CRITICAL LINK

John M. Colmers
Secretary

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The Laboratories Administration—Maryland's State Public Health Laboratory

The Role of PFGE in Foodborne Outbreak Investigations

and the Subsequent Investigation of the 2008 Nationwide Outbreak of *Salmonella* Saintpaul Using Pulsed Field Gel Electrophoresis

Introduction

A foodborne outbreak is defined by the CDC (Centers for Disease Control and Prevention) as two or more cases of the same disease that share a common food exposure. Foodborne diseases are caused by consuming contaminated foods or beverages. Many different disease-causing microbes, or pathogens, can contaminate foods. Most of these diseases are infections caused by a variety of bacteria, viruses, and parasites. The most commonly recognized foodborne infections are those caused by bacteria such as *E. coli* O157:H7, *Campylobacter*, and Salmonella, and by a group of caliciviruses known as noroviruses.[1]

An estimated 76 million cases of foodborne disease occur each year in the United States. The majority of these cases are mild and cause symptoms for only a day or two. Some cases are more serious, and the CDC estimates there are 325,000 hospitalizations and 5,000 deaths related to foodborne diseases each year. The most severe cases tend to occur in the very old, the very young, and those with weakened immune system function.[1]

Most reported cases of foodborne illness are not part of recognized outbreaks but occur as individual or "sporadic" cases. The challenge in detecting an outbreak is determining if cases of a disease are related, distinguishing these cases from unrelated cases, and being able to show a link to a particular food product. Local and state health departments and the CDC investigates about 400-500 foodborne outbreaks each year. [1]

Contaminated Foods

Fruits, vegetables, meat products, and other foods that come into contact with pathogens may become contaminated. These foods consumed raw are of particular concern. Fresh fruits and vegetables can be contaminated if they are washed or irrigated with water that is contaminated with animal manure or human sewage. Once a food product has become contaminated by a pathogen, it can spread from surface to surface. Thus, foodborne pathogens can be introduced by cross-contamination from one raw agricultural product to another, or from infected humans who handle the food.[2]

For example, fresh produce contaminated with *Salmonella* can spread the bacterium to the hands of a person who cuts the produce, and to the cutting board on which the produce is sliced. Subsequent contact with the contaminated hands or the cutting board could further spread the pathogen to new food products. Washing can decrease the amount of bacteria on surfaces but does not always eliminate contamination.[2]

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The Role of PFGE in Foodborne Outbreak Investigations

In recent years, a number of large interstate foodborne outbreaks have been traced to fresh fruits and vegetables that were processed under less than sanitary conditions. In the late spring and early summer of 2008, a large, widely publicized food borne disease outbreak attributed to *Salmonella* Saintpaul contamination of fresh produce resulted in a massive recall of tomatoes nationwide. *Salmonella* bacteria may cause up to one half of all foodborne disease outbreaks for which a cause has been determined. *Salmonella* lives in the intestinal tracts of humans and other animals, and can live in soil and water for months.[2]

People who have eaten food contaminated with *Salmonella* usually develop symptoms 12-72 hours after infection. Symptoms may include fever, diarrhea (which may be bloody), nausea, vomiting, and abdominal pain. The illness usually lasts four to seven days. Although most people recover without treatment, the bacterium can enter the bloodstream and cause more severe illness requiring antibiotic treatment. Rarely, infection with *Salmonella* can be severe or fatal in babies, frail or elderly people, and people with compromised immune systems.[1]

A *Salmonella* infection is usually diagnosed by culture of a stool sample. After the bacterial pathogen is isolated in "pure culture," it is identified as *Salmonella* by biochemical means, and then further characterized using anti-sera directed against heat stable somatic "O" antigens and flagellar "H" antigens. Over 2,500 serotypes of *Salmonella* have been characterized.

Epidemiology

Once a bacterial isolate has been identified and typed, it can be further subtyped molecularly by the physical characterization of the organism's biomolecules. Various subtyping methods are used by laboratories to examine certain genetic characteristics of groups of bacterial isolates, to discriminate below the species level to identify clones or clonal groups. Bacteria generally reproduce asexually by binary fission resulting in clones of microorganisms that arise from a single cell and are genetically identical (or nearly identical). Common-source microorganisms associated with foodborne outbreaks generally are clonal (the progeny of a single cell). Molecular epidemiology refers to the application of molecular laboratory methods to subtype different isolates of pathogenic microorganisms of the same species to determine their degree of genetic relatedness. These molecular methods can ultimately identify highly genetically related organisms as the potential source of an outbreak or can recognize isolates from subsequent cases of illness associated with a discrete outbreak.

Currently, Pulsed Field Gel Electrophoresis (PFGE) is one of the most widely used and powerful genetic subtyping techniques used to determine the source of bacterial foodborne outbreaks. PFGE is a DNA "fingerprinting" method used to analyze and compare the DNA of bacterial isolates of the same species. The DNA of the bacterial pathogen is isolated and

(Continued on page 3)

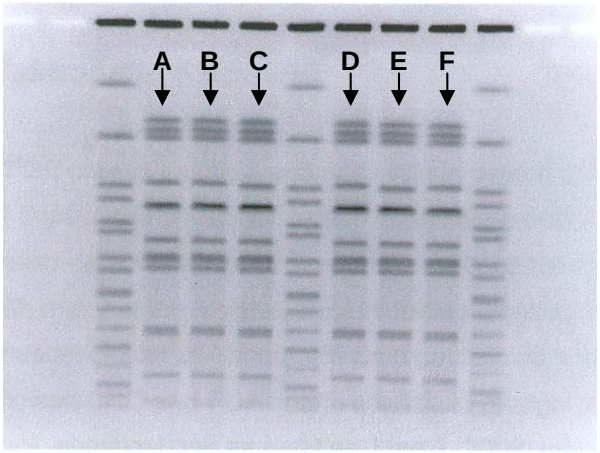

Figure 1: Gel image showing the PFGE fingerprint patterns for six Salmonella Saintpaul isolates (See lanes A through F) associated with the national outbreak. (Source: DHMH, Laboratories Administration, PFGE Laboratory)

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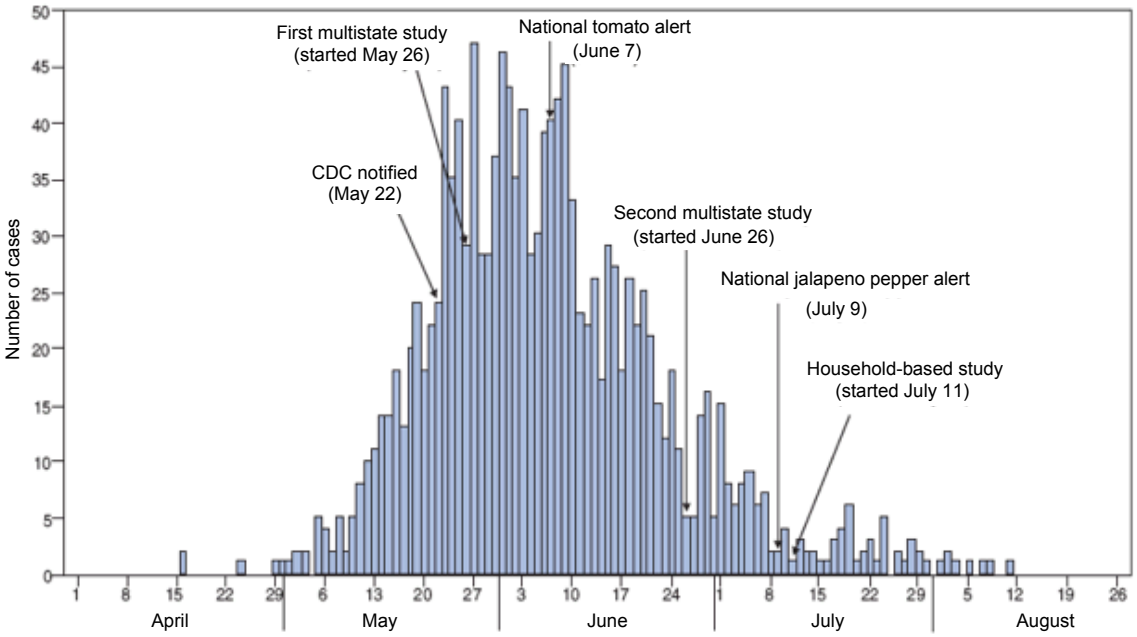
The Role of PFGE in Foodborne Outbreak Investigations

Figure 2: Number of laboratory-confirmed cases (n = 1,414) of Salmonella Saintpaul (outbreak strain), by date of illness onset - United States, 2008* The epidemic curve (epi curve) shows progression of an outbreak over time. The horizontal axis represents the date when a person became ill, also called the date of onset. The vertical axis is the number of persons who became ill on each date (Source: Centers for Disease Control and Prevention, National Center for Zoonotic, Vector-Borne, and Enteric Diseases)



*Includes cases with onset information received as of August 25, 2008. Some illness onset dates (n = 366) were estimated by subtracting 3 days from the specimen date. Illness that began during July 29 - August 25 might not yet be reported.

purified in an agarose gel, then restricted (cut) into 10 to 20 fragments with special enzymes (restriction endonucleases). An alternating pulsed electric field applied across the gel causes the DNA fragments to migrate through the gel over a period of about 18 hours. The smaller fragments move through the gel more quickly than the larger fragments so the DNA fragments become separated into distinct bands in the gel resembling a "bar-code" (see Figure 1.) The resulting pattern of bands is often referred to as a "molecular fingerprint." Each clone of bacteria of the same species can have a unique PFGE pattern. If two bacterial isolates of the same species are found with an indistinguishable pattern, it is possible they have come from a common source and may be part of an outbreak.

The CDC has developed standardized PFGE methods, and in collaboration with the Association of Public Health Laboratories (APHL), created PulseNet. PulseNet is a national network of public health and food regulatory agency laboratories coordinated by the CDC. The network consists of state health departments, local health departments, and federal agencies such as the CDC, the United States Department of Agriculture (USDA), and the Food and Drug Administration (FDA.) A national computer database of PFGE fingerprint patterns is housed at CDC as part of PulseNet. PulseNet Laboratories submit PFGE patterns of bacterial pathogens associated with illness or contaminated foods to the database over the Internet. An important feature of PulseNet is that all of the participating laboratories perform these PFGE protocols using the same methodology. Scientists at public health and regulatory laboratories throughout the country, using common software and normalization protocols, can use this database to rapidly compare the PFGE patterns of bacteria isolated from ill persons or contaminated foods to the patterns stored in the database, and search for matches to DNA fingerprint patterns of bacterial pathogens isolated from cases of illness or contaminated food items, both within their state and anywhere else in the United States and Canada.

When a matching PFGE pattern is found, the laboratory notifies state epidemiologists and the CDC to begin or to support an ongoing investigation. Once an outbreak is detected, and the states and the CDC have determined that two or more cases of the same disease share a common food exposure, a "trace-back" investigation is started. A trace-back investigation is an attempt to link the outbreak to a food product, and then, track the product from the point of purchase or service back through each point in the distribution chain to find the source of the contamination.

Salmonella Saintpaul

PFGE played a critical and early role in detecting the recent highly publicized nationwide outbreak of *Salmonella* Saintpaul. In early May, state public health PFGE laboratories in New Mexico and Texas detected a rise in the number of cases of the uncommon *Salmonella* Saintpaul serotype, with many of the isolates demonstrating identical PFGE fingerprint patterns. Identification of this unusual cluster of *Salmonella* Saintpaul isolates alerted state and CDC epidemiologists and allowed CDC and FDA health officials to recognize an outbreak was occurring and begin trace-back investigations as early as May 26, 2008. Initial epidemiologic investigations in New Mexico and Texas, comparing foods eaten by persons who were ill, to foods eaten by persons who were well, identified consumption of raw tomatoes as strongly linked to illness. This strong epidemiologic association prompted the FDA to issue a public warning concerning tomatoes on June 7, 2008.[3]

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The Role of PFGE in Foodborne Outbreak Investigations

As more and more cases of *Salmonella* Saintpaul were found across the nation, PFGE continued to play an important role in the on-going investigation of this rapidly broadening outbreak by confirming related cases and weeding out unrelated cases. Between April 8 and August 11, 2008, 1,442 people in 43 states, the District of Columbia, and Canada would eventually be found infected with the bacterium *Salmonella* Saintpaul, all with the same genetic fingerprint (see Figure 1.) The DHMH PFGE laboratory identified 42 Salmonella Saintpaul isolates with the genetic fingerprint associated with this outbreak.[4]

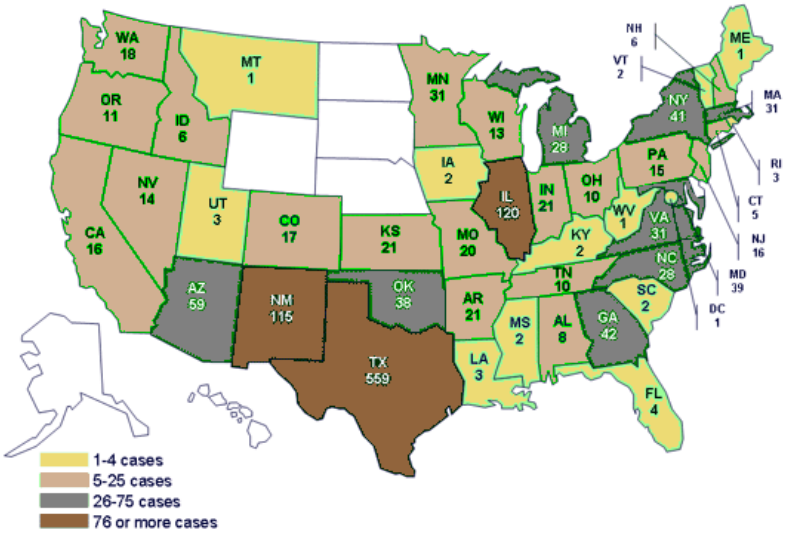

Figure 3: Cases infected with the outbreak strain of *Salmonella* Saintpaul, United States, by state, as of August 25, 2008 9pm EDT. (Source: http://

Additional epidemiological investigations identified smaller clusters of infection that were associated with specific restaurants. These investigations found that ill persons were more likely to have recently consumed raw tomatoes, raw jalapeno peppers, and raw serrano peppers. PFGE again aided in the trace-back investigation when FDA laboratories performed PFGE analysis on Salmonella Saintpaul isolates from two jalapeno peppers, a serrano pepper, and an agricultural water sample which resulted in matching DNA fingerprint patterns. These food and environmental samples led investigators to identify the source of the contaminated peppers from a distribution center in McAllen, Texas, and ultimately to identify a farm in Mexico that supplied peppers to the distribution center. Once the FDA expanded its warnings to the public to include peppers, and produce from the implicated sources were withdrawn from distribution, the number of new cases quickly dropped and the outbreak came to an end. Together, the CDC and FDA then lifted the consumer warning for all tomatoes and peppers.[4]

Detecting and investigating foodborne outbreaks is a major challenge to our public health system This recent, large, interstate outbreak again demonstrated the utility of PFGE to quickly identify and characterize bacterial pathogens representing a common point-source of contamination in the food-supply chain. PFGE results are commonly used by epidemiologists to guide their investigations of food borne illness and are utilized by decision makers in regulatory agencies to implement measures to protect the nation's food supply.

This article was written by Jonathan Johnston of the Laboratories Administration's PFGE Laboratory.

References

[1] CDC - National Center for Infectious Diseases
[2] CDC Division of Foodborne, Bacterial and Mycotic Diseases (DFBMD)
[3] FDA Center for Food Safety and Applied Nutrition
[4] Centers for Disease Control and Prevention National Center for Zoonotic, Vector-Borne, and Enteric Diseases (ZVED)

Laboratory Statistics

Reported from the Laboratories Administration during the month of

August 2008

ENTERIC BACTERIOLOGY

GENUS SEROVAR	SEX	AGE	#	JURISDICTION
AEROMONAS SPECIES				
	M	78	1	BALTIMORE
CAMPYLOBACTER FETUS				
	M	77	1	BALTIMORE CITY
CAMPYLOBACTER JEJUNI				
	F	0	1	ALLEGANY
	M	0	1	ALLEGANY
	M	0	1	ALLEGANY
	F	91	1	BALTIMORE
	M	5	1	BALTIMORE
	M	28	1	BALTIMORE
	U	0	1	BALTIMORE CITY
	M	1	1	BALTIMORE CITY
	F	0	1	CALVERT
	F	27	1	CHARLES
	F	38	1	CHARLES
	F	38	1	CHARLES
	M	24	1	CHARLES
	F	0	1	HARFORD
	F	35	1	HARFORD
	M	54	1	MONTGOMERY
	M	29	1	OUT OF STATE
ESCHERICHIA COLI, SEROTYPE O157:H7				
	F	0	1	BALTIMORE CITY
	M	11	1	FREDERICK
	M	41	1	FREDERICK
	M	11	1	HOWARD
	F	61	1	OUT OF STATE
	M	12	1	OUT OF STATE
	M	14	1	OUT OF STATE
	M	16	1	OUT OF STATE
	U	5	1	OUT OF STATE
	U	11	1	OUT OF STATE
	U	13	1	OUT OF STATE
	U	16	1	OUT OF STATE
ESCHERICHIA COLI, SEROTYPE O157:NON-MOTILE				
	F	17	1	ANNE ARUNDEL
	M	0	1	ANNE ARUNDEL
	U	16	1	BALTIMORE CITY
SALMONELLA				
	U	0	1	ANNE ARUNDEL
	M	3	1	BALTIMORE CITY

M	0	1	WICOMICO
M	63	1	WICOMICO
SALMONELLA AGONA			
U	31	1	OUT OF STATE
M	8	1	OUT OF STATE
U	12	1	OUT OF STATE
SALMONELLA ENTERITIDIS			
F	0	1	ALLEGANY
F	80	1	ANNE ARUNDEL
M	0	1	ANNE ARUNDEL
F	0	1	BALTIMORE
F	0	1	BALTIMORE
F	0	1	BALTIMORE
F	26	1	BALTIMORE
F	90	1	BALTIMORE
M	0	1	BALTIMORE
M	9	1	BALTIMORE
U	0	1	BALTIMORE CITY
U	0	1	BALTIMORE CITY
U	0	1	BALTIMORE CITY
U	0	1	BALTIMORE CITY
U	0	1	BALTIMORE CITY
F	0	1	BALTIMORE CITY
F	2	1	BALTIMORE CITY
F	3	1	BALTIMORE CITY
F	4	1	BALTIMORE CITY
F	4	1	BALTIMORE CITY
F	37	1	BALTIMORE CITY
F	54	1	BALTIMORE CITY
M	0	1	BALTIMORE CITY
M	3	1	BALTIMORE CITY
M	4	1	BALTIMORE CITY
M	6	1	BALTIMORE CITY
M	9	1	BALTIMORE CITY
M	43	1	BALTIMORE CITY
M	51	1	BALTIMORE CITY
M	70	1	BALTIMORE CITY
M	74	1	BALTIMORE CITY
M	80	1	BALTIMORE CITY
M	32	1	CALVERT
F	19	1	MONTGOMERY
F	43	1	OUT OF STATE
M	60	1	OUT OF STATE
F	71	1	PRINCE GEORGE'S
M	74	1	PRINCE GEORGE'S
M	77	1	TALBOT
SALMONELLA HARTFORD			
F	37	1	BALTIMORE
M	63	1	WASHINGTON
SALMONELLA HEIDELBERG			
F	0	1	BALTIMORE
F	4	1	BALTIMORE CITY
M	1	1	BALTIMORE CITY
U	0	1	OUT OF STATE
SALMONELLA INFANTIS			
F	47	1	TALBOT
SALMONELLA JAVIANA			
M	12	1	BALTIMORE
F	26	1	BALTIMORE CITY
M	35	1	MONTGOMERY
SALMONELLA MONTEVIDEO			
F	0	1	ANNE ARUNDEL
SALMONELLA MUENCHEN			
F	75	1	OUT OF STATE
SALMONELLA NEWPORT			
F	0	1	ANNE ARUNDEL
F	0	1	MONTGOMERY
U	48	1	OUT OF STATE
F	1	1	OUT OF STATE
F	33	1	WICOMICO
F	86	1	WICOMICO
M	9	1	WICOMICO
SALMONELLA READING			
F	1	1	OUT OF STATE
SALMONELLA RUBISLAW			
M	17	1	BALTIMORE CITY
SALMONELLA SAINTPAUL			
F	0	1	ANNE ARUNDEL
SALMONELLA SENFTENBERG			
F	37	1	BALTIMORE CITY
SALMONELLA SER 4,12:I:-			
F	85	1	OUT OF STATE
SALMONELLA SER 4,5,12:I:-			
F	0	1	ALLEGANY
M	0	1	BALTIMORE CITY
M	0	1	BALTIMORE CITY
F	14	1	OUT OF STATE
U	3	1	OUT OF STATE
U	8	1	OUT OF STATE
U	4	1	OUT OF STATE
U	4	1	OUT OF STATE
F	2	1	OUT OF STATE
SALMONELLA TYPHI			
M	10	1	MONTGOMERY
SALMONELLA TYPHIMURIUM			
U	0	1	ALLEGANY
M	3	1	BALTIMORE
M	17	1	BALTIMORE
F	54	1	BALTIMORE CITY
F	3	1	CARROLL
U	39	1	OUT OF STATE
F	3	1	OUT OF STATE
F	10	1	OUT OF STATE
F	32	1	OUT OF STATE
M	34	1	TALBOT
SALMONELLA TYPHIMURIUM VAR COPENHAGEN			
F	89	1	CARROLL
F	11	1	OUT OF STATE
M	3	1	OUT OF STATE
SHIGELLA			
M	41	1	BALTIMORE CITY
U	0	1	BALTIMORE CITY
SHIGELLA FLEXNERI			
M	67	1	WASHINGTON
SHIGELLA FLEXNERI, SEROVAR X			
M	0	1	BALTIMORE CITY
M	42	1	BALTIMORE CITY
SHIGELLA SONNEI			
F	0	1	BALTIMORE
U	0	1	OUT OF STATE
U	2	1	OUT OF STATE
U	29	1	OUT OF STATE
U	38	1	OUT OF STATE
U	4	1	OUT OF STATE
F	0	1	OUT OF STATE
F	1	1	OUT OF STATE
F	4	1	OUT OF STATE
F	9	1	OUT OF STATE
F	27	1	OUT OF STATE
M	2	1	OUT OF STATE
M	5	1	OUT OF STATE
M	7	1	OUT OF STATE
M	10	1	OUT OF STATE
VIBRIO ALGINOLYTICUS			
F	75	1	ANNE ARUNDEL
M	22	1	BALTIMORE
VIBRIO FLUVIALIS			
F	42	1	ANNE ARUNDEL
F	75	1	ANNE ARUNDEL
VIBRIO PARAHAEMOLYTICUS			
F	24	1	BALTIMORE
M	0	1	BALTIMORE CITY
M	46	1	MONTGOMERY
VIBRIO VULNIFICUS			
M	79	1	TALBOT

TOTAL 155

ISOLATES -THROAT CULTURES

COUNTY	GROUP A[1]	NON-GROUP A
ALLEGANY	0	3
WICOMICO	0	1
WORCESTER	1	0
TOTAL	**1**	**4**

[1] *Streptococcus pyogenes*

ISOLATES - REFERENCE

GENUS SPECIES		
SOURCE	#	JURISDICTION
ACINETOBACTER CALCOACETICUS/BAUMANNI COMPLEX		
WOUND	1	WICOMICO
ENTEROBACTER CLOACAE		
SPUTUM	1	BALTIMORE CITY
ENTEROCOCCUS FAECIUM		
URINE	1	WICOMICO
HAEMOPHILUS INFLUENZAE		
SPUTUM	1	BALTIMORE CITY
KLEBSIELLA PNEUMONIAE		
OTHER	1	WICOMICO
URINE	1	ALLEGANY
MORGANELLA MORGANII		
UNKNOWN	1	ALLEGANY
MYROIDES SOECIES		
WOUND	1	ALLEGANY
STAPHYLOCOCCUS AUREUS		
OTHER	1	WICOMICO
OTHER	1	WICOMICO
STREPTOCOCCUS ACIDOMINIMUS		
ABSCESS	1	BALTIMORE CITY

TOTAL 11

ISOLATES - MISCELLANEOUS

GENUS SPECIES		
SOURCE	#	JURISDICTION
ACINETOBACTER CALCOACETICUS		
OTHER	1	FREDERICK
WOUND	1	FREDERICK
CITROBACTER FREUNDII		
OTHER	1	MONTGOMERY
ENTEROCOCCUS FAECALIS		
WOUND	1	FREDERICK
ESCHERICHIA COLI		
BLOOD	1	BALTIMORE CITY
SKIN	1	MONTGOMERY
VAGINAL	1	MONTGOMERY
GARDNERELLA VAGINALIS		
VAGINAL	1	PRINCE GEORGE'S
GRAM-NEGATIVE BACILLUS		
URINE	1	BALTIMORE
STAPHYLOCOCCUS AUREUS		
BLOOD	2	BALTIMORE CITY
WOUND	1	BALTIMORE CITY

NASAL	1	CARROLL
WOUND	1	CHARLES
WOUND	1	FREDERICK
SCALP	2	MONTGOMERY
STREPTOCOCCUS, BETA HEMOLYTIC GROUP B		
VAGINAL	4	ANNE ARUNDEL
BLOOD	1	BALTIMORE CITY
VAGINAL	3	HOWARD
VAGINAL	1	MONTGOMERY
VAGINAL	1	PRINCE GEORGE'S
VAGINAL	8	PRINCE GEORGE'S
STAPHYLOCOCCUS, COAGULASE NEGATIVE		
OTHER	1	BALTIMORE CITY
WOUND	2	CARROLL
WOUND	1	FREDERICK
STREPTOCOCCUS, GROUP G		
BLOOD	2	BALTIMORE CITY
TOTAL	**43**	

SEXUALLY TRANSMITTED DISEASES

GENUS SPECIES SEX	#	JURISDICTION
SYPHILIS SEROLOGY		
M	2	ALLEGANY
F	4	ANNE ARUNDEL
F	8	BALTIMORE
M	8	BALTIMORE
U	1	BALTIMORE
F	15	BALTIMORE CITY
M	36	BALTIMORE CITY
U	1	BALTIMORE CITY
M	3	CARROLL
M	1	DORCHESTER
M	3	HOWARD
F	8	MONTGOMERY
M	8	MONTGOMERY
F	4	PRINCE GEORGE'S
M	24	PRINCE GEORGE'S
F	2	TALBOT
M	1	UNKNOWN
F	1	WASHINGTON
M	1	WASHINGTON
U	1	WASHINGTON
F	1	WICOMICO
M	4	WICOMICO
M	1	WORCESTER
TOTAL	**138**	
CHLAMYDIA TRACHOMATIS		
M	12	ALLEGANY
F	7	ANNE ARUNDEL
M	7	ANNE ARUNDEL
U	2	ANNE ARUNDEL
M	7	BALTIMORE
F	4	BALTIMORE CITY
M	41	BALTIMORE CITY
U	4	BALTIMORE CITY
M	3	CECIL
F	2	HARFORD
M	18	HARFORD
F	2	HOWARD
M	3	HOWARD
F	15	MONTGOMERY
M	31	MONTGOMERY
F	3	PRINCE GEORGE'S
M	42	PRINCE GEORGE'S
M	2	SOMERSET
F	1	WICOMICO
TOTAL	206	
NEISSERIA GONORRHOEAE		
F	1	BALTIMORE
M	4	BALTIMORE
F	1	BALTIMORE CITY
M	1	CAROLINE
M	1	CECIL
F	2	DORCHESTER
M	1	KENT
F	1	MONTGOMERY
F	3	PRINCE GEORGE'S
M	18	PRINCE GEORGE'S
F	8	WICOMICO
M	2	WORCESTER
TOTAL	**43**	

MYCOBACTERIOLOGY

ISOLATE SEX	AGE	#	JURISDICTION
ACID-FAST BACILLUS			
M	52	1	SOMERSET
AFB NOT FOUND IN CULTURE. CULTURE WAS HELD FOR 6 WEEKS TO R/O AFB.			
M	46	1	ALLEGANY
CULTURE OVERGROWN BY CONTAMINATING BACTERIA. PLEASE SUBMIT ANOTHER SAMPLE.			
F	47	1	BALTIMORE CITY
MYCOBACTERIUM ABSCESSUS			
M	32	1	ANNE ARUNDEL
F	36	1	MONTGOMERY
MYCOBACTERIUM AVIUM COMPLEX			
F	48	1	ANNE ARUNDEL
M	55	1	ANNE ARUNDEL
F	85	1	BALTIMORE
M	83	1	BALTIMORE
M	53	1	BALTIMORE
F	76	1	BALTIMORE
F	34	1	BALTIMORE CITY
F	63	1	BALTIMORE CITY
M	28	1	BALTIMORE CITY
M	59	1	BALTIMORE CITY
F	55	1	BALTIMORE CITY
F	83	1	BALTIMORE CITY
M	43	1	BALTIMORE CITY
M	45	1	BALTIMORE CITY
M	66	1	BALTIMORE CITY
M	48	1	CARROLL
M	56	1	CARROLL
F	55	1	CARROLL
M	70	1	CARROLL
F	69	1	FREDERICK
M	67	1	FREDERICK
M	77	1	FREDERICK
M	58	1	FREDERICK
M	67	1	FREDERICK
M	27	1	MONTGOMERY
M	78	1	MONTGOMERY
M	82	1	MONTGOMERY
F	67	1	PRINCE GEORGE'S
M	22	1	SOMERSET
F	73	1	TALBOT
M	77	1	WICOMICO
M	79	1	WICOMICO
M	58	1	WICOMICO
M	79	1	WICOMICO
MYCOBACTERIUM CHELONAE			
F	34	1	MONTGOMERY
M	49	1	MONTGOMERY
MYCOBACTERIUM FORTUITUM			
F	70	1	BALTIMORE
F	63	1	FREDERICK
M	55	1	WASHINGTON
MYCOBACTERIUM FORTUITUM COMPLEX			
F	71	1	MONTGOMERY
F	34	1	MONTGOMERY
MYCOBACTERIUM GORDONAE			
F	91	1	ANNE ARUNDEL
M	82	1	BALTIMORE
M	37	1	BALTIMORE CITY
M	47	1	BALTIMORE CITY
M	70	1	CARROLL
M	32	1	MONTGOMERY
M	59	1	PRINCE GEORGE'S
M	60	1	PRINCE GEORGE'S
F	48	1	PRINCE GEORGE'S
F	61	1	WICOMICO
F	64	1	WICOMICO
M	66	1	WICOMICO
MYCOBACTERIUM KANSASII			
M	27	1	MONTGOMERY
MYCOBACTERIUM MARINUM			
F	57	1	ANNE ARUNDEL
F	56	1	BALTIMORE CITY
MYCOBACTERIUM SZULGAI			
M	44	1	CECIL
MYCOBACTERIUM TUBERCULOSIS			
F	84	1	BALTIMORE CITY
F	83	1	BALTIMORE CITY
M	41	1	BALTIMORE CITY
M	62	1	BALTIMORE CITY
M	35	1	BALTIMORE CITY
M	17	1	CECIL
F	47	1	MONTGOMERY
M	38	1	MONTGOMERY
M	36	1	MONTGOMERY
M	21	1	MONTGOMERY
M	28	1	OUT OF STATE
F	54	1	OUT OF STATE
M	45	1	OUT OF STATE
F	29	1	OUT OF STATE
M	48	1	OUT OF STATE
M	84	1	OUT OF STATE
M	27	1	OUT OF STATE
M	69	1	OUT OF STATE
F	59	1	PRINCE GEORGE'S
M	75	1	WICOMICO
F	37	1	WICOMICO
F	20	1	WORCESTER
MYCOBACTERIUM TUBERCULOSIS COMPLEX			
M	67	1	ANNE ARUNDEL
M	52	1	BALTIMORE
M	56	1	BALTIMORE CITY
M	51	1	BALTIMORE CITY
M	62	1	BALTIMORE CITY
F	28	1	BALTIMORE CITY
M	43	1	BALTIMORE CITY
M	56	1	BALTIMORE CITY
M	17	1	CECIL
M	40	1	CECIL
M	38	1	CHARLES
F	39	1	HOWARD
F	28	1	MONTGOMERY
F	47	1	MONTGOMERY
F	52	1	MONTGOMERY
M	51	1	MONTGOMERY

M	26	1	MONTGOMERY
M	52	1	MONTGOMERY
F	34	1	MONTGOMERY
M	34	1	MONTGOMERY
M	23	1	MONTGOMERY
M	36	1	MONTGOMERY
M	38	1	MONTGOMERY
M	73	1	MONTGOMERY
M	69	1	MONTGOMERY
M	0	1	OUT OF STATE
M	21	1	OUT OF STATE
F	0	1	OUT OF STATE
F	29	1	OUT OF STATE
M	32	1	PRINCE GEORGE'S
F	30	1	PRINCE GEORGE'S
F	33	1	PRINCE GEORGE'S
M	28	1	PRINCE GEORGE'S
M	46	1	PRINCE GEORGE'S
M	48	1	PRINCE GEORGE'S
F	59	1	PRINCE GEORGE'S
M	34	1	PRINCE GEORGE'S
M	75	1	WICOMICO
M	58	1	WICOMICO
F	20	1	WORCESTER

MYCOBACTERIUM XENOPI

M	57	1	BALTIMORE

PLEASE SUBMIT ANOTHER SPECIMEN.
CULTURE OVERGROWN
BY CONTAMINATION.

M	79	1	MONTGOMERY

TOTAL 126

MYCOBACTERIUM SUSCEPTIBILITY RESULTS

26 ISOLATES IDENTIFIED
6 DRUG RESISTANT STRAINS FOUND

#	COUNTY	DRUG(S)
1	ANNE ARUNDEL	STREPTOMYCIN
2[A]	BALTIMORE	STREPTOMYCIN
2[A]	MONTGOMERY	ISONIAZID
1[B,C]	OUT OF STATE	ISONIAZID, PYRAZINAMIDE, and RIFAMPIN

[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

M	0	1	TALBOT
M	68	1	WICOMICO

ASPERGILLUS FLAVUS

F	0	1	ANNE ARUNDEL
F	59	1	ANNE ARUNDEL
F	69	1	ANNE ARUNDEL
U	72	1	ANNE ARUNDEL

ASPERGILLUS FUMIGATUS

F	46	1	BALTIMORE
M	75	1	PRINCE GEORGE'S
F	48	1	PRINCE GEORGE'S
M	64	1	TALBOT
M	76	1	BALTIMORE CITY

ASPERGILLUS NIGER

F	69	1	ANNE ARUNDEL
F	44	1	MONTGOMERY
F	0	1	TALBOT
M	0	1	WICOMICO
M	53	1	BALTIMORE CITY

ASPERGILLUS USTUS

M	65	1	PRINCE GEORGE'S

ASPERGILLUS VERSICOLOR

F	9	1	ALLEGANY
U	38	1	MONTGOMERY

AUREOBASIDIUM

F	1	1	BALTIMORE

BIPOLARIS SPECIES

F	27	1	ANNE ARUNDEL

CANDIDA ALBICANS

M	70	1	CALVERT
M	43	1	CARROLL
F	21	1	MONTGOMERY
F	42	1	MONTGOMERY
F	46	1	MONTGOMERY
F	46	1	MONTGOMERY
F	88	1	MONTGOMERY
M	56	1	MONTGOMERY
M	82	1	MONTGOMERY
F	32	1	MONTGOMERY
F	35	1	MONTGOMERY
F	82	1	MONTGOMERY
F	62	1	PRINCE GEORGE'S
F	78	1	PRINCE GEORGE'S
M	64	1	PRINCE GEORGE'S
U	61	1	PRINCE GEORGE'S
U	83	1	PRINCE GEORGE'S
F	0	1	PRINCE GEORGE'S
F	28	1	PRINCE GEORGE'S
M	0	1	PRINCE GEORGE'S
F	20	1	PRINCE GEORGE'S
F	26	1	PRINCE GEORGE'S
F	37	1	PRINCE GEORGE'S
F	45	1	PRINCE GEORGE'S
F	25	1	PRINCE GEORGE'S
F	27	1	PRINCE GEORGE'S
F	21	1	PRINCE GEORGE'S
U	59	1	BALTIMORE CITY
F	56	1	BALTIMORE CITY
M	54	1	BALTIMORE CITY
M	68	1	BALTIMORE CITY
M	67	1	BALTIMORE CITY
M	81	1	BALTIMORE CITY

CANDIDA GLABRATA

U	79	1	CALVERT
U	79	1	CALVERT
F	88	1	MONTGOMERY
F	21	1	MONTGOMERY
F	35	1	MONTGOMERY
F	41	1	MONTGOMERY
F	58	1	MONTGOMERY
F	76	1	PRINCE GEORGE'S
M	68	1	BALTIMORE CITY

CANDIDA KRUSEI

F	76	1	PRINCE GEORGE'S
F	44	1	PRINCE GEORGE'S

CANDIDA LUSITANIAE

F	27	1	WICOMICO

CANDIDA PARAPSILOSIS

M	59	1	BALTIMORE
F	72	1	CARROLL
F	61	1	FREDERICK
M	68	1	FREDERICK
M	46	1	MONTGOMERY
M	69	1	MONTGOMERY
M	72	1	PRINCE GEORGE'S
M	67	1	PRINCE GEORGE'S
M	64	1	BALTIMORE CITY

CANDIDA SPECIES

F	86	1	CALVERT
M	67	1	BALTIMORE CITY

CANDIDA TROPICALIS

F	61	1	MONTGOMERY
F	32	1	MONTGOMERY
F	76	1	PRINCE GEORGE'S
F	86	1	PRINCE GEORGE'S
F	42	1	PRINCE GEORGE'S

CHRYSOSPORIUM SPECIES

F	47	1	MONTGOMERY
F	83	1	PRINCE GEORGE'S
M	73	1	BALTIMORE CITY

CLADOSPORIUM SPECIES

F	61	1	FREDERICK
F	61	1	PRINCE GEORGE'S
F	52	1	TALBOT
F	57	1	TALBOT

CRYPTOCOCCUS

F	53	1	FREDERICK

CRYPTOCOCCUS NEOFORMANS

M	49	1	PRINCE GEORGE'S
M	56	1	BALTIMORE CITY

CURVULARIA SPECIES

F	72	1	TALBOT
M	51	1	TALBOT

DEMATIACEOUS FUNGI IMPERFECTI

F	66	1	BALTIMORE

ENGYODONTIUM ALBUM

M	48	1	BALTIMORE CITY

EPICOCCUM SPECIES

M	61	1	ALLEGANY
M	51	1	TALBOT
F	68	1	WICOMICO
M	64	1	BALTIMORE CITY

EXOPHIALA SPECIES

F	61	1	FREDERICK
M	48	1	FREDERICK

FUSARIUM SPECIES

F	66	1	BALTIMORE
M	48	1	FREDERICK
M	57	1	BALTIMORE CITY

GEOTRICHUM SPECIES

M	68	1	ANNE ARUNDEL
F	66	1	CHARLES

ISOLATE IS NON-VIABLE. PLEASE RESUBMIT ACTIVELY GROWING FUNGUS FOR ID.

F	77	1	ALLEGANY

MYCELIA STERILIA

F	0	1	ANNE ARUNDEL
F	86	1	CALVERT
F	64	1	CHARLES
F	50	1	FREDERICK
U	61	1	PRINCE GEORGE'S
M	48	1	PRINCE GEORGE'S
M	67	1	BALTIMORE CITY
M	70	1	BALTIMORE CITY

PAECILOMYCES SPECIES

M	75	1	ANNE ARUNDEL

PAECILOMYCES VARIOTII

M	56	1	PRINCE GEORGE'S

PENICILLIUM SPECIES

F	87	1	ANNE ARUNDEL
F	61	1	CARROLL
M	79	1	CHARLES
U	38	1	MONTGOMERY
F	79	1	PRINCE GEORGE'S
F	83	1	PRINCE GEORGE'S
F	47	1	TALBOT
F	57	1	TALBOT
F	65	1	TALBOT

PHIALOPHORA SPECIES

F	1	1	BALTIMORE
F	86	1	CALVERT

PITHOMYCES SPECIES

M	0	1	WICOMICO

RHODOTORULA SPECIES

F	1	1	BALTIMORE

SCYTALIDIUM SPECIES

M	61	1	ALLEGANY
M	51	1	TALBOT

TRICHOPHYTON MENTAGROPHYTES

F	85	1	ANNE ARUNDEL

TRICHOPHYTON RUBRUM

F	55	1	FREDERICK
M	60	1	TALBOT
F	48	1	WICOMICO

TRICHOPHYTON SPECIES

F	0	1	ANNE ARUNDEL

TRICHOPHYTON TONSURANS

F	4	1	CARROLL
M	8	1	MONTGOMERY
F	5	1	TALBOT
M	7	1	TALBOT
M	8	1	BALTIMORE CITY

TRICHOSPORON MUCOIDES

F	26	1	PRINCE GEORGE'S
F	83	1	PRINCE GEORGE'S

TOTAL 145

WATER MICROBIOLOGY

	# TESTED	# NON-COMPLIANT
COMMUNITY	0	0
NON-COMMUNITY	454	119
TOTAL	**454**	**119**

PARASITOLOGY

GENUS/SPECIES

#	JURISDICTION
BLASTOCYSTIS HOMINIS	
1	MONTGOMERY
1	PRINCE GEORGE'S
4	ANNE ARUNDEL
1	PRINCE GEORGE'S
1	MONTGOMERY
1	FREDERICK
2	BALTIMORE CITY
CALLIPHORIDAE, BLOWFLIES	
2	BALTIMORE CITY
CALYPTRATE MUSCOID	
1	MONTGOMERY
CHILOMASTIX MESNILI	
1	MONTGOMERY
DIENTAMOEBA FRAGILIS	
2	MONTGOMERY
2	PRINCE GEORGE'S
ENDOLIMAX NANA	
2	CARROLL
1	ANNE ARUNDEL
3	MONTGOMERY
2	MONTGOMERY
ENTAMEBA COLI	
1	PRINCE GEORGE'S
2	MONTGOMERY
3	PRINCE GEORGE'S
1	FREDERICK
1	PRINCE GEORGE'S
ENTAMEBA HARTMANNI	
1	FREDERICK
1	MONTGOMERY
ENTAMOEBA COLI	
1	PRINCE GEORGE'S
1	MONTGOMERY
ENTAMOEBA HARTMANNI	
1	CARROLL
ENTEROBIUS VERMICULARIS	
2	PRINCE GEORGE'S
GIARDIA LAMBLIA	
2	MONTGOMERY
1	FREDERICK
1	MONTGOMERY
IODAMEBA BÜTSCHLII	
1	MONTGOMERY
TOTAL	**47**

FOOD SAFETY & SECURITY

FOOD
53 SAMPLES
NOTABLE PATHOGENS:
SALMONELLA SP. IN 7 SAMPLES

CRABMEAT
22 SAMPLES
0 EXCEEDING STANDARDS[1]
NOTABLE PATHOGENS:
LISTERIA INNOCUA IN 2 SAMPLES

SHELLFISH
0 SAMPLES
0 EXCEEDING STANDARDS[2]
NOTABLE PATHOGENS:
NONE

SHELLFISH GROWING WATERS
404 SAMPLES

ENVIRONMENTAL
0 SAMPLES

OTHER
0 SAMPLES

479 TOTAL SAMPLES
0 TOTAL STANDARDS EXCEEDED

STANDARDS

[1]CRABMEAT FRESH
ESCHERICHIA COLI AT < 36 MPN/100 GRAMS
STANDARD PLATE COUNT AT < 100,000 PER GRAM

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

VIRUS ISOLATION

ISOLATE

SEX	AGE	#	JURISDICTION
HERPES SIMPLEX VIRUS TYPE 1			
F	28	1	BALTIMORE CITY
M	27	1	BALTIMORE CITY
F	28	1	BALTIMORE CITY
U	25	1	BALTIMORE CITY
SUBTOTAL		**4**	
TOTAL		**4**	

VIRAL POLYMERASE CHAIN REACTION (PCR)

ISOLATE

SEX	AGE	#	JURISDICTION
HERPES SIMPLEX VIRUS TYPE 1			
F	18	1	ALLEGANY
F	19	2	BALTIMORE CITY
F	41	1	BALTIMORE CITY
M	28	1	BALTIMORE CITY
F	18	1	CHARLES
M	23	1	CHARLES
F	25	1	HARFORD
F	25	1	MONTGOMERY
M	24	1	PRINCE GEORGE'S
F	22	1	TALBOT
F	24	1	TALBOT
HERPES SIMPLEX VIRUS TYPE 2			
U	24	1	ANNE ARUNDEL
F	55	1	ANNE ARUNDEL
F	21	1	BALTIMORE
F	22	1	BALTIMORE
F	28	2	BALTIMORE
F	31	1	BALTIMORE
F	16	1	BALTIMORE CITY
F	19	1	BALTIMORE CITY
F	20	2	BALTIMORE CITY
F	22	2	BALTIMORE CITY
F	23	1	BALTIMORE CITY
F	24	1	BALTIMORE CITY
F	26	1	BALTIMORE CITY
F	31	1	BALTIMORE CITY
F	34	1	BALTIMORE CITY
F	75	1	BALTIMORE CITY
M	0	1	BALTIMORE CITY
M	19	1	BALTIMORE CITY
M	21	1	BALTIMORE CITY
M	22	1	BALTIMORE CITY
M	23	2	BALTIMORE CITY
M	25	2	BALTIMORE CITY
M	26	1	BALTIMORE CITY
M	27	1	BALTIMORE CITY
M	28	2	BALTIMORE CITY
M	30	2	BALTIMORE CITY
M	32	1	BALTIMORE CITY
M	40	1	BALTIMORE CITY
M	45	1	BALTIMORE CITY
M	65	1	BALTIMORE CITY
F	20	1	CARROLL
F	33	1	CARROLL
F	26	1	CHARLES
F	30	1	CHARLES
F	35	1	DORCHESTER
F	22	1	FREDERICK
F	28	1	FREDERICK

M	34	1	GARRETT
F	25	1	HARFORD
F	34	1	HARFORD
F	27	1	HOWARD
F	20	1	MONTGOMERY
F	26	1	MONTGOMERY
F	30	1	MONTGOMERY
F	33	1	MONTGOMERY
F	47	1	MONTGOMERY
F	55	1	MONTGOMERY
F	22	1	PRINCE GEORGE'S
F	25	1	PRINCE GEORGE'S
F	29	1	PRINCE GEORGE'S
M	25	1	PRINCE GEORGE'S
M	20	1	QUEEN ANNE'S
F	50	1	SOMERSET
F	21	1	TALBOT
F	24	1	WORCESTER
TOTAL		**74**	

VIRAL HEPATITIS

ORGANISM	# SPECIMENS	# POSITIVES	JURISDICTION
HEPATITIS A			
	2	0	ANNE ARUNDEL
	2	0	BALTIMORE
	3	1	BALTIMORE CITY
	1	0	WICOMICO
SUBTOTAL	**8**	**1**	
HEPATITIS B			
	59	0	ALLEGANY
	106	1	ANNE ARUNDEL
	88	1	BALTIMORE
	661	3	BALTIMORE CITY
	3	0	CALVERT
	37	0	CARROLL
	155	1	CECIL
	4	0	CHARLES
	94	1	FREDERICK
	20	0	GARRETT
	50	0	HARFORD
	25	1	HOWARD
	319	4	MONTGOMERY
	5	1	PRINCE GEORGE'S
	342	9	PRINCE GEORGE'S
	4	0	SAINT MARY'S
	15	0	TALBOT
	6	0	UNKNOWN
	31	0	WASHINGTON
	121	2	WICOMICO
	2	0	WORCESTER
SUBTOTAL	**2,147**	**24**	
HEPATITIS C			
	51	5	ALLEGANY
	115	44	ANNE ARUNDEL
	93	7	BALTIMORE
	284	79	BALTIMORE CITY
	5	0	CALVERT
	41	9	CARROLL
	78	11	CECIL
	6	1	CHARLES
	107	5	FREDERICK
	21	0	GARRETT
	32	2	HARFORD
	5	1	HOWARD
	41	2	MONTGOMERY
	5	4	PRINCE GEORGE'S
	212	6	PRINCE GEORGE'S
	3	0	QUEEN ANNE'S
	6	0	SAINT MARY'S
	34	0	TALBOT
	5	2	UNKNOWN
	3	1	WASHINGTON
	20	1	WICOMICO
	2	1	WORCESTER
SUBTOTAL	**1,169**	**181**	
TOTALS	**3,324**	**206**	

RABIES

SOURCE	#	JURISDICTION
BAT	2	ANNE ARUNDEL
	1	BALTIMORE
	1	CARROLL
	1	FREDERICK
	1	HARFORD
	3	MONTGOMERY
	1	PRINCE GEORGE'S
	1	SOMERSET
	1	WASHINGTON
	1	BALTIMORE CITY
CAT	2	BALTIMORE
	1	FREDERICK
	1	BALTIMORE CITY
FOX	1	MONTGOMERY
	1	ST. MARY'S
GROUNDHOG	1	FREDERICK
RACCOON	1	ALLEGANY
	3	BALTIMORE
	1	CARROLL
	1	FREDERICK
	2	HARFORD
	1	HOWARD
	5	MONTGOMERY
	1	PRINCE GEORGE'S
	2	QUEEN ANNE'S
	1	ST. MARY'S
	1	TALBOT
	1	WASHINGTON
	1	WICOMICO
	3	WORCESTER
SKUNK	2	ST. MARY'S
	1	WORCESTER

TOTAL POSITIVES 47

TOTAL SPECIMENS 558

CHLAMYDIOPHILIA PSITTACI
(CHLAMYDIA)

REPORTED QUARTERLY
NO REPORT THIS MONTH

CD4 FLOW CYTOMETRY WORKLOAD

REPORTED QUARTERLY
NO REPORT THIS MONTH

NEWBORN & CHILDHOOD SCREENING

PRESUMPTIVE POSITIVES

DISORDERS	#
PHENYLKETONURIA	6
MAPLE SYRUP URINE DISEASE	11
HOMOCYSTINURIA	15
TYROSINEMIA	7
ARGININEMIA	1
CITRULLINEMIA	2
GALACTOSEMIA	2
BIOTINIDASE DEFICIENCY	1
HYPOTHYROIDISM	68
HEMOGLOBIN -DISEASE	15
HEMOGLOBIN -BENIGN	439
CONGENITAL ADRENAL HYPERPLASIA (CAH)	26
CYSTIC FIBROSIS	4
FATTY ACID OXIDATIONS	10
ORGANIC ACIDEMIAS	18
ACYLCARNITINE - BORDERLINE	5
ACYLCARNITINE - OTHERS	1

MONTHLY TOTALS

# OF SPECIMENS SCREENED	10,846
NUMBER OF TESTS	704,191
% UNSATISFACTORY SPECIMENS	2.7

YEAR-TO-DATE CONFIRMED CASES

CONDITIONS	# CON-FIRMED
MCAD	2
3MCC	1
SCAD	0
VLCAD	0
GA-I	1
PA	1
MAPLE SYRUP URINE DISEASE	0
PKU- CLINICALLY SIGNIFICANT VARIANT	2
PKU- NOT CLINICALLY SIGNIFICANT VARIANT	1
GALACTOSEMIA- CLASSICAL GALT DEFICIENCY	2
GALACTOSEMIA - VARIANT	1
BIOTINIDASE DEFICIENCY	0
GALACTOSE EPIMERASE DEFICIENCY	0
PARTIAL BIOTINIDASE DEFICIENCY	0
CAH- CLASSICAL SALT WASTING	2
CAH-NON-CLASSICAL	0
HYPOTHYROIDISM - PRIMARY	8
OTHER HYPOTHYROIDISM	4
SECONDARY HYPOTHYROIDISM	1
SICKLE CELL DISEASE -SS	7
SICKLE CELL DISEASE -SE	1
SICKLE CELL DISEASE -SC	3
SICKLE CELL DISEASE -S β THALASSEMIA	4
CYSTIC FIBROSIS	3

VIRAL LOAD SPECIMENS

HIV-1 RNA COPIES/ML	$<10^3$	10^3—10^4	10^4—10^5	$>10^5$	TOTALS
ALLEGANY	13	0	0	0	**13**
CARROLL	1	0	0	0	**1**
FREDERICK	1	0	2	0	**3**
MONTGOMERY	65	9	8	6	**88**
PRINCE GEORGE'S	101	7	22	9	**139**
SOMERSET	2	0	0	0	**2**
WASHINGTON	1	1	0	0	**2**
WICOMICO	3	1	0	0	**4**
SUBTOTALS	**187**	**18**	**32**	**15**	**252**
DEPT. of CORRECTIONS	45	9	13	6	**73**
TOTALS	**232**	**27**	**45**	**21**	**325**

HIV ANTIBODY SCREENING

	TOTAL SPECIMENS	# EIA POSITIVE	% EIA POSITIVE	# WB POSITIVE	% WB POSITIVE
HEALTH DEPARTMENTS AND CLINICS	2,735	156	5.70%	147	94.23%
HOSPITALS	182	9	4.94%	8	88.88%
DETENTION CENTERS	349	5	1.43%	5	100.00%
PRIVATE PHYSICIANS	15	0	0.00%	0	0.00%
STUDENT HEALTH CLINICS	300	3	1.00%	0	0.00%
EMPLOYEE HEALTH CLINICS	8	0	0.00%	0	0.00%
AUTOPSY (MEDICAL EXAMINER/ HOSPITAL CASES)	337	26	7.72%	12	46.15%
ORGAN/TISSUE DONORS (ANATOMY BOARD/EYE BANK)	79	0	0.00%	0	0.00%
TOTALS	**4,005**	**199**	**4.97%**	**172**	**86.43%**

MAILING LABEL

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