Carbapenem Susceptibility Testing - Recommendations for Microbiology Laboratories

Utah Department of Health
Division of Disease Control
and Prevention
Bureau of Epidemiology
HAI Program
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Carbapenem Susceptibility Testing - Recommendations for Microbiology Laboratories

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The Utah Department of Health’s Carbapenem Susceptibility Testing - Recommendations for Microbiology Laboratories was modeled after the Oregon CRE Toolkit (http://public.health.oregon.gov/diseasesconditions/communicabledisease/reportingcommunicabledisease/reportingguidelines/documents/cre_iguide.pdf) but includes Utah-specific definitions, recommendations and protocols.

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Recommendations for Microbiology Laboratories

Determine carbapenem susceptibility following the CLSI recommended procedures and interpretive criteria. Between 2010 and 2012, CLSI adjusted susceptibility breakpoints for testing Enterobacteriaceae to carbapenems (see Table below). The 2012 breakpoints increased the sensitivity for carbapenamase detection; laboratories using the 2012 breakpoints do not need to perform a “confirmatory” Modified Hodge Test (MHT) for patient management.

The Utah Department of Health (UDOH) administered a statewide survey in December 2013 and found that most Utah microbiology laboratories used CLSI breakpoints predating the 2010 update and did not perform MHT for confirmatory carbapenamase testing. This is a potential gap in our ability to detect and report carbapenemase-producing CRE (CP-CRE). We recommend that laboratories using pre-2010 breakpoints perform carbapenemase screening and confirmation via MHT. If those laboratories are unable to do their own carbapenemase screening and confirmation, we advise that they send their specimens to a reference laboratory that is able to test (Appendix A).

In May 2013, the UDOH required the reporting of carbapenem non-susceptible Acinetobacter, E coli, and Klebsiella species. Use the UDOH case definition as follows:

**Confirmed:**
- Isolation of Acinetobacter species and:
  - MIC to Imipenem or Meropenem of $\geq 4 \mu g/mL$, or
  - PCR positive for carbapenemase gene
- Isolation of Klebsiella species or Escherichia coli and:
  - Intermediate or resistant MIC to a carbapenem (refer to table for breakpoints) or
  - Positive Modified Hodge test, or
  - PCR positive for carbapenemase gene

### Breakpoints Predating 2010 Update

<table>
<thead>
<tr>
<th></th>
<th>Susceptible</th>
<th>Intermediate</th>
<th>Resistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doripenem</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Ertapenem</td>
<td>$\leq 2$</td>
<td>4</td>
<td>$\geq 8$</td>
</tr>
<tr>
<td>Imipenem$^a$</td>
<td>$\leq 4$</td>
<td>8</td>
<td>$\geq 16$</td>
</tr>
<tr>
<td>Meropenem</td>
<td>$\leq 4$</td>
<td>8</td>
<td>$\geq 16$</td>
</tr>
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</table>

### 2012 Breakpoints

<table>
<thead>
<tr>
<th></th>
<th>Susceptible</th>
<th>Intermediate</th>
<th>Resistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>(revised Jun. 2010 and Jan. 2012; M100-S22)</td>
<td>$\leq 1$</td>
<td>2</td>
<td>$\geq 4$</td>
</tr>
<tr>
<td>Doripenem</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Ertapenem</td>
<td>$\leq 0.5$</td>
<td>1</td>
<td>$\geq 2$</td>
</tr>
<tr>
<td>Imipenem$^a$</td>
<td>$\leq 1$</td>
<td>2</td>
<td>$\geq 4$</td>
</tr>
<tr>
<td>Meropenem</td>
<td>$\leq 1$</td>
<td>2</td>
<td>$\geq 4$</td>
</tr>
</tbody>
</table>
**Screening cultures**

CRE screening cultures for outbreak investigations should be performed as recommended by local facility’s Infection Prevention and Control staff in consultation with UDOH. The number of surveillance cultures requested will be based on pertinent epidemiology.

- The recommended protocol for screening cultures is included *(Appendix B)*. If your laboratory does not have ertapenem (preferred) or meropenem (alternative) disks, contact UDOH HAI epidemiologist. Confirm candidate CRE organisms via routine identification (UPHL should be able to type specimens) and susceptibility (specimens will be sent to a reference lab); keep confirmed CRE isolates until further notification by UDOH.

- Screening cultures should NOT be billed to the patient; discuss billing with your facility’s Infection Prevention and Control department in consultation with UDOH.
- Facilities may want to consider allocation of ‘emergency funds’ to pay for active screening cultures in the event of an outbreak or identification of rare organism.
- Discuss how results of screening cultures will be reported with your facility’s Infection Prevention and Control department.

How to send isolates to UPHL for typing only:

Use the General Microbiology Request Form *(Appendix C)*.

- In “tests requested”, check “other” under isolate identification and write “CRE/CRAB”.
- In “comments”, please indicate genus and species.
- Send specimen....on a slant; a plate is also acceptable.
- Include collection date, source of specimen, and patient medical record number.

**“Unusual” Isolates**

To send any *E. coli, Klebsiella spp.*, or *Acinetobacter spp.* or other isolates that are ‘unusual*’ to the Utah Public Health Laboratory (UPHL) for further testing at CDC please contact the UDOH HAI Epidemiologist at 801-538-9182. The HAI Epidemiologist will work with you and UPHL to forward the isolate to the Centers for Disease Control and Prevention for further analysis if warranted (not real-time). UPHL will fax results to your laboratory within 3 business days of receipt of test result.

*Unusual: Rare or unknown isolate.*
**Acinetobacter species isolate identified that meets case definition**

Is this your facility’s first CRAB?

- **Yes**
  - Results confirmed?
    - **Yes**
      - Report lab results to Local Health Department
        - Submit updated lab report
        - Submit susceptibilities
        - Notify Infection Prevention and Control
    - **No**
      - Confirm results
        - Negative
          - Do not report
        - Positive
          - Report lab results to Local Health Department
            - Submit updated lab report
            - Submit susceptibilities
            - Notify Infection Prevention and Control

- **No**
  - Report to Local Health Department
    - Submit Lab Report
    - Submit susceptibilities
    - Notify Infection Prevention and Control

**Acinetobacter species**

**Case definition**

**Confirmed:**
Isolation of *Acinetobacter* species and:
- MIC to Imipenem or Meropenem of $\geq 4 \, \mu g/mL$, or
- PCR positive for carbapenemase gene

**Note:** If using FDA-cleared instruments, follow instrument (FDA) breakpoints for CRAB.
**Escherichia coli and Klebsiella species Laboratory Response Diagram**

**Escherichia coli and Klebsiella species isolate identified that meets case definition**

Report to Local Health Department
- Submit Lab Report
- Submit susceptibilities

**Notify Infection Prevention and Control**

**Did your laboratory test for carbapenemase production?**

- Yes
- No

**Submit isolate to reference laboratory (Appendix A) for Confirmatory testing**

**Result confirmed carbapenemase producer?**

- Yes
- No

**Report updated lab results to Local Health Department**
- Submit updated lab report
- Submit susceptibilities

**Notify Infection Prevention and Control**

---

**Escherichia coli and Klebsiella species Case definition**

**Confirmed:**
Isolation of Klebsiella species or Escherichia coli and:
- MIC to Imipenem, or Meropenem of $\geq 8 \mu g/mL$, Ertapenem of $\geq 4 \mu g/mL$ (if using pre-2010 CLSI breakpoints), or
- MIC to Imipenem, Meropenem, or Doripenem of $\geq 2 \mu g/mL$, Ertapenem of $\geq 1 \mu g/mL$ (if using post-2012 CLSI breakpoints as described in the table above) or
- Positive Modified Hodge test, or
- PCR positive for carbapenemase gene

**Note:** If using FDA-cleared instruments, follow instrument (FDA) breakpoints for CRE.
<table>
<thead>
<tr>
<th>Laboratory</th>
<th>Address</th>
<th>City</th>
<th>Phone</th>
<th>Supervisor</th>
<th>Email</th>
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<tbody>
<tr>
<td>ARUP</td>
<td>500 Chipeta Way, Salt Lake City, UT 84108</td>
<td>Salt Lake City</td>
<td>801-583-2787</td>
<td>Haleina Muir</td>
<td><a href="mailto:haleina.m.muir@aruplab.com">haleina.m.muir@aruplab.com</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lab Supervisor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Testing Provided:</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>NDM, KPC, PCR test</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-Mail: <a href="mailto:haleina.m.muir@aruplab.com">haleina.m.muir@aruplab.com</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTERMOUNTAIN CENTRAL LABORATORY</td>
<td>5121 S. Cottonwood St., Salt Lake City, UT 84107</td>
<td>Salt Lake City</td>
<td>801-507-2244</td>
<td>George Hinde</td>
<td><a href="mailto:george.hinde@imail.org">george.hinde@imail.org</a></td>
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<tr>
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<tr>
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<td>NDM, KPC, OXA, IMP, VIM, CTXM type ESBL</td>
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</tr>
<tr>
<td>E-Mail: <a href="mailto:george.hinde@imail.org">george.hinde@imail.org</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRIMARY CHILDREN'S HOSPITAL</td>
<td>100 N. Mario Cappelli Drive, Salt Lake City, UT 84113</td>
<td>Salt Lake City</td>
<td>801-662-2140</td>
<td>Abby Phillips</td>
<td><a href="mailto:Abby.Phillips@imail.org">Abby.Phillips@imail.org</a></td>
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<td>E-Mail: <a href="mailto:Abby.Phillips@imail.org">Abby.Phillips@imail.org</a></td>
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Laboratory Protocol for Detection of Carbapenem-Resistant or Carbapenemase-Producing, *Klebsiella* spp. and *E. coli* from Rectal Swabs

**Purpose**
To identify patients colonized with carbapenem-resistant or carbapenemase-producing Enterobacteriaceae in the intestinal tract. Patients who grow these organisms should be placed on Contact Precautions (5) to prevent transmission of the resistant bacteria. The procedure described below is a modification of the procedure described by Landman et al. (4). See the procedural notes for steps in the procedure which can be modified.

**Background**
Carbapenem-resistant Enterobacteriaceae (CRE) are usually resistant to all β-lactam agents as well as most other classes of antimicrobial agents. The treatment options for patients infected with CRE are very limited. Healthcare-associated outbreaks of CRE have been reported. Patients colonized with CRE are thought to be a source of transmission in the healthcare setting (1). Identifying patients who are colonized with CRE and placing these patients in isolation precautions may be an important step in preventing transmission (6).

Carbapenem resistance in Enterobacteriaceae occurs when an isolate acquires a carbapenemase or when an isolate produces an extended-spectrum cephalosporinase, such as an AmpC-type β-lactamase, in combination with porin loss. In the United States, the most common mechanism of carbapenem resistance is the *Klebsiella pneumoniae* carbapenemase (KPC).

Detection of carbapenemase production is complicated because some carbapenemase-producing isolates demonstrate elevated but susceptible, carbapenem MICs. CLSI has published guidelines for detection of isolates producing carbapenemases (CLSI document M100) (2). For isolates that test susceptible to a carbapenem but demonstrate reduced susceptibility either by disk diffusion or MIC testing, performing a phenotypic test for carbapenemase activity, the Modified Hodge Test (MHT), is recommended.

Carbapenem resistance and carbapenemase-production in any species of Enterobacteriaceae is an infection control concern. However, the methodology described here focuses on the detection of carbapenem-resistant or carbapenemase-producing *Klebsiella* spp and *E. coli* as this facilitates performance of the test in the microbiology laboratory and, more importantly, because these organisms, especially *Klebsiella* spp. represent the vast majority of CRE encountered in the United States (3).
Reagents
5 ml Trypticase Soy Broth
10-µg carbapenem disks
MacConkey agar

Equipment
Vortex
35 ± °C, ambient air

Supplies
100 µl calibrated pipettes
Forceps
Sterile loops

Specimen
Rectal swab or perianal swab specimen in suitable transport media

Special safety precautions
Biosafety Level 2

Quality Control (QC)
The carbapenem disks that are used in this procedure should be quality control tested using disk diffusion methods and quality control strains as described in the CLSI guideline documents M2 and M100 (2,(2). For example, if the 10-µg/mL meropenem disk is used in this procedure, test *E. coli* ATCC 25922 by the disk diffusion method using meropenem disks from the same lot. An acceptable control test will yield a zone size between 28-34 mm. Follow CLSI guidelines for frequency of disk QC testing and corrective action if results are out of range.
Procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Day</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Day One</td>
<td>Aseptically, place one 10-µg ertapenem or meropenem disc in 5 ml trypticase soy broth (TSB) (see procedure note 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Immediately inoculate the broth with the rectal culture swab</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Incubate overnight at 35 ± 2°C, ambient air</td>
</tr>
<tr>
<td>Step 2</td>
<td>Day Two</td>
<td>Vortex and subculture 100 µl of the incubated broth culture onto a MacConkey agar plate (see procedure note 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Streak for isolation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Incubate overnight at 35 ± 2°C, ambient air</td>
</tr>
<tr>
<td>Step 3</td>
<td>Day Three</td>
<td>Examine the MacConkey agar for lactose-fermenting (pink-red) colonies. More than one colony morphology may represent different species of Enterobacteriaceae (see procedure note 3).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>It may be necessary to subculture representative colonies of each morphology type to a non-selective media for isolation and/or for susceptibility testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Screen representative isolated colonies using a phenotypic test for carbapenemase production, such as the Modified Hodge Test (MHT) or test for carbapenem susceptibility using a standardized method and follow the CLSI guidelines for identification of carbapenemase-producing Enterobacteriaceae (see procedure note 4).</td>
</tr>
<tr>
<td>Step 4</td>
<td>Day Four</td>
<td>For CRE and/or MHT-positive isolates, perform species-level identification.</td>
</tr>
</tbody>
</table>

Interpretation/Results
Report all cultures that are positive for CRE or carbapenemase-producing Enterobacteriaceae to the appropriate infection control personnel. Contact Precautions should be implemented for all patients with positive cultures for CRE or carbapenemase-producing Enterobacteriaceae.

Quality assurance
The ability to recover CRE using this procedure could be assessed as follows: Inoculate 5mL of TSB containing the 10-ug carbapenem disk with a swab that was used to sample a known CRE-negative stool specimen. In addition, inoculate the TSB with 0.5 mL of a 1 x 10^5 CFU/mL suspension of a known carbapenemase-producing isolate (e.g., *K. pneumoniae* ATCC BAA-1705), (see procedural note 5 for suspension preparation) Proceed with Step 2 of the procedure. The carbapenemase-producing *K. pneumoniae* should be recovered on the MacConkey agar.
To test for specificity of the procedure, use a carbapenem susceptible *Klebsiella pneumoniae*, (e.g. ATCC 700603) and follow the same steps. The carbapenem susceptible *K. pneumoniae* isolate should not grow on the MacConkey agar.

**Method limitations**

1. Patients may be colonized with CRE or carbapenemase-producing Enterobacteriaceae at a concentration that is not detectable by this method. Studies described by Landman et al. and studies performed at the CDC suggest that the lower limit of detection is between ranges from 1 x 10^2 CFU/ mL to 1 x 10^6 CFU/ mL (4).

2. Non-fermenting gram-negative bacilli with intrinsic mechanisms of carbapenem-resistance, such as *Acinetobacter* spp. and *P. aeruginosa*, will be detected on the MacConkey agar. These isolates should be identified as non-lactose fermenters on the MacConkey agar and therefore would not be picked for characterization. If carbapenem-resistant non-fermenters are present at high concentration, they could overgrow CRE or carbapenemase-producing Enterobacteriaceae on the media and prevent detection of colonization.

3. Enterobacteriaceae can be resistant to carbapenems by mechanisms other than a carbapenemase, the most common of which is expression of an extended-spectrum cephalosporinase, such as an AmpC-type enzyme or an ESBL, combined with porin loss. These isolates will also grow on the MacConkey agar and be identified as carbapenem-intermediate or resistant by standard susceptibility testing but these isolates are negative by the MHT. For isolates that test intermediate or resistant to carbapenems, it may not be necessary to distinguish between these mechanisms of resistance because all carbapenem-nonsusceptible Enterobacteriaceae produce a broad-spectrum β-lactamase, and are therefore an infection control concern. Implementing Contact Precautions for patients colonized with these bacteria would be appropriate. Laboratories may choose to test carbapenem-intermediate or resistant isolates with the MHT to identify carbapenemase-production for epidemiological purposes.

**Procedure notes**

1. The procedure described by Landman et al. (4) describes using a 10-µg imipenem disk for step 1. However, there are species of Enterobacteriaceae which have intrinsic mechanisms of resistance to imipenem other than a carbapenemase (See CLSI document M100, Appendix G)(2). Therefore, ertapenem or meropenem may provide more specific selection for acquired carbapenem resistance in Enterobacteriaceae.

2. Some laboratories performing cultures for isolation of CRE from rectal specimens place a 10-µg carbapenem disk in the first quadrant of the MacConkey plate. Only colonies growing “close” to the carbapenem disk are picked for characterization. No clear criteria for “close” have been established. However, it may be helpful to use either a meropenem or ertapenem disk and then apply the CLSI disk diffusion screening criteria to identify potential carbapenemase-producing isolates (i.e., an ertapenem or meropenem disk zone ≤ 21 mm). Note: These zone size criteria
were validated for standardized disk diffusion testing methods as described in CLSI document M2.

3. Carbapenemases are known to exist in several different species of gram-negative bacilli including species of Enterobacteriaceae and *Pseudomonas aeruginosa*. However, carbapenemases are more common in lactose-fermenting species of Enterobacteriaceae (e.g., *K. pneumoniae* and *E. coli*) than in non-lactose fermenting Enterobacteriaceae (e.g. *Serratia marcescens* and some *Enterobacter* spp.) and *P. aeruginosa*. In this procedure, it is suggested that laboratories focus their efforts on detection of resistant lactose-fermenting bacteria to reduce workload. Healthcare facilities that have identified clinical infections with carbapenemase-producing non-lactose fermenting gram-negative species should consider altering this procedure to include characterization of colonies with a morphology that is consistent with those species.

4. The exact procedure for confirmation of CRE or carbapenemase-production should be laboratory-specific and chosen based upon laboratory workflow and the types of isolates causing clinical infections in the patient population served. It may be helpful to refer to the CLSI guidelines for identification of carbapenemase production in isolates that test susceptible to carbapenems in document M100 (2).

5. A $1 \times 10^4$ CFU/mL suspension of the known carbapenem-resistant or carbapenem-susceptible isolates could be prepared as follows: Dilute 0.1 mL of a 0.5 McFarland standard suspension (equals approximately $1 \times 10^8$ CFU/mL), in 9.9 mL sterile water or saline for a 1:100 dilution. From the 1:100, dilute 1.0 mL in 9.0 mL water or saline for a 1:1000 dilution. Add 0.5 mL of the 1:1000 dilution (equals approximately $1 \times 10^5$ CFU/mL), suspension to the 5 mL TSB for a final concentration of approximately $1 \times 10^4$ CFU/mL.

References


Appendix C

UTAH PUBLIC HEALTH LABORATORY
4431 SOUTH 2700 WEST
TAYLORSVILLE, UTAH 84129
TELEPHONE: (801) 965-2400
FAX: (801) 965-2551
http://health.utah.gov/lab/infectious-diseases

INFECTION DISEASE TEST REQUEST FORM

FOR UPHL USE ONLY

LAB# DATE

PLEASE PRINT CLEARLY FOR ACCURACY.

PATIENT INFORMATION:

PATIENT STATE OF RESIDENCE: PATIENT COUNTY OF RESIDENCE: ZIP CODE: DATE OF BIRTH (mm/dd/yyyy) AGE SEX

M F

PATIENT NAME (Last, First):

Is Patient Insured? STI TESTING ONLY: Is patient MSM?

[ ] Yes [ ] No [ ] Yes [ ] No

PATIENT ID #

ETNICITY RACE

[ ] Hispanic [ ] White [ ] Black or African American [ ] American Indian or Alaska Native

[ ] Non-Hispanic [ ] Asian [ ] Native Hawaiian or other Pacific Islander

PROVIDER INFORMATION

Provider Code:

Physician: ____________________________

Provider Phone: ______________________

Provider Email: _______________________

Secure Fax #: ________________________

SPECIMEN COLLECTION DATE AND TIME

SPECIMEN SOURCE/SITE (CHOOSE 1):

[ ] Blood

[ ] Environmental (specify): ________________

[ ] Plasma

[ ] Urethra

[ ] Body Fluid (specify): ________________

[ ] Food (specify): ________________

[ ] Rectum

[ ] Urine

[ ] Bronchoalveolar lavage

[ ] Isolate (source): ________________

[ ] Serum

[ ] Vagina

[ ] Bronchial aspirate/wash

[ ] Lesion (site): ________________

[ ] Sputum (natural / induced)

[ ] Vomitus

[ ] Cerebrospinal Fluid

[ ] Liquid Pap

[ ] Stool

[ ] Wound/Abcess

[ ] Cervix

[ ] Nasal (aspirate /swab /wash)

[ ] Throat swab

[ ] Other (specify): ________________

[ ] Endotracheal aspirate/wash

[ ] Nasopharyngeal swab

[ ] Tissue (specify): ________________

BACTERIOLOGY/TUBERCULOSIS TESTS

Bacteriology Specimen

REQUIRED Shipping Temperature:

[ ] Bacillus anthracis Detection/identification

[ ] Bacterial Culture

[ ] Bacterial ID / Referral

Presumptive ID:

[ ] Mycobacterial culture

[ ] Mycobacterial referral

Presumptive ID:

[ ] Other (specify): ____________________________

[ ] C. trachomatis and N. gonorrhoea by NAAT

[ ] Herpes/VZV PCR (HSV-1, HSV-2, VZV)

[ ] Virus Identification (culture)

[ ] QuantIFERON-TB Gold

REQUIRED Information:

Blood draw date/time: __________________

Incubation at 37C completed? [ ] Yes [ ] No

Signature: ____________________________

Incubation starte date/time: __________________

Incubation end date/time: __________________

VIROLOGY / IMMUNOLOGY TESTS

[ ] Chlamydia

[ ] Multi-Pathogen Respiratory Panel

[ ] Herpes simplex virus

[ ] Hepatitis C Antibody

[ ] Respiratory virus

[ ] Metapneumovirus, Rhino/Enterovirus, Influenza A, Influenza B, Parainfluenza 1-4, RSV, Bordetella pertussis, C. pneumoniae, M. pneumoniae)

[ ] Hepatitis C RNA

[Qualitative; Antibody screen not included]

[ ] Parvovirus

[ ] Hantavirus (Sin Nombre) IgG/IgM

[ ] Hepatitis B Antibody

[ ] Varicella zoster virus

[ ] Acute Serum (mm/dd/yy) / / /

[ ] Orthopox viruses Detection

[ ] Convalescent serum (mm/dd/yy) / / /

[ ] Bacillus anthracis Detection/identification

[ ] RPR (suspect acute infection/previous positive)

[ ] Brucella species Detection/identification

[ ] HIV Antigen/Antibody (includes confirm. testing)

[ ] Brucella antibody

[ ] Previous positive

[ ] Burkholderia mallei/pseudomallei Detection/ID

[ ] RPR (suspect acute infection/previous positive)

[ ] Clostridium botulinum culture & toxin

[ ] HIV Antigen/Antibody (includes confirm. testing)

[ ] Coxiella burnetii Detection

[ ] Hepatitis B Antibody

[ ] Francisella tularensis Detection/Identification

[ ] Hepatitis B Antibody

[ ] F. tularensis antibody

[ ] Hantavirus (Sin Nombre) IgG/IgM

[ ] Orthopox viruses Detection

[ ] Hepatitis B Antigen

[ ] Varicella zoster virus

[ ] West Nile virus IgM (Human)

OTHER DATE

[ ] West Nile virus IgM (Human)

BIOTERRORISM TESTS

(Notify lab before submitting)

[ ] Referral Test to CDC (form REQUIRED) specify:

CONTACT UPHL FOR CDC form

ADDITONAL INFORMATION

[ ] Other Disease Suspected: ____________________________

COMMENTS:

