CRITICAL LINK

John M. Colmers
Secretary

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The Laboratories Administration—Maryland's State Public Health Laboratory

Respiratory and Enteric Virus Isolation Results

While the Swine Flu dominated 2009, other respiratory viruses and enteroviruses added confusion

Background

The viruses that primarily infect the respiratory tract, designated respiratory viruses, include the influenza viruses, parainfluenza viruses (PIV), adenoviruses, respiratory syncytial viruses (RSV), and rhinoviruses. Non-polio enteroviruses such as coxsackie viruses, echoviruses, and other enteroviruses can also cause upper respiratory symptoms and even lead to viral meningitis.[1] Enteric viruses, such as rotaviruses, usually infect the gastrointestinal tract and can cause severe gastroenteritis among infants and young children worldwide.[2] Viral infections of the respiratory and the gastrointestinal tract as a group annually account for substantial morbidity and mortality worldwide. Laboratory detection and identification of respiratory and enteric viruses play significant roles in infection control and disease surveillance.

Introduction

The Maryland Department of Health and Mental Hygiene (DHMH) Laboratories Administration has participated in the CDC National Respiratory and Enteric Virus Surveillance System (NREVSS) since 2000. This voluntary laboratory-based surveillance system, pronounced "nervous," monitors temporal and geographic patterns associated with the detection of respiratory syncytial virus (RSV), human parainfluenza viruses (PIV), respiratory and enteric adenoviruses and rotavirus.[3] NREVSS is a network consisting of collaborating university and community hospital laboratories, selected state and county public health laboratories, and commercial laboratories. NREVSS data are published periodically online at http://www.cdc.gov/surveillance/nrevss/ and in the CDC's Morbidity and Mortality Weekly Report.

The Virus Isolation Laboratory, of the Division of Virology and Immunology, is one of the 14 participating laboratories that reports virus isolations and antigen detections results to NREVSS on a bi-weekly basis. Other laboratories participating in NREVSS in Maryland include: Anne Arundel Medical Center, Calvert Memorial Hospital, Civista Medical Center Laboratory, Franklin Square Hospital, Greater Baltimore Medical Center, Hagerstown Medical Laboratory, Holy Cross Hospital, Johns Hopkins Hospital, Mercy Medical Center, Montgomery General Hospital, Sinai Hospital of Baltimore, Union Hospital of Cecil County, and Western Maryland Health System. This network is an important part of the effort to prevent and control respiratory and enteric viral diseases in Maryland.

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Respiratory and Enteric Virus Isolation Results

As a key player in the disease surveillance system, the Virus Isolation Laboratory tests specimens for respiratory and enteric viruses throughout the year. This article reports on the work performed in the Virus Isolation Laboratory and examines the temporal patterns of viral pathogens identified in 2009.

Methods

For respiratory virus testing, naso-pharyngeal secretion samples in Universal Transport Media (Diagnostic Hybrids, Inc., Athens, OH, USA) are collected from patients with influenza-like illness (ILI) and submitted to the Virus Isolation Laboratory by more than 100 clinical labs and sentinel providers of the Maryland ILI Surveillance Network (ILINet). These specimens are first screened by polymerase chain reaction (PCR) assays for influenza viruses by the Molecular Biology Laboratory. Specimens negative for influenza are forwarded to the Virus Isolation Laboratory for inoculation. Specimens are cultured at 33°C using R-Mix cells (Diagnostic Hybrids Inc.), primary monkey kidney cells (Diagnostic Hybrids Inc. and ViroMed Laboratories, Minnetonka, MN), and HEp-2 cells (Diagnostic Hybrids Inc.). Identification of adenovirus, influenza A and B, parainfluenza viruses (PIV) 1, 2, and 3, and RSV is achieved by direct fluorescent antibody testing, using the D3 UltraTM Respiratory Virus Screening & ID Kit (Diagnostic Hybrids, Inc.). In addition, specimens suspected to be rhinoviruses are sent to the Enterovirus Diagnostic Laboratory at the CDC for confirmation and further characterization by PCR.

Fecal specimens, cerebrospinal fluid and nasopharyngeal secretion samples being tested for enteroviruses are inoculated at 37°C using E-Mix cells (Diagnostic Hybrids, Inc.), RD cells (ViroMed Laboratories), WI-38 cells (Diagnostic Hybrids Inc.) and primary monkey kidney cells (either Diagnostic Hybrids, Inc. or ViroMed Laboratories). Coxsackieviruses, echoviruses, and other enteroviruses are detected by indirect fluorescent antibody testing, using Light Diagnostics™ Enterovirus Screening Set Kit (Millipore, Billerica, MA). Certain subtypes of coxsackie-viruses (A9, A24, B1, B2, B3, B4, B5, and B6) and echoviruses (6, 9, 11, 30, and 4) are identified using Light Diagnostics™ Coxsackievirus Antibody Set and Light Diagnostics™ Echovirus Antibody Set respectively. Viral isolates that cannot be subtyped in-house (e.g., enteroviruses, other coxsackieviruses, and echovirus subtypes) are sent to the Enterovirus Diagnostic Laboratory at the CDC for further characterization.

For enteric viruses, human fecal specimens are first screened by PCR for noroviruses by the Molecular Biology Laboratory. Specimens negative for noroviruses are forwarded to the Virus Isolation Laboratory. Rotavirus antigen in fecal suspension is detected by an enzyme immunoassay, Premier™ Rotaclone© (Meridian Bioscience, Inc., Cincinnati, OH).

Results

From January 4, 2009 to December 26, 2009, 3,309 specimens were inoculated in cell culture to test for non-influenza respiratory viruses, and 261 specimens were inoculated to test for enteroviruses at the Virus Isolation Laboratory (see Table 1).

The following non-influenza respiratory viruses were isolated: PIV (59), adenoviruses (32), RSV (21), and rhinoviruses (4), see Table 1. PIV represented a large proportion (59 of 138 (43%)) of non-influenza respiratory viruses identified in 2009. These consisted of four serotypes of PIV (1 through 4) and two subtypes (4a and 4b). In 2009, 25 PIV-1, 17 PIV-2, and 17 PIV-3 were isolated at the Virus Isolation Laboratory (PIV-4 is not detected using our current methods) (see Figure 1). Activities of PIV-1 and 2 peaked in late September and October 2009, with 11 PIV-1 and 7 PIV-2

(Continued on page 3)

Table 1. Non-influenza Respiratory Viruses, Enteroviruses and Rotaviruses Identified at the Virus Isolation Lab in 2009

	Virus Isolation						Antigen Detection	
	No. Tested	PIV	Adenovirus	RSV	Rhinovirus*	Enterovirus	No. Tested	Rotavirus
January	237	3	2	4	0	2	0	0
February	194	1	7	5	1	1	9	0
March	93	1	0	0	0	0	13	5
April	65	1	0	0	0	0	6	2
May	251	10	4	0	0	0	0	0
June	170	7	5	0	0	0	0	0
July	251	0	1	0	0	0	8	0
August	158	2	2	0	0	0	0	0
September	522	11	1	0	3	10	9	0
October	504	14	1	1	0	6	0	0
November	580	7	8	8	0	0	0	0
December	284	2	1	4	0	2	10	0
Total	**3309**	**59**	**32**	**22**	**4**	**21**	**55**	**7**

(Continued from page 2)

Respiratory and Enteric Virus Isolation Results

isolated. PIV-3 activity increased in the early summer months, and seven PIV-3 in May 2009 and five PIV-3 in June 2009 were isolated. Adenoviruses accounted for the second largest group (32 of 138 (23%)) of respiratory viruses isolated in 2009. They are detected throughout the year except in March and April 2009. On the other hand, RSV activities occurred concurrently with the annual influenza season with peak activity observed in November 2009. RSV was isolated in January-February and again in October-December 2009.

Also isolated were the following viruses that belong to the Enterovirus genus: rhinoviruses (4), coxsackieviruses (8), echoviruses (6), and enteroviruses (5) (see Figure 2). Rhinoviruses were only detected in February 2009 (1) and in September 2009 (3). Further characterization of rhinoviruses by PCR was performed by the CDC Enterovirus Diagnostic Laboratory. The rhinovirus isolated in February 2009 was characterized as rhinovirus 16; the three rhinoviruses isolated in September were determined to be two rhinoviruses 1B and one rhinovirus 68. Among the coxsackie viruses isolated, one was coxsackie virus B1; one was B2; five were B4; and two were B5. Among the echoviruses, two were echovirus 30; three were echovirus 18; and one was echovirus 9. Enteroviruses were further characterized by the CDC Enterovirus Diagnostic Laboratory where all were found to be enterovirus 68.

In 2009, of the 55 specimens tested for rotavirus antigen, seven rotavirus were identified positive (see Table 1).

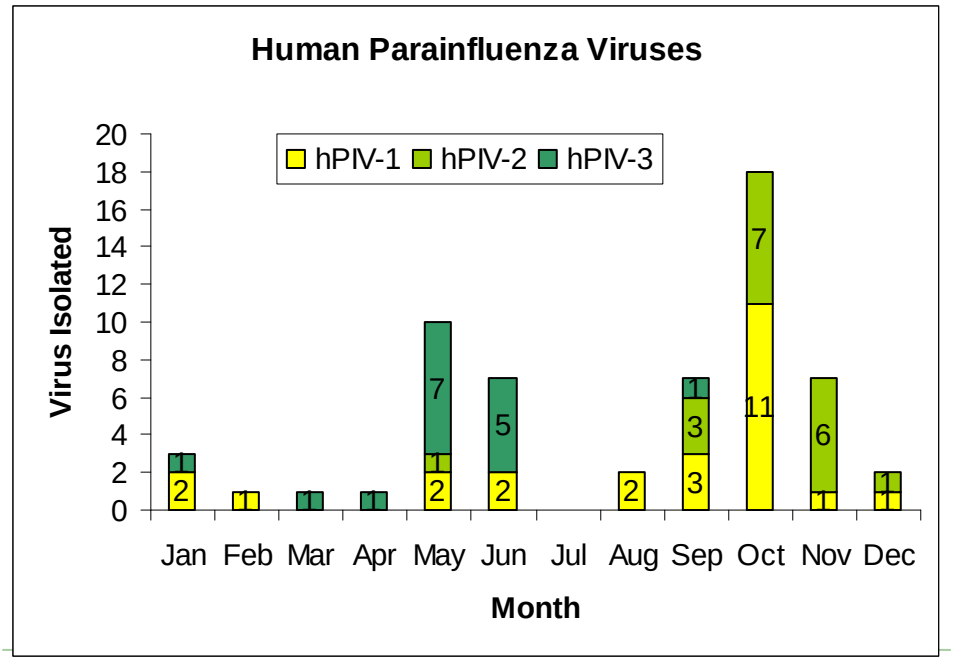
Discussion

Human PIV ranks among the most important groups of respiratory viruses that can cause acute upper and lower respiratory tract disease in infants and children.[4] Each of the four PIV serotypes has different epidemiologic features. PIV-1, 2, and 3 occur worldwide and primarily infect infants and children; PIV-4A and B are much less prevalent.[4] They also have different temporal patterns. PIV-1 causes biennial outbreaks of croup in the fall; PIV-2 causes annual or biennial fall outbreaks; and PIV-3 peak activity occurs during the spring and early summer months each year, but the virus can also be isolated throughout the year.[5] The activities of PIV monitored in Maryland were consistent with the epidemiologic features described above and also closely match the national trends reported in NREVSS. According to NREVSS, PIV-1 and 2 activities increased in the fall of 2009.[6] Virus Isolation Laboratory data indicated that PIV 1 and 2 activities surged in October 2009. The national trend of PIV-3 activity showed an increase in the spring and summer of 2009.[6] The duration of PIV-3 activity in Maryland was less extensive and was clustered in May and June 2009.

Adenoviruses most commonly cause respiratory illness, ranging from the common cold syndrome to pneumonia, croup, and bronchitis.[7] Outbreaks of adenovirus-associated respiratory disease have been more common in the late winter, spring, and early summer nationally; however, adenovirus infections can occur throughout the year.[7] Data from the Virus Isolation Laboratory indicated that adenoviruses were detected in the communities throughout 2009 except for March and April. No adenoviruses were detected by the Virus Isolation Laboratory during those two months, likely due to the small number of samples (N=65) inoculated that month compared to other months. The activities peaked in February 2009, with 7 isolates identified in that month, and again in November 2009, with 8 isolates identified. The overall level of adenovirus activities observed at the Virus Isolation Laboratory was consistent with the national trend of continuous circulation of adenoviruses.[8]

(Continued on page 4)

Figure 1. Human parainfluenza virus subtypes isolated at the Virus Isolation Laboratory in 2009. Source: DHMH, Division of Virology and Immunology.



(Continued from page 3)

Respiratory and Enteric Virus Isolation Results

RSV is the most common etiological agent of bronchiolitis and pneumonia in children under 1 year of age worldwide.[9] Outbreaks of RSV occur in communities each year, usually lasting 3–4 months during the fall, winter, and/or spring months.[9] Data indicated that the RSV season of 2008-2009 ended in February 2009 and the RSV season of 2009-2010 started in October 2009. Since the exact timing of the RSV season can vary by geographical location,[9] we based our discussion on the Middle Atlantic Region (DE, DC, MD, PA, VA, WV). Elevated RSV activities were found in January-February and October-December 2010 regionally, 10 which were consistent with the data collected by the Virus Isolation Laboratory.

Rhinoviruses comprise a group of more than 100 serotypes and cause more common colds (minor upper respiratory tract illness) than any other virus that infects the respiratory tract.[4] Although symptoms of rhinovirus infections may be mild, common colds represent an important cause of reduced productivity and absenteeism. Rhinovirus infections occur year-round, with peaks in the early spring and fall months in the temperate zones.[4] Rhinovirus isolates were only identified by the Virus Isolation Laboratory in February and October 2009. Rhinoviruses are commonly present in the community, but laboratory data did not describe the full extent of their circulation, because rhinoviruses present mild symptoms and most patients with the common cold may elect to stay home instead of visiting a clinic/ hospital and getting laboratory tests.

Human enteroviruses are very common. They are second only to the "common cold" viruses, the rhinoviruses, as the most common viral infectious agents in humans.[1] In the United States, infections caused by the enteroviruses are most likely to occur during the summer and fall.[1] The Virus Isolation Laboratory data indicated activities of coxsackieviruses, echoviruses, and enteroviruses mainly occurred in September and October 2009. Although infections with enteroviruses are very common, most infections are mild or subclinical.[11] Therefore, the small number of enteroviruses isolated is likely due to asymptomatic infections.

Rotavirus is the most common cause of severe diarrhea among children, and its annual epidemic occurs from November to April.[12] One rotavirus isolate and three rotaviruses isolates were identified in February and September 2009, respectively. However, due to the small number of total samples (N=55) the Virus Isolation Laboratory tested for rotaviruses, the temporal pattern of

(Continued on page 5)

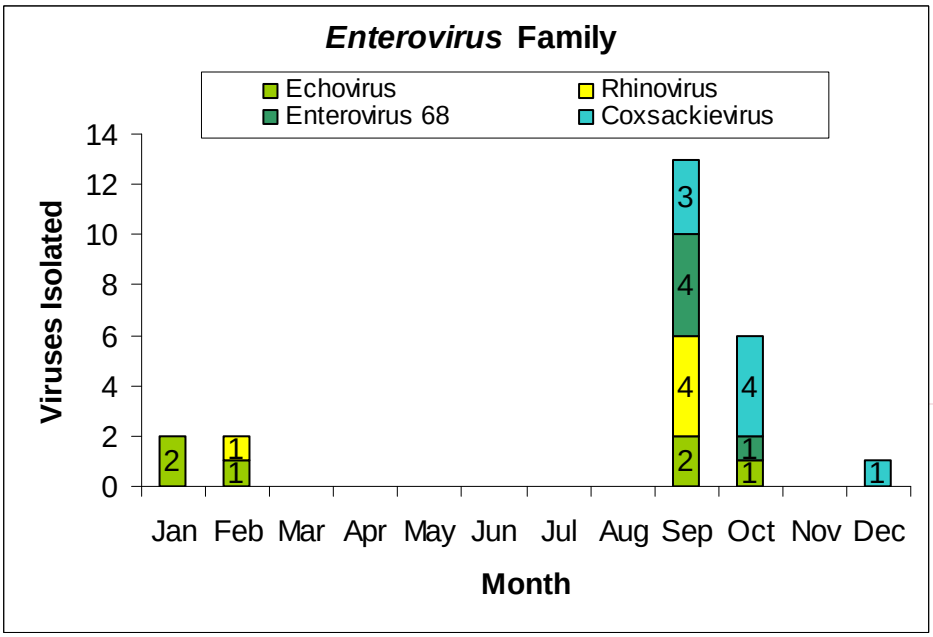


Figure 2. Enterovirus subtypes isolated at the Virus Isolation Laboratory in 2009. Source: DHMH, Division of Virology and Immunology.

(Continued from page 4)

Respiratory and Enteric Virus Isolation Results

rotavirus activities could not be conclusively defined.

Conclusion

Non-influenza respiratory viruses and enteroviruses are common in communities and can cause respiratory symptoms similar to influenza virus infections. While the H1N1 2009 pandemic influenza has dominated the scene this flu season, infections by other respiratory viruses and enteroviruses can easily add to the complication and confusion of clinical interpretation. Although none of the above described viruses has been associated with an outbreak in Maryland this year, it is important to recognize and identify the activities of respiratory and enteric viruses circulating in our communities. Active surveillance of a wide range of respiratory and enteric viruses allows the continual monitoring of circulating viral strains in Maryland. The role of the MD DHMH Laboratories Administration Virus Isolation Lab is critical in the surveillance efforts to prevent and control diseases caused by these pathogens.

This article was written by Jing Wen Tan, APHL Emerging Infectious Disease Fellow, in the Division of Virology and Immunology.

References

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[6] www.cdc.gov/surveillance/nrevss/human-paraflu/natl-trend.html

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[11] Zeichhardt, H. and Grunert, H-P. 2000. Enteroviruses, p. 252-269. In Specter, S., Hodinka, R.L., and Young, S.A. (ed.). Clinical Virology Manual, 3rd ed. Washington, DC: ASM Press.

Laboratory Statistics

Reported from the
Laboratories Administration
during the month of
January 2010

ENTERIC BACTERIOLOGY

GENUS SEROVAR	SEX	AGE	#	JURISDICTION
CAMPYLOBACTER JEJUNI				
	F	1	1	ALLEGANY
	M	74	1	ALLEGANY
	F	63	1	BALTIMORE
	M	19	1	BALTIMORE
	M	4	1	BALTIMORE
	U	8	1	BALTIMORE
	M	45	1	CECIL
	F	38	2	MONTGOMERY
	U	51	1	OUT OF STATE
	U	35	1	OUT OF STATE
	F	70	1	OUT OF STATE
	F	43	1	OUT OF STATE
	M	31	1	OUT OF STATE
	M	15	1	OUT OF STATE
	F	30	1	TALBOT
CAMPYLOBACTER UPSALIENSIS				
	F	50	1	MONTGOMERY
	F	3	1	OUT OF STATE
	M	62	1	OUT OF STATE
	M	2	1	OUT OF STATE
SALMONELLA				
	U	21	1	BALTIMORE
	F	76	1	MONTGOMERY
	F	50	1	OUT OF STATE
	F	45	1	OUT OF STATE
	F	26	1	OUT OF STATE
	M	50	1	OUT OF STATE
	M	34	1	OUT OF STATE
	M	12	1	OUT OF STATE
	F	0	1	PRINCE GEORGE'S
	M	60	1	WICOMICO
SALMONELLA ENTERITIDIS				
	F	2	1	BALTIMORE CITY
	F	32	2	BALTIMORE CITY
SALMONELLA SER. 4,12:I:-				
	F	0	1	FREDERICK
	F	5	1	OUT OF STATE
	F	0	1	OUT OF STATE
	F	4	1	OUT OF STATE
SALMONELLA SER. BARDO				
	M	0	1	ANNE ARUNDEL
SALMONELLA SER. BAREILLY				
	F	75	1	BALTIMORE
SALMONELLA SER. BERTA				
	F	70	1	OUT OF STATE
	M	69	1	WICOMICO
SALMONELLA SER. ENTERITIDIS				
	M	36	1	ALLEGANY
	F	0	1	BALTIMORE
	F	42	1	BALTIMORE
	F	0	1	BALTIMORE
	M	2	1	BALTIMORE
	F	0	3	BALTIMORE CITY
	F	20	1	BALTIMORE CITY
	F	4	1	BALTIMORE CITY
	F	1	1	BALTIMORE CITY
	F	0	1	BALTIMORE CITY
	M	57	2	BALTIMORE CITY
	M	53	2	BALTIMORE CITY
	M	39	1	BALTIMORE CITY
	M	31	1	BALTIMORE CITY
	M	14	1	BALTIMORE CITY
	M	11	1	BALTIMORE CITY
	M	9	2	BALTIMORE CITY
	M	1	3	BALTIMORE CITY
	F	0	1	HARFORD
	M	30	1	MONTGOMERY
	F	59	1	OUT OF STATE
	M	88	1	OUT OF STATE
	M	0	1	OUT OF STATE
	M	0	1	OUT OF STATE
	F	36	1	PRINCE GEORGE'S
	F	14	1	TALBOT
	M	16	1	TALBOT
	U	0	1	UNKNOWN
SALMONELLA SER. HARTFORD				
	F	24	1	HARFORD
SALMONELLA SER. III ARIZONAE 48:Z4,Z24:--				
	U	15	1	BALTIMORE
SALMONELLA SER. JAVIANA				
	F	4	1	CARROLL
	F	83	1	OUT OF STATE
	F	3	1	OUT OF STATE
	M	49	1	OUT OF STATE
	F	1	1	OUT OF STATE
SALMONELLA SER. MUENCHEN				
	M	47	1	HARFORD
SALMONELLA SER. MUENSTER				
	M	13	1	OUT OF STATE
SALMONELLA SER. NEWPORT				
	M	66	1	MONTGOMERY
	F	47	1	OUT OF STATE
	F	72	1	TALBOT
SALMONELLA SER. ORANIENBURG				
	M	3	2	BALTIMORE
	M	0	1	BALTIMORE
SALMONELLA SER. PANAMA				
	M	1	1	OUT OF STATE
SALMONELLA SER. PARATYPHI A				
	F	27	1	MONTGOMERY
	F	67	1	MONTGOMERY
SALMONELLA SER. THOMPSON				
	F	26	1	OUT OF STATE
SALMONELLA SER. TYPHIMURIUM				
	M	0	1	BALTIMORE CITY
	M	4	1	BALTIMORE CITY
	F	9	1	BALTIMORE CITY
	F	1	1	BALTIMORE CITY
SALMONELLA SER. TYPHIMURIUM VAR COPENHAGEN				
	F	82	1	HARFORD
	U	2	1	OUT OF STATE
	M	18	1	PRINCE GEORGE'S
	F	1	1	WICOMICO
SHIGELLA FLEXNERI				
	M	25	1	MONTGOMERY
	M	39	1	MONTGOMERY
	M	27	1	MONTGOMERY
SHIGELLA SONNEI				
	F	6	1	BALTIMORE
	F	45	1	BALTIMORE CITY
	F	24	1	BALTIMORE CITY
	M	63	1	MONTGOMERY
	M	35	1	MONTGOMERY
	M	3	1	OUT OF STATE
	F	15	1	PRINCE GEORGE'S
TOTAL			**113**	

ISOLATES - REFERENCE

GENUS SPECIES / SOURCE	#	JURISDICTION
BACILLUS SPHAERICUS		
BLOOD	1	ALLEGANY
HAEMOPHILUS INFLUENZAE		
SPUTUM	1	BALTIMORE CITY
PLACENTA	1	WASHINGTON
KLEBSIELLA PNEUMONIAE		
WOUND	1	CHARLES
STAPHYLOCOCCUS EPIDERMIDIS		
BLOOD	1	ALLEGANY
TOTAL	**5**	

ISOLATES - MISCELLANEOUS

GENUS SPECIES / SOURCE	#	JURISDICTION
CLOSTRIDIUM BIFERMENTANS		
BLOOD	1	BALTIMORE CITY
CLOSTRIDIUM NOVYI		
BLOOD	1	BALTIMORE CITY
CORYNEBACTERIUM AFERMENTANS		
BLOOD	1	BALTIMORE CITY
ESCHERICHIA COLI		
BLOOD	1	BALTIMORE CITY
GARDNERELLA VAGINALIS		
VAGINAL	4	PRINCE GEORGE'S
KLEBSIELLA OXYTOCA		
CSF	1	BALTIMORE CITY
KLEBSIELLA PNEUMONIAE		
OTHER	1	BALTIMORE CITY
PEDIOCOCCUS		
BLOOD	1	BALTIMORE CITY
CSF	1	BALTIMORE CITY
PROPIONIBACTERIUM ACNES		
BLOOD	1	BALTIMORE CITY
PSEUDOMONAS AERUGINOSA		
WOUND	1	CARROLL
WOUND	1	WASHINGTON
STAPHYLOCOCCUS AUREUS		
BLOOD	3	BALTIMORE CITY
SKIN	1	BALTIMORE CITY
WOUND	3	BALTIMORE CITY
ABSCESS	1	CARROLL
NASAL	1	CARROLL
WOUND	3	CARROLL
WOUND	1	PRINCE GEORGE'S
SPUTUM	1	WICOMICO
STAPHYLOCOCCUS, COAGULASE NEGATIVE		
BLOOD	1	BALTIMORE CITY
STREPTOCOCCUS, ALPHA-HEMOLYTIC		
WOUND	1	ALLEGANY
BLOOD	3	BALTIMORE CITY
CSF	1	BALTIMORE CITY
WOUND	1	MONTGOMERY
STREPTOCOCCUS, BETA HEMOLYTIC GROUP A		
THROAT	1	ALLEGANY
STREPTOCOCCUS, BETA HEMOLYTIC NON-GROUP A		
THROAT	3	ALLEGANY
STREPTOCOCCUS, BETA HEMOLYTIC GROUP B		
VAGINAL	1	ANNE ARUNDEL
VAGINAL	3	ANNE ARUNDEL
URINE	1	PRINCE GEORGE'S
VAGINAL	2	PRINCE GEORGE'S
STREPTOCOCCUS PNEUMONIAE		
CSF	1	BALTIMORE CITY
STREPTOCOCCUS, GROUP D		
BLOOD	1	BALTIMORE CITY
TOTAL	**49**	

SEXUALLY TRANSMITTED DISEASES

GENUS SPECIES / SEX	#	JURISDICTION
SYPHILIS SEROLOGY		
F	1	ANNE ARUNDEL
M	2	ANNE ARUNDEL
F	3	BALTIMORE
M	3	BALTIMORE
F	16	BALTIMORE CITY
M	43	BALTIMORE CITY
U	1	BALTIMORE CITY
F	2	CHARLES
F	3	MONTGOMERY
M	10	MONTGOMERY
F	13	PRINCE GEORGE'S
M	16	PRINCE GEORGE'S
M	1	SOMERSET
M	1	WASHINGTON
M	1	WICOMICO
TOTAL	**116**	
CHLAMYDIA TRACHOMATIS		
M	5	ALLEGANY
F	23	ANNE ARUNDEL
M	10	ANNE ARUNDEL
F	13	BALTIMORE
M	7	BALTIMORE
F	13	BALTIMORE CITY
M	21	BALTIMORE CITY
F	1	CALVERT
M	2	CALVERT
F	1	CAROLINE
M	2	CAROLINE
F	2	CARROLL
M	2	CARROLL
F	1	CECIL
M	2	CECIL
F	6	CHARLES
M	4	CHARLES
F	1	DORCHESTER
F	2	FREDERICK
M	2	FREDERICK
F	9	HARFORD
M	6	HARFORD
M	3	HOWARD
U	1	HOWARD
F	12	MONTGOMERY
M	2	MONTGOMERY
F	38	PRINCE GEORGE'S
M	44	PRINCE GEORGE'S
U	2	PRINCE GEORGE'S
F	4	QUEEN ANNE'S
F	2	SAINT MARY'S
M	4	SOMERSET
F	4	TALBOT
M	1	TALBOT
F	1	WASHINGTON
M	2	WASHINGTON
F	21	WICOMICO
M	7	WICOMICO
F	3	WORCESTER
M	3	WORCESTER
U	1	WORCESTER
TOTAL	**290**	
NEISSERIA GONORRHOEAE		
F	1	ALLEGANY
M	2	ALLEGANY
F	2	ANNE ARUNDEL
F	1	BALTIMORE
M	2	BALTIMORE
F	4	BALTIMORE CITY
U	1	BALTIMORE CITY
F	3	CHARLES
M	1	CHARLES
M	1	DORCHESTER
F	1	HARFORD
M	1	HOWARD
F	1	MONTGOMERY
M	1	MONTGOMERY
F	15	PRINCE GEORGE'S
M	26	PRINCE GEORGE'S
F	1	SAINT MARY'S
M	1	SOMERSET
F	7	WICOMICO
M	1	WICOMICO
F	1	WORCESTER
TOTAL	**74**	

MYCOBACTERIOLOGY

ISOLATE / SEX	AGE	#	JURISDICTION
MYCOBACTERIUM AVIUM COMPLEX			
F	1	1	ANNE ARUNDEL
F	66	1	ANNE ARUNDEL
U	63	1	BALTIMORE
F	4	1	BALTIMORE
F	51	1	BALTIMORE
F	61	1	BALTIMORE
F	72	1	BALTIMORE
F	73	1	BALTIMORE
M	47	4	BALTIMORE
M	53	1	BALTIMORE
F	45	2	BALTIMORE CITY
M	36	1	BALTIMORE CITY
M	40	2	BALTIMORE CITY
M	47	1	BALTIMORE CITY
M	73	1	BALTIMORE CITY
M	29	1	CECIL
M	49	1	FREDERICK
M	63	1	FREDERICK
M	87	1	FREDERICK
F	53	1	MONTGOMERY
F	68	1	MONTGOMERY
F	81	3	MONTGOMERY
F	82	1	MONTGOMERY
M	24	1	MONTGOMERY
M	34	1	OUT OF STATE
F	28	1	PRINCE GEORGE'S

M	51	1	PRINCE GEORGE'S
M	34	5	WASHINGTON
F	72	1	WICOMICO
M	62	1	WICOMICO
MYCOBACTERIUM CHELONAE			
U	17	1	WICOMICO
MYCOBACTERIUM FORTUITUM COMPLEX			
M	73	1	BALTIMORE
F	51	1	BALTIMORE CITY
F	85	2	FREDERICK
M	33	1	FREDERICK
M	42	1	FREDERICK
F	66	1	MONTGOMERY
F	35	1	OUT OF STATE
M	52	1	OUT OF STATE
F	64	1	PRINCE GEORGE'S
M	17	2	PRINCE GEORGE'S
M	29	1	PRINCE GEORGE'S
M	53	1	PRINCE GEORGE'S
M	50	1	WICOMICO
MYCOBACTERIUM GORDONAE			
M	69	1	ANNE ARUNDEL
M	27	1	BALTIMORE
M	80	1	FREDERICK
F	24	2	HOWARD
F	23	2	MONTGOMERY
F	75	1	MONTGOMERY
M	37	1	MONTGOMERY
M	45	1	MONTGOMERY
M	48	1	MONTGOMERY
F	27	1	OUT OF STATE
F	55	1	OUT OF STATE
F	19	1	PRINCE GEORGE'S
F	30	1	PRINCE GEORGE'S
F	76	1	PRINCE GEORGE'S
M	23	1	PRINCE GEORGE'S
F	71	1	WICOMICO
M	50	1	WICOMICO
MYCOBACTERIUM KANSASII			
M	50	1	BALTIMORE
M	40	2	BALTIMORE CITY
M	70	1	BALTIMORE CITY
MYCOBACTERIUM MARINUM			
F	52	1	ANNE ARUNDEL
MYCOBACTERIUM SZULGAI			
M	45	1	CECIL
MYCOBACTERIUM TUBERCULOSIS			
M	37	2	BALTIMORE
F	37	1	BALTIMORE CITY
F	53	1	BALTIMORE CITY
M	35	1	BALTIMORE CITY
F	39	1	CALVERT
M	31	1	CARROLL
F	18	1	MONTGOMERY
F	73	1	MONTGOMERY
M	30	1	MONTGOMERY
M	38	1	MONTGOMERY
M	52	2	MONTGOMERY
M	90	1	MONTGOMERY
U	21	1	OUT OF STATE
F	19	1	OUT OF STATE
F	38	1	OUT OF STATE
M	25	1	OUT OF STATE
M	33	1	OUT OF STATE
M	46	1	OUT OF STATE
F	27	1	PRINCE GEORGE'S
M	41	1	PRINCE GEORGE'S
M	82	1	TALBOT
MYCOBACTERIUM TUBERCULOSIS COMPLEX			
M	48	2	ANNE ARUNDEL
U	44	5	BALTIMORE
F	25	1	BALTIMORE
F	32	3	BALTIMORE
M	37	1	BALTIMORE
M	73	3	BALTIMORE
F	28	2	BALTIMORE CITY
M	46	2	BALTIMORE CITY
M	60	1	BALTIMORE CITY
M	78	1	BALTIMORE CITY
F	26	3	FREDERICK
F	51	6	HARFORD
F	18	5	MONTGOMERY
F	23	5	MONTGOMERY
F	38	1	MONTGOMERY
F	41	4	MONTGOMERY
F	73	2	MONTGOMERY
F	75	1	MONTGOMERY
F	79	10	MONTGOMERY
M	21	4	MONTGOMERY
M	24	2	MONTGOMERY
M	29	1	MONTGOMERY
M	40	5	MONTGOMERY
M	45	2	MONTGOMERY
M	52	11	MONTGOMERY
M	74	1	MONTGOMERY
F	37	1	OUT OF STATE
M	25	3	OUT OF STATE
M	29	1	OUT OF STATE
F	19	2	PRINCE GEORGE'S
M	22	2	PRINCE GEORGE'S
M	29	4	PRINCE GEORGE'S
M	51	1	PRINCE GEORGE'S
F	19	1	TALBOT
F	53	2	WICOMICO
M	25	7	WICOMICO
F	79	3	WORCESTER
NON-PHOTOCHROMOGENIC MYCOBACTERIA			
F	64	1	WICOMICO
PARTIALLY ACID-FAST ORGANISM SEEN IN SMEAR			
M	64	1	BALTIMORE CITY
RAPIDLY GROWING MYCOBACTERIA			
M	38	1	ALLEGANY
F	87	1	FREDERICK
SCOTOCHROMOGENIC MYCOBACTERIA			
M	67	1	BALTIMORE

TOTAL 221

MYCOBACTERIUM SUSCEPTIBILITY RESULTS

15 ISOLATES IDENTIFIED
4 DRUG RESISTANT STRAINS FOUND

#	JURISDICTION	DRUG(S)
1	MONTGOMERY	ISONIAZID, STREPTOMYCIN
1	BALTIMORE	STREPTOMYCIN
2[A]	BALTIMORE	STREPTOMYCIN

[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
CANDIDA ALBICANS			
F	46	1	CALVERT
F	48	1	CALVERT
F	32	1	MONTGOMERY
CANDIDA PARAPSILOSIS			
	51	1	PRINCE GEORGE'S
CANDIDA TROPICALIS			
F	19	1	PRINCE GEORGE'S
MOLD			
M	75	1	BALTIMORE CITY
F	46	1	CALVERT
MYCELIA STERILIA			
	44	1	ANNE ARUNDEL
F	61	1	BALTIMORE CITY
M	15	1	BALTIMORE CITY
NOCARDIA ASTEROIDES COMPLEX			
M	74	1	FREDERICK
PENICILLIUM SPECIES			
M	70	1	PRINCE GEORGE'S
YEAST			
M	75	1	BALTIMORE CITY
F	54	1	MONTGOMERY

TOTAL 14

PARASITOLOGY

GENUS/SPECIES	#	JURISDICTION
ASCARIS	1	BALTIMORE CITY
BLASTOCYSTIS HOMINIS		
	2	HOWARD
	2	MONTGOMERY
CRYPTOSPORIDIUM		
	3	PRINCE GEORGE'S
ENDOLIMAX NANA		
	4	MONTGOMERY
	1	BALTIMORE CITY
	4	HOWARD
	1	HOWARD
ENTAMEBA COLI		
	1	PRINCE GEORGE'S
ENTAMOEBA COLI		
	1	HOWARD
	3	PRINCE GEORGE'S
ENTAMOEBA HARTMANNI		
	1	WASHINGTON
ENTEROBIUS VERMICULARIS		
	1	PRINCE GEORGE'S
GIARDIA LAMBLIA		
	1	BALTIMORE CITY
	4	HOWARD
	7	HOWARD
HOOKWORM	1	MONTGOMERY
IODAMOEBA BÜTSCHLII		
	1	BALTIMORE CITY
MICROSPORIDIUM		
	1	BALTIMORE CITY

TOTAL 40

WATER MICROBIOLOGY

	# TESTED	# NON-COMPLIANT
COMMUNITY	3	0
NON-COMMUNITY	429	60
TOTAL	**432**	**60**

FOOD PROTECTION

	TOTALS
FOOD	
NUMBER OF SAMPLES	51
NOTABLE PATHOGENS:	
CAMPYLOBACTER SP.	7
LISTERIA SP.	0
SALMONELLA SP.	9
CRABMEAT	
NUMBER OF SAMPLES	0
EXCEEDING STANDARDS[1]	0
NOTABLE PATHOGENS:	
LISTERIA INNOCUA	0
SHELLFISH	
NUMBER OF SAMPLES	3
EXCEEDING STANDARDS[2]	0
TOTAL STANDARDS EXCEEDED	4
SHELLFISH GROWING WATERS	
NUMBER OF SAMPLES	138
OTHER	
CLOSTRIDIUM BOTULINUM	0
TOTAL NUMBER OF SAMPLES	**208**

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			
F	86	1	BALTIMORE
F	21	1	BALTIMORE
F	1	1	CALVERT
F	2	1	CALVERT
F	47	1	HARFORD
COXSACKIEVIRUS B5			
F	1	1	WICOMICO
F	0	1	BALTIMORE CITY
HERPES SIMPLEX VIRUS TYPE 1			
F	83	1	BALTIMORE
M	19	1	WICOMICO
M	21	1	BALTIMORE CITY
U	24	1	BALTIMORE CITY
M	19	1	BALTIMORE CITY
M	20	1	BALTIMORE CITY
INFLUENZA B VIRUS			
F	24	1	PRINCE GEORGE'S
PARAINFLUENZA VIRUS 1			
M	3	1	CALVERT
PARAINFLUENZA VIRUS 3			
M	63	1	CECIL
RESPIRATORY SYNCYTIAL VIRUS			
M	0	1	ANNE ARUNDEL
M	0	1	ANNE ARUNDEL
F	0	1	ANNE ARUNDEL
M	0	1	ANNE ARUNDEL
F	0	1	ANNE ARUNDEL
F	0	1	ANNE ARUNDEL
M	0	1	BALTIMORE
F	0	1	PRINCE GEORGE'S
F	2	1	PRINCE GEORGE'S
M	3	1	SAINT MARY'S
F	3	1	BALTIMORE CITY
TOTAL		**27**	

VIRAL POLYMERASE CHAIN REACTION (PCR)

ISOLATE SEX	AGE	#	JURISDICTION
HERPES SIMPLEX VIRUS TYPE 1			
F	18	1	BALTIMORE
F	25	1	BALTIMORE
U	17	1	BALTIMORE CITY
F	0	1	BALTIMORE CITY
F	21	1	BALTIMORE CITY
F	23	1	BALTIMORE CITY
F	26	1	BALTIMORE CITY
M	24	1	BALTIMORE CITY
M	26	1	BALTIMORE CITY
M	30	1	BALTIMORE CITY
U	17	1	BALTIMORE CITY
F	24	1	CHARLES
M	19	1	DORCHESTER
F	22	1	FREDERICK
F	18	1	PRINCE GEORGE'S
F	20	1	PRINCE GEORGE'S
F	26	1	PRINCE GEORGE'S
F	27	1	PRINCE GEORGE'S
HERPES SIMPLEX VIRUS TYPE 2			
F	23	1	ANNE ARUNDEL
F	26	1	ANNE ARUNDEL
F	22	1	BALTIMORE
F	23	1	BALTIMORE
F	33	1	BALTIMORE
M	24	1	BALTIMORE
U	30	1	BALTIMORE CITY
F	0	2	BALTIMORE CITY
F	21	1	BALTIMORE CITY
F	28	1	BALTIMORE CITY
F	29	1	BALTIMORE CITY
F	37	1	BALTIMORE CITY
F	40	1	BALTIMORE CITY
F	45	1	BALTIMORE CITY
F	47	1	BALTIMORE CITY
M	18	1	BALTIMORE CITY
M	20	2	BALTIMORE CITY
M	21	1	BALTIMORE CITY
M	22	2	BALTIMORE CITY
M	26	1	BALTIMORE CITY
M	27	2	BALTIMORE CITY
M	28	1	BALTIMORE CITY
M	30	1	BALTIMORE CITY
M	42	1	BALTIMORE CITY
M	43	1	BALTIMORE CITY
M	58	1	BALTIMORE CITY
M	65	1	BALTIMORE CITY
M	26	1	CALVERT
M	22	1	CECIL
F	23	1	CHARLES
M	19	1	CHARLES
M	51	1	CHARLES
F	36	1	MONTGOMERY
F	38	1	MONTGOMERY
M	24	1	MONTGOMERY
F	21	1	PRINCE GEORGE'S
F	23	1	PRINCE GEORGE'S
F	26	1	PRINCE GEORGE'S
F	27	1	PRINCE GEORGE'S
M	28	1	PRINCE GEORGE'S
M	40	1	PRINCE GEORGE'S
F	26	1	WICOMICO
INFLUENZA A (H1/N1) NOVEL A			
M	58	1	ANNE ARUNDEL
M	23	1	BALTIMORE
F	0	2	BALTIMORE CITY
M	57	1	BALTIMORE CITY
U	46	1	PRINCE GEORGE'S
M	0	1	PRINCE GEORGE'S
M	23	1	PRINCE GEORGE'S
F	45	1	SAINT MARY'S
M	45	1	SAINT MARY'S
F	19	1	WASHINGTON
F	28	1	WASHINGTON
M	51	1	WASHINGTON
INFLUENZA B VIRUS			
F	24	1	PRINCE GEORGE'S
TOTAL		**78**	

VIRAL HEPATITIS

ORGANISM	# SPECIMENS	# POSITIVES	JURISDICTION
HEPATITIS A			
	1	0	ANNE ARUNDEL
	2	0	PRINCE GEORGE'S
SUBTOTAL	**3**	**0**	
HEPATITIS B			
	42	1	ALLEGANY
	144	4	ANNE ARUNDEL
	23	0	BALTIMORE
	383	7	BALTIMORE CITY
	2	0	CALVERT
	15	1	CARROLL
	146	1	CECIL
	8	0	CHARLES
	19	0	FREDERICK
	9	0	GARRETT
	25	0	HARFORD
	8	0	HOWARD
	1	0	KENT
	269	6	MONTGOMERY
	272	4	PRINCE GEORGE'S
	2	0	SAINT MARY'S
	4	0	SOMERSET
	12	0	TALBOT

40	1	WASHINGTON
104	1	WICOMICO
SUBTOTAL		
1,528	**26**	
HEPATITIS C		
43	7	ALLEGANY
174	28	ANNE ARUNDEL
34	0	BALTIMORE
197	45	BALTIMORE CITY
2	0	CALVERT
17	1	CARROLL
85	10	CECIL
11	0	CHARLES
1	0	DORCHESTER
18	4	FREDERICK
6	0	GARRETT
53	1	HARFORD
4	1	HOWARD
1	0	KENT
32	3	MONTGOMERY
132	2	PRINCE GEORGE'S
2	0	SAINT MARY'S
2	0	SOMERSET
12	0	TALBOT
31	6	WASHINGTON
12	1	WICOMICO
SUBTOTAL		
869	**109**	
TOTALS		
2,400	**135**	

RABIES

SOURCE	#	JURISDICTION
CAT	1	HOWARD
COW	1	PRINCE GEORGES
RACCOON	1	ANNE ARUNDEL
	4	BALTIMORE
	1	CARROLL
	1	HARFORD
	1	HOWARD
	3	MONTGOMERY
	2	PRINCE GEORGES
	1	WORCESTER
SKUNK	1	FREDERICK
	1	HOWARD
TOTAL POSITIVES	**18**	
TOTAL SPECIMENS	**290**	

CHLAMYDIOPHILIA PSITTACI
(CHLAMYDIA)

REPORTED QUARTERLY
NO REPORT THIS MONTH

CD4 FLOW CYTOMETRY WORKLOAD

REPORTED QUARTERLY
NO REPORT THIS MONTH

BLOOD LEAD

MARYLAND			
	I	<10	103
	IIA	10-14	1
	IIB	15-19	3
	III	20-44	5
	IV	45-69	1
	V	>69	0
TOTAL			**113**
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	4
MAPLE SYRUP URINE DISEASE	2
HOMOCYSTINURIA	9
TYROSINEMIA	8
ARGININEMIA	0
CITRULLINEMIA	1
GALACTOSEMIA	8
BIOTINIDASE DEFICIENCY	3
HYPOTHYROIDISM	80
HEMOGLOBIN -DISEASE	19
HEMOGLOBIN -BENIGN	542
CONGENITAL ADRENAL HYPERPLASIA (CAH)	42
CYSTIC FIBROSIS	5
FATTY ACID OXIDATIONS	3
ORGANIC ACIDEMIAS	23
ACYLCARNITINE - BORDERLINE	23
ACYLCARNITINE - OTHERS	0

MONTHLY TOTALS

# OF SPECIMENS SCREENED	11,521
NUMBER OF TESTS	824,864
% 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	4
SICKLE CELL DISEASE -SC	4
SICKLE CELL DISEASE - S BETA THALASSEMIA	1
CYSTIC FIBROSIS	1

ENVIRONMENTAL CHEMISTRY

SAMPLE TYPES	# NON-COMPLIANT	# TESTED
ASBESTOS		
AIR	0	0
BULK	0	13
AIR QUALITY		
$PM_{2.5}$	0	389
RADIATION		
AIR/CHARCOAL FILTERS	0	64
MILK	0	3
WIPES	0	73
RAW WATER	0	7
VEGETATION	0	0
OTHER	0	0
DRINKING WATER		
METALS		
COMMUNITY	14	20
NON-COMMUNITY	2	9
PRIVATE WELLS	27	93
PESTICIDES & PCBs		
COMMUNITY	0	20
NON-COMMUNITY	0	8
PRIVATE WELLS	0	0
VOLATILE ORGANIC COMPOUNDS		
COMMUNITY	1	78
NON-COMMUNITY	0	50
PRIVATE WELLS	0	58
RADIATION		
COMMUNITY	0	29
NON-COMMUNITY	0	0
PRIVATE WELLS	0	4
INORGANICS		
COMMUNITY	0	10
NON-COMMUNITY	4	185
PRIVATE WELLS	4	110
FOOD CHEMISTRY		
SUSPECTED TAMPERING	0	0
MICROSCOPIC FILTH	0	0
LABELING	0	0
SURVEILLANCE	0	0
CHEMICAL CONTAMINATION	0	0
TOTAL	**52**	**1,223**

VIRAL LOAD SPECIMENS

HIV-1 RNA COPIES/ML	$<10^3$	10^3—10^4	10^4—10^5	$>10^5$	**TOTALS**
ALLEGANY	11	3	1	0	**15**
CARROLL	1	0	0	0	**1**
FREDERICK	0	2	1	0	**3**
MONTGOMERY	75	4	8	1	**88**
PRINCE GEORGE'S	88	11	14	10	**123**
WASHINGTON	5	1	0	0	**6**
WICOMICO	2	2	1	1	**6**
SUBTOTALS	182	23	25	12	**242**
DEPARTMENT OF CORRECTIONS	17	7	4	2	**30**
TOTALS	**199**	**30**	**29**	**14**	**272**

HIV ANTIBODY SCREENING

SUBMITTER	TOTAL SPECIMENS	# EIA POSITIVE	% EIA POSITIVE	# WB POSITIVE	% WB POSITIVE
CORRECTIONAL INSTITUTIONS	183	2	1.09%	2	100.00%
FAMILY PLANNING (NON-GOVERNMENT)	76	0	0.00%	0	0.00%
HEALTH CENTERS (NON-GOVERNMENT)	517	37	7.16%	37	100.00%
HLTH DEPT, NON-STD, FAMILY PLAN	385	1	0.26%	1	100.00%
HLTH DEPT, NON-STD, OB/GYN	79	0	0.00%	0	0.00%
HLTH DEPT, NON-STD, OTHER	520	43	8.27%	43	100.00%
HLTH DEPT, STD CLINICS	904	11	1.22%	9	81.82%
HOSPITAL, OTHER	128	4	3.13%	4	100.00%
HOSPITAL, PUBLIC	25	1	4.00%	1	100.00%
JUVENILE SERVICES	84	0	0.00%	0	0.00%
LABORATORIES (NON-HOSPITAL)	236	13	5.51%	10	76.92%
PEDIATRIC - CHILD HEALTH	8	0	0.00%	0	0.00%
PRIVATE PHYSICIANS	12	3	25.00%	2	66.67%
PRIVATE STUDENT HEALTH CNTRS	31	0	0.00%	0	0.00%
PUBLIC STUDENT HEALTH CENTERS	134	0	0.00%	0	0.00%
UNKNOWN, NOT SPECIFIED	1	0	0.00%	0	0.00%
TOTALS	**3,323**	**115**	**3.46%**	**109**	**94.78%**

MAILING LABEL

Critical Link
c/o Georgia Corso, Room L-15
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