health Department (BCHD.) The submitters collect lesion exudates from suspect syphilis patients and perform dark field microscopy examinations for the presence of *T. pallidum.* Slides that require further confirmation are sent to the Laboratories Administration for DFA-TP testing.

The success of any DFA test is based on the quality and specificity of the test kit's antibody. According to Mr. Gurney and the current Program Director, Thomas Lawson, there are no FDA approved reagents for the DFA-TP assay. The laboratory currently performs the test with a non-absorbed polyclonal antibody that reacts with non-pathenogenic treponemal organisms. Staff must therefore differentiate treponemal species based on factors such as morphology and motility rather then fluorescence emission alone.

In the rare instance that the Laboratories Administration reports *possible T. pallidum* presence via DFA-TP analysis (one to two times yearly), the results must be qualified as "for research purposes only." Mr. Lawson has spoken to the Directors of the BCHD and has made them aware of the limitations of the assay and the considerations for the assay's phase-out.

Furthermore in 2006, CDC discontinued DFA-TP testing and replaced these test requests with real-time PCR assays. The Laboratories Administration offers a series of syphilis test assays that can serve as alternatives to DFA-TP testing, including: RPR, VDRL, and EIA. All of the aforementioned tests can demonstrate higher sensitivity and specificity when compared to a DFA-TP platform that utilizes a polyclonal antibody for detection.

Laboratory Statistics

Reported from the
Laboratories Administration
during the month of
February 2010

ENTERIC BACTERIOLOGY

GENUS SEROVAR	SEX	AGE	#	JURISDICTION
CAMPYLOBACTER JEJUNI				
	M	39	1	ANNE ARUNDEL
	U	20	1	BALTIMORE
	F	63	1	BALTIMORE
	F	51	1	BALTIMORE
	F	50	1	BALTIMORE
	F	45	1	BALTIMORE
	M	20	1	KENT
	M	5	1	KENT
	U	80	1	OUT OF STATE
	F	53	1	OUT OF STATE
	M	102	1	OUT OF STATE
	M	47	1	OUT OF STATE
	M	14	1	OUT OF STATE
	M	18	1	OUT OF STATE
SALMONELLA				
	M	35	1	BALTIMORE
	M	46	1	MONTGOMERY
	F	47	1	OUT OF STATE
	F	1	1	OUT OF STATE
	M	0	1	TALBOT
SALMONELLA SER. BAREILLY				
	M	0	1	BALTIMORE
SALMONELLA SER. BERTA				
	F	6	1	BALTIMORE CITY
SALMONELLA SER. ENTERITIDIS				
	F	23	1	ANNE ARUNDEL
	F	21	1	BALTIMORE
	M	49	1	BALTIMORE
	M	6	1	BALTIMORE
	U	20	2	BALTIMORE CITY
	F	66	1	BALTIMORE CITY
	F	49	3	BALTIMORE CITY
	F	3	1	BALTIMORE CITY
	F	2	1	BALTIMORE CITY
	F	1	1	BALTIMORE CITY
	F	1	1	BALTIMORE CITY
	M	0	1	BALTIMORE CITY
	M	70	1	BALTIMORE CITY
	M	49	1	BALTIMORE CITY
	F	80	1	HARFORD
	F	20	1	OUT OF STATE
	M	0	1	OUT OF STATE
	M	19	1	OUT OF STATE
	M	1	1	OUT OF STATE
	F	65	2	PRINCE GEORGE'S
	F	77	1	PRINCE GEORGE'S
SALMONELLA SER. HEIDELBERG				
	M	2	1	BALTIMORE CITY
	M	6	1	FREDERICK
SALMONELLA SER. MISSISSIPPI				
	U	0	1	ANNE ARUNDEL
SALMONELLA SER. MUENCHEN				
	F	56	1	FREDERICK
SALMONELLA SER. SANDIEGO				
	M	12	1	MONTGOMERY
SALMONELLA SER. TYPHI				
	F	35	1	BALTIMORE
	M	0	1	BALTIMORE CITY
	F	77	1	BALTIMORE CITY
SALMONELLA SER. TYPHIMURIUM VAR COPENHAGEN				
	M	63	1	BALTIMORE
	U	45	1	OUT OF STATE
	F	3	1	OUT OF STATE
SHIGELLA FLEXNERI II:3,4				
	U	3	1	MONTGOMERY
SHIGELLA SONNEI				
	F	6	1	OUT OF STATE
	U	61	1	WASHINGTON
VIBRIO FLUVIALIS				
	M	87	1	BALTIMORE CITY
TOTAL			**61**	

ISOLATES - REFERENCE

GENUS SPECIES	SOURCE	#	JURISDICTION
PSEUDOMONAS PUTIDA			
	U	1	PRINCE GEORGE'S
TOTAL		**1**	

ISOLATES - MISCELLANEOUS

GENUS SPECIES	SOURCE	#	JURISDICTION
CITROBACTER FREUNDII COMPLEX			
	LEG	1	BALTIMORE CITY
CORYNEBACTERIUM PSEUDODIPHTHERITICUM			
	THROAT	1	WASHINGTON
ENTEROCOCCUS FAECALIS			
	BLOOD	1	BALTIMORE CITY
	OTHER	1	BALTIMORE CITY
ESCHERICHIA COLI			
	ASPIRATE	1	BALTIMORE CITY
	BLOOD	1	BALTIMORE CITY
	OTHER	1	BALTIMORE CITY
	VAGINAL	1	MONTGOMERY
	VAGINAL	1	PRINCE GEORGE'S
GARDNERELLA VAGINALIS			
	VAGINAL	3	PRINCE GEORGE'S
	VAGINAL	1	SOMERSET
STAPHYLOCOCCUS AUREUS			
	BLOOD	2	BALTIMORE CITY
	SCALP	1	BALTIMORE CITY
	NASAL	3	CARROLL
	NASO	1	CARROLL
	WOUND	3	CARROLL
	WOUND	1	FREDERICK
	VAGINAL	1	MONTGOMERY
STAPHYLOCOCCUS, COAGULASE NEGATIVE			
	BLOOD	1	BALTIMORE CITY
STREPTOCOCCUS, BETA HEMOLYTIC GROUP A			
	THROAT	1	BALTIMORE
STREPTOCOCCUS, BETA HEMOLYTIC GROUP B			
	VAGINAL	4	ANNE ARUNDEL
	VAGINAL	3	PRINCE GEORGE'S
	VAGINAL	1	PRINCE GEORGE'S
	VAGINAL	9	PRINCE GEORGE'S
STREPTOCOCCUS, VIRIDANS GROUP			
	WOUND	1	CARROLL
TOTAL		**45**	

SEXUALLY TRANSMITTED DISEASES

GENUS SPECIES	SEX	#	JURISDICTION
SYPHILIS SEROLOGY			
	M	2	ANNE ARUNDEL
	F	3	BALTIMORE
	M	5	BALTIMORE
	F	9	BALTIMORE CITY
	M	18	BALTIMORE CITY
	M	1	FREDERICK
	M	1	HOWARD
	F	3	MONTGOMERY
	M	5	MONTGOMERY
	F	4	PRINCE GEORGE'S
	M	16	PRINCE GEORGE'S
	M	2	SAINT MARY'S
	M	1	UNKNOWN
	M	1	WASHINGTON
	U	1	WASHINGTON
	F	1	WICOMICO
	M	2	WICOMICO
TOTAL		**75**	
CHLAMYDIA TRACHOMATIS			
	F	9	ALLEGANY
	M	11	ALLEGANY
	U	1	ALLEGANY
	F	20	ANNE ARUNDEL
	M	7	ANNE ARUNDEL
	F	24	BALTIMORE
	M	12	BALTIMORE
	F	8	BALTIMORE CITY
	M	13	BALTIMORE CITY
	U	1	BALTIMORE CITY
	F	3	CALVERT
	M	2	CALVERT
	M	1	CAROLINE
	F	2	CARROLL
	M	2	CECIL
	F	9	CHARLES
	M	1	CHARLES
	F	1	DORCHESTER
	M	1	DORCHESTER
	U	1	DORCHESTER
	F	2	FREDERICK

M	3	FREDERICK
M	1	GARRETT
F	8	HARFORD
M	2	HARFORD
F	5	HOWARD
M	1	HOWARD
U	1	HOWARD
F	2	KENT
M	1	KENT
F	6	MONTGOMERY
M	4	MONTGOMERY
F	41	PRINCE GEORGE'S
M	42	PRINCE GEORGE'S
U	2	PRINCE GEORGE'S
M	2	QUEEN ANNE'S
F	2	SAINT MARY'S
M	2	SAINT MARY'S
F	4	SOMERSET
M	5	SOMERSET
F	3	TALBOT
M	2	TALBOT
F	3	WASHINGTON
M	3	WASHINGTON
F	17	WICOMICO
M	5	WICOMICO
F	3	WORCESTER
M	3	WORCESTER

TOTAL 304

NEISSERIA GONORRHOEAE

M	1	ANNE ARUNDEL
F	1	BALTIMORE
M	2	BALTIMORE
M	1	CAROLINE
F	3	CHARLES
M	1	CHARLES
M	2	DORCHESTER
M	1	HARFORD
F	1	MONTGOMERY
M	1	MONTGOMERY
F	12	PRINCE GEORGE'S
M	7	PRINCE GEORGE'S
F	1	SAINT MARY'S
M	1	SAINT MARY'S
F	1	WASHINGTON
M	1	WASHINGTON
F	1	WICOMICO
M	4	WICOMICO
M	1	WORCESTER

TOTAL 43

MYCOBACTERIOLOGY

ISOLATE

SEX	AGE	#	JURISDICTION
AEROBIC ACTINOMYCETE			
M	65	1	BALTIMORE
MYCOBACTERIUM AVIUM COMPLEX			
M	80	4	ANNE ARUNDEL
M	54	1	BALTIMORE
F	40	1	BALTIMORE CITY
F	93	1	BALTIMORE CITY
M	27	1	BALTIMORE CITY
M	31	1	BALTIMORE CITY
M	74	1	BALTIMORE CITY
M	90	1	BALTIMORE CITY
F	40	1	CALVERT
M	32	1	CARROLL
M	52	1	CECIL
F	33	1	FREDERICK
F	81	1	FREDERICK
M	63	1	FREDERICK
F	49	1	MONTGOMERY
M	29	1	OUT OF STATE
F	68	3	PRINCE GEORGE'S
M	53	3	SAINT MARY'S
M	34	2	WASHINGTON
F	78	1	WICOMICO
MYCOBACTERIUM CHELONAE			
M	42	1	CECIL
F	85	1	FREDERICK
MYCOBACTERIUM FORTUITUM			
F	60	1	MONTGOMERY
F	89	1	MONTGOMERY
M	52	1	OUT OF STATE
MYCOBACTERIUM FORTUITUM COMPLEX			
M	87	1	BALTIMORE CITY
F	85	3	FREDERICK
F	79	1	MONTGOMERY
M	37	1	MONTGOMERY
M	46	1	MONTGOMERY
M	17	1	PRINCE GEORGE'S
F	50	1	SOMERSET
M	71	2	WICOMICO
MYCOBACTERIUM GORDONAE			
F	63	1	BALTIMORE CITY
M	37	1	BALTIMORE CITY
M	35	1	MONTGOMERY
M	68	1	MONTGOMERY
F	21	1	PRINCE GEORGE'S
M	78	2	WASHINGTON
MYCOBACTERIUM KANSASII			
F	68	1	BALTIMORE
M	50	1	BALTIMORE
M	48	1	TALBOT
MYCOBACTERIUM MARINUM			
F	81	1	ANNE ARUNDEL
MYCOBACTERIUM TUBERCULOSIS			
F	81	1	BALTIMORE
F	63	1	BALTIMORE CITY
F	38	1	MONTGOMERY
M	29	1	MONTGOMERY
M	33	1	MONTGOMERY
M	48	1	MONTGOMERY
U	25	1	OUT OF STATE
F	30	1	OUT OF STATE
F	47	1	OUT OF STATE
M	57	1	OUT OF STATE
M	15	1	PRINCE GEORGE'S
MYCOBACTERIUM TUBERCULOSIS COMPLEX			
U	44	1	BALTIMORE
M	68	1	BALTIMORE
M	48	1	BALTIMORE CITY
F	51	1	HARFORD
F	19	6	MONTGOMERY
F	38	3	MONTGOMERY
M	29	4	MONTGOMERY
M	31	1	MONTGOMERY
M	33	2	MONTGOMERY
M	52	3	MONTGOMERY
M	25	3	OUT OF STATE
M	57	1	OUT OF STATE
U	28	1	OUT OF STATE
F	47	1	PRINCE GEORGE'S
M	29	1	PRINCE GEORGE'S
MYCOBACTERIUM, NON-TUBERCULOSIS			
M	84	1	WICOMICO

TOTAL 98

MYCOBACTERIUM SUSCEPTIBILITY RESULTS

16 ISOLATES IDENTIFIED
3 DRUG RESISTANT STRAINS FOUND

#	JURISDICTION	DRUG(S)
1	BALTIMORE CITY	STREPTOMYCIN
1	MONTGOMERY	ISONIAZID, STREPTOMYCIN
1[B]	MONTGOMERY	PYRAZINAMIDE

[A] TWO ISOLATES FROM THE SAME PATIENT
[B] PROBABLE FOR M. BOVIS
[C] MEETS CASE DEFINITION OF MULTI-DRUG TUBERCULOSIS (MDRTB)

Mycobacterium tuberculosis complex consists of:
M. tuberculosis
M. bovis
M. bovis, BCG
M. africanum
M. microti
M. canettii

MYCOLOGY

ISOLATE

SEX	AGE	#	JURISDICTION
ALTERNARIA SPECIES			
U	0	1	UNKNOWN
ASPERGILLUS FUMIGATUS			
F	56	1	ALLEGANY
CANDIDA ALBICANS			
F	83	1	CALVERT
CANDIDA PARAPSILOSIS			
U	0	1	UNKNOWN
EPIDERMOPHYTON FLOCCOSUM			
U	0	1	UNKNOWN
FONSECAEA PEDROSOI			
U	0	1	UNKNOWN
NOCARDIA SPECIES			
F	50	1	CECIL
F	66	1	FREDERICK
PENICILLIUM SPECIES			
F	83	1	CALVERT
WANGIELLA DERMATITIDIS			
U	0	1	UNKNOWN

TOTAL 10

PARASITOLOGY

GENUS/SPECIES

#	JURISDICTION
BLASTOCYSTIS HOMINIS	
1	MONTGOMERY
ENDOLIMAX NANA	
1	BALTIMORE CITY
1	MONTGOMERY
ENTAMOEBA COLI	
1	CARROLL
ENTEROBIUS VERMICULARIS	
1	PRINCE GEORGE'S
GIARDIA LAMBLIA	
1	BALTIMORE CITY
1	PRINCE GEORGE'S
1	BALTIMORE CITY
PLASMODIUM FALCIPARUM	
1	BALTIMORE CITY

TOTAL 9

WATER MICROBIOLOGY

	# TESTED	# NON-COMPLIANT
COMMUNITY	1	0
NON-COMMUNITY	181	28
TOTAL	**182**	**28**

FOOD PROTECTION

	TOTALS
FOOD	
NUMBER OF SAMPLES	40
NOTABLE PATHOGENS:	
CAMPYLOBACTER SP.	5
LISTERIA SP.	0
SALMONELLA SP.	7
CRABMEAT	
NUMBER OF SAMPLES	0
EXCEEDING STANDARDS[1]	0
NOTABLE PATHOGENS:	
LISTERIA INNOCUA	0
SHELLFISH	
NUMBER OF SAMPLES	0
EXCEEDING STANDARDS[2]	0
TOTAL STANDARDS EXCEEDED	12
SHELLFISH GROWING WATERS	
NUMBER OF SAMPLES	36
OTHER	
CLOSTRIDIUM BOTULINUM	0
TOTAL NUMBER OF SAMPLES	**76**

STANDARDS

[1]CRABMEAT FRESH
ESCHERICHIA COLI AT < 36 MPN/100 GRAMS
STANDARD PLATE COUNT AT < 100

[2]SHELLFISH
FECAL COLIFORMS AT < 230 MPN/100 GRAMS
STANDARD PLATE COUNT AT < 500,000 PER GRAM

VIRUS ISOLATION

ISOLATE SEX	AGE	#	JURISDICTION
ADENOVIRUS			
M	0	1	ANNE ARUNDEL
F	0	1	BALTIMORE CITY
HERPES SIMPLEX VIRUS TYPE 1			
F	18	1	ALLEGANY
F	20	1	ALLEGANY
M	41	1	BALTIMORE CITY
M	20	1	BALTIMORE CITY
PARAINFLUENZA VIRUS 1			
U	1	1	CHARLES
RESPIRATORY SYNCYTIAL VIRUS			
F	86	1	ANNE ARUNDEL
M	0	1	ANNE ARUNDEL
F	1	1	ANNE ARUNDEL
F	0	1	ANNE ARUNDEL
M	0	1	BALTIMORE
U	0	1	BALTIMORE
M	1	1	BALTIMORE
M	0	1	BALTIMORE
M	1	1	BALTIMORE
U	1	1	BALTIMORE
M	0	1	CECIL
M	2	1	BALTIMORE CITY
RHINOVIRUS			
F	49	1	MONTGOMERY
TOTAL		**20**	

VIRAL POLYMERASE CHAIN REACTION (PCR)

ISOLATE SEX	AGE	#	JURISDICTION
HERPES SIMPLEX VIRUS TYPE 1			
F	20	1	ALLEGANY
F	0	1	BALTIMORE CITY
F	21	1	BALTIMORE CITY
F	22	1	BALTIMORE CITY
F	23	1	BALTIMORE CITY
F	24	1	BALTIMORE CITY
F	25	1	BALTIMORE CITY
M	19	1	BALTIMORE CITY
M	21	1	BALTIMORE CITY
M	29	1	BALTIMORE CITY
F	20	1	PRINCE GEORGE'S
M	20	1	PRINCE GEORGE'S
M	21	1	PRINCE GEORGE'S
F	19	1	SAINT MARY'S
F	36	1	TALBOT
HERPES SIMPLEX VIRUS TYPE 2			
F	22	1	ALLEGANY
F	24	1	ANNE ARUNDEL
F	56	1	ANNE ARUNDEL
F	23	2	BALTIMORE
U	0	2	BALTIMORE CITY
F	19	1	BALTIMORE CITY
F	20	1	BALTIMORE CITY
F	22	2	BALTIMORE CITY
F	29	1	BALTIMORE CITY
M	0	1	BALTIMORE CITY
M	19	1	BALTIMORE CITY
M	21	1	BALTIMORE CITY
M	23	1	BALTIMORE CITY
M	25	1	BALTIMORE CITY
M	30	1	BALTIMORE CITY
M	32	2	BALTIMORE CITY
M	38	1	BALTIMORE CITY
M	40	1	BALTIMORE CITY
M	42	1	BALTIMORE CITY
M	46	1	BALTIMORE CITY
F	22	1	CHARLES
F	26	1	CHARLES
F	30	1	CHARLES
F	18	1	PRINCE GEORGE'S
F	22	1	PRINCE GEORGE'S
F	28	1	PRINCE GEORGE'S
M	19	1	PRINCE GEORGE'S
F	24	1	TALBOT
F	24	1	WICOMICO
F	16	1	WORCESTER
INFLUENZA A(H1/N1) NOVEL A			
F	21	1	ALLEGANY
M	2	1	ALLEGANY
M	20	1	ALLEGANY
M	41	1	ALLEGANY
M	50	1	ANNE ARUNDEL
F	46	1	BALTIMORE CITY
F	50	1	BALTIMORE CITY
F	52	1	BALTIMORE CITY
M	24	1	BALTIMORE CITY
M	49	1	BALTIMORE CITY
M	17	1	CECIL
TOTAL		**60**	

VIRAL HEPATITIS

ORGANISM	# SPECIMENS	# POSITIVES	JURISDICTION
HEPATITIS A			
	1	0	BALTIMORE
	1	0	MONTGOMERY
	1	0	PRINCE GEORGE'S
SUBTOTAL	**3**	**0**	
HEPATITIS B			
	51	0	ALLEGANY
	132	2	ANNE ARUNDEL
	43	1	BALTIMORE
	290	3	BALTIMORE CITY
	2	0	CALVERT
	17	1	CARROLL
	117	2	CECIL
	8	0	CHARLES
	1	0	DORCHESTER
	22	0	FREDERICK
	8	1	GARRETT
	13	0	HARFORD
	26	4	HOWARD
	1	0	KENT
	173	1	MONTGOMERY
	252	6	PRINCE GEORGE'S
	1	0	QUEEN ANNE'S
	1	0	SAINT MARY'S
	8	0	TALBOT
	1	0	UNKNOWN
	39	0	WASHINGTON
	65	0	WICOMICO
SUBTOTAL	**1,271**	**21**	

HEPATITIS C

47	5	ALLEGANY
151	31	ANNE ARUNDEL
48	4	BALTIMORE
149	38	BALTIMORE CITY
4	0	CALVERT
20	2	CARROLL
51	15	CECIL
8	0	CHARLES
1	0	DORCHESTER
20	0	FREDERICK
10	0	GARRETT
28	1	HARFORD
13	1	HOWARD
1	0	KENT
21	1	MONTGOMERY
146	2	PRINCE GEORGE'S
1	0	QUEEN ANNE'S
1	0	SAINT MARY'S
8	0	TALBOT
1	0	UNKNOWN
20	0	WASHINGTON
16	1	WICOMICO
SUBTOTAL		
765	**101**	
TOTALS		
2,039	**122**	

RABIES

SOURCE	#	JURISDICTION
CAT	1	CECIL
FOX	1	CECIL
	1	MONTGOMERY
RABBIT	1	CARROLL
RACCOON	1	BALTIMORE
	2	BALTIMORE CITY
	1	CECIL
	1	FREDERICK
	1	HARFORD
	2	MONTGOMERY
	1	PRINCE GEORGE'S
	2	SAINT MARY'S
	2	SOMERSET
	3	WORCESTER
SKUNK	1	ALLEGANY
	1	TALBOT
TOTAL POSITIVES	**22**	
TOTAL SPECIMENS	**206**	

CHLAMYDIOPHILIA PSITTACI
(CHLAMYDIA)

REPORTED QUARTERLY
NO REPORT THIS MONTH

CD4 FLOW CYTOMETRY WORKLOAD

REPORTED QUARTERLY
NO REPORT THIS MONTH

BLOOD LEAD

MARYLAND

I	<10	71
IIA	10-14	2
IIB	15-19	1
III	20-44	3
IV	45-69	0
V	>69	0
TOTAL		**77**

WASHINGTON DC

I	<10	0
IIA	10-14	0
IIB	15-19	0
III	20-44	0
IV	45-69	0
V	>69	0
TOTAL		**0**

NEWBORN & CHILDHOOD SCREENING

PRESUMPTIVE POSITIVES

DISORDERS	#
PHENYLKETONURIA	2
MAPLE SYRUP URINE DISEASE	1
HOMOCYSTINURIA	9
TYROSINEMIA	9
ARGININEMIA	0
CITRULLINEMIA	0
GALACTOSEMIA	1
BIOTINIDASE DEFICIENCY	5
HYPOTHYROIDISM	54
HEMOGLOBIN -DISEASE	15
HEMOGLOBIN -BENIGN	485
CONGENITAL ADRENAL HYPERPLASIA (CAH)	40
CYSTIC FIBROSIS	1
FATTY ACID OXIDATIONS	6
ORGANIC ACIDEMIAS	18
ACYLCARNITINE - BORDERLINE	16
ACYLCARNITINE - OTHERS	0

MONTHLY TOTALS

# OF SPECIMENS SCREENED	11,081
NUMBER OF TESTS	833,444
% UNSATISFACTORY SPECIMENS	2.6

YEAR-TO-DATE CONFIRMED CASES

CONDITIONS	# CONFIRMED
MCAD	1
SCAD	2
GALACTOSE EPIMERASE DEFICIENCY	1
HYPOTHYROIDISM - PRIMARY	4
OTHER HYPOTHYROIDISM	1
SICKLE CELL DISEASE -SS	12
SICKLE CELL DISEASE -SC	5
SICKLE CELL DISEASE -S BETA THALASSEMIA	1
CYSTIC FIBROSIS	2
3-METHYLCROTONYL-COA CAR-BOXYLASE DEFICIENCY (3-MCC)	1
GALACTOSEMIA - VARIANT -DG	2
TBG DEFICIENCY	1

ENVIRONMENTAL CHEMISTRY

SAMPLE TYPES	# NON-COMPLIANT	# TESTED
ASBESTOS		
AIR	0	0
BULK	1	1
AIR QUALITY		
$PM_{2.5}$	0	431
RADIATION		
AIR/CHARCOAL FILTERS	0	24
MILK	0	2
WIPES	0	0
RAW WATER	0	2
VEGETATION	0	0
OTHER	0	5
DRINKING WATER		
METALS		
COMMUNITY	2	3
NON-COMMUNITY	1	3
PRIVATE WELLS	27	96
PESTICIDES & PCBs		
COMMUNITY	0	31
NON-COMMUNITY	0	3
PRIVATE WELLS	0	3
VOLATILE ORGANIC COMPOUNDS		
COMMUNITY	0	176
NON-COMMUNITY	0	61
PRIVATE WELLS	1	41
RADIATION		
COMMUNITY	0	16
NON-COMMUNITY	0	0
PRIVATE WELLS	0	2
INORGANICS		
COMMUNITY	0	33
NON-COMMUNITY	3	91
PRIVATE WELLS	3	92
FOOD CHEMISTRY		
SUSPECTED TAMPERING	0	0
MICROSCOPIC FILTH	0	0
LABELING	0	0
SURVEILLANCE	0	0
CHEMICAL CONTAMINATION	0	0
TOTAL	**38**	**1,116**

VIRAL LOAD SPECIMENS

HIV-1 RNA COPIES/ML	$<10^3$	10^3—10^4	10^4—10^5	$>10^5$	**TOTALS**
ALLEGANY	10	1	0	1	**12**
CARROLL	0	0	0	1	**1**
FREDERICK	2	1	0	0	**3**
MONTGOMERY	62	5	5	1	**73**
PRINCE GEORGE'S	77	9	5	1	**92**
WASHINGTON	7	1	0	0	**8**
WICOMICO	2	1	2	0	**5**
SUBTOTALS	160	18	12	4	**194**
DEPT. OF CORRECTIONS	13	0	3	0	**16**
TOTALS	**173**	**18**	**15**	**4**	**210**

HIV ANTIBODY SCREENING

SUBMITTER	TOTAL SPECIMENS	# EIA POSITIVE	% EIA POSITIVE	# WB POSITIVE	% WB POSITIVE
CORRECTIONAL INSTITUTIONS	183	0	0.00%	0	0.00%
FAMILY PLANNING (NON-GOVERNMENT)	90	0	0.00%	0	0.00%
HEALTH CENTERS (NON-GOVERNMENT)	279	31	11.11%	30	96.77%
HLTH DEPT, NON-STD, FAMILY PLAN	283	3	1.06%	0	0.00%
HLTH DEPT, NON-STD, OB/GYN	68	1	1.47%	0	0.00%
HLTH DEPT, NON-STD, OTHER	398	26	6.53%	24	92.31%
HLTH DEPT, STD CLINICS	611	8	1.31%	6	75.00%
HOSPITAL, OTHER	110	6	5.45%	6	100.00%
HOSPITAL, PUBLIC	30	0	0.00%	0	0.00%
JUVENILE SERVICES	52	1	1.92%	1	100.00%
LABORATORIES (NON-HOSPITAL)	301	18	5.98%	10	55.56%
PEDIATRIC - CHILD HEALTH	4	0	0.00%	0	0.00%
PRIVATE PHYSICIANS	7	1	14.29%	0	0.00%
PRIVATE STUDENT HEALTH CNTRS	40	0	0.00%	0	0.00%
PUBLIC STUDENT HEALTH CENTERS	150	1	0.67%	0	0.00%
UNKNOWN, NOT SPECIFIED	1	0	0.00%	0	0.00%
TOTALS	**2,607**	**96**	**3.68%**	**77**	**80.21%**

MAILING LABEL

Critical Link
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