WIPAG

WY Infection Prevention Orientation Manual

Section #10, Laboratory

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Table of Contents

Section #10: Laboratory

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Objectives

At the completion of this section the Infection Preventionist (IP) will:

- Describe basic elements of laboratory that are pertinent to Infection Prevention and Control
- Identify and interpret laboratory tests which have an impact on infection prevention and control
- Become familiar and meet with laboratory department personnel (i.e. chemistry-which usually includes serology, microbiology, and hematology) and the Manager/Director
- Become familiar with the State of Wyoming Public Health Laboratory
- Become familiar with laboratory methods such as how test are performed, how to interpret results and normal values
- Become familiar with the Wyoming Department of Health Reportable Conditions and diseases, notifications times and phone numbers
- Determine who and **IF** the lab reports State reportable diseases and become familiar with their process of reporting.

Number of hours

- Key Concepts - 1 hours
- Methods – 2 hours

Required Readings

- Grota P, Allen V, Boston KM, et al, eds. *APIC Text of Infection Control & Epidemiology. 4th Edition.* Washington, D.C.: Association for Professionals in Infection Control and Epidemiology, Inc.; 2014.
    - Chapter 25, Laboratory Testing and Diagnostics, by J Smyer
    - Chapter 108, Laboratory Services, by P Prinz Luebbert
- Information available in Appendices A, B and C
- Wyoming Infection Prevention Orientation Manual (WY IPOM), Section #11 Microbiology

Overview

The IP should view the laboratory setting from two perspectives: an employee health and safety perspective, and as an essential partner of IPs in the detection and characterization of pathogens. The IP in many other healthcare facilities such as ambulatory surgery, outpatient dialysis, and long term care will find this information helpful in networking, assuring quality reports, and answering questions with the Laboratory. Refer to the WY IPOM Microbiology Section #11 for more details on the identification of specific organisms.

Key Concepts

Most microorganisms (bacteria and fungus) are singe cells and exhibit characteristics common to all biological systems: reproduction, metabolism growth, irritability, adaptability, mutation and organization. In contrast, viruses are considered a prokaryote because they lack the characteristics of living things, except the ability to replicate, which they accomplish only in living cells. Therefore, the most commonly used test methods for the detection of viral diseases are blood tests and/or titers for an

immunologic response also known as serology.

Serology is the scientific study of plasma serum and other bodily fluids and refers to the detection of antibodies (immune response) in the serum or titers. Such antibodies are typically formed in response to an infection, against other foreign proteins (i.e. mismatched blood), or to one's own proteins (i.e. autoimmune disease).

In addition to the microbiology sections of a laboratory, the hematology area performs the Complete Blood Count (CBC), hemoglobin and hematocrit, and the differential (diff). The CBC includes the white blood count (WBC). The hemoglobin and hematocrit tests determine red blood cells. The differential provides a percentage concentration of various cellular components of the white blood cells (neutrophils, lymphocytes, monocytes, eosinophils, basophiles, and platelets). The results of these tests (CBC, WBC, hemoglobin, and hematocrit) will give information regarding the potential for a bacterial vs. viral infection.

Methods

The IP should become familiar with the laboratory tests needed to diagnose diseases and the types of organism which cause the diseases. The IP should understand the specific requirements for specimen collection and transportation in order to insure that the correct sample is collected and can be tested. If a sample is not collected, handled, or stored properly, testing may be refused by the laboratory. The testing of specimens not collected, handled or stored properly will cause results to be misleading, inaccurate, or entirely incorrect due to the breakdown of enzymes, overgrowth of bacteria, or for other reasons. The IP should have a relationship with either the in-house laboratory, or the reference laboratory with whom the facility is contracting.

Clinical Microbiology Laboratory Experience

The IP should spend time with a mentor in the laboratory including the sections of microbiology, virology/serology and hematology.

> *Exercise #1: Discuss the following items noted in Table 1 with your laboratory and/or IP mentor. In addition, follow a specimen from the time it is received in the laboratory until the report is finalized and sent to the ordering professionals. Use the information gained in your discussion and following a specimen through the process to complete Table 1.*

Table 1. Laboratory process discussion with mentor.

Item	Notes
Get an understanding of how lab work is divided	
How long different tests take and why	

The differences in the type of media for different tests	
How the media are selected	
How contamination of the specimens is avoided	
Tests for identifying organisms	
Review antibiotic sensitivity testing	
How is a gram stain performed	
How are reports generated	

Exercise #2: Observe all procedures applicable to the lab. Use the information gained while observing to complete Table 2.

Table 2. Observation of laboratory procedures.

Procedure	Notes
Gram stain	
Sensitivity method	
Blood culture	
Specimen for AFB	

Urine culture	
Wound culture	

The Hospital Laboratory

Not all healthcare facilities have a laboratory in-house and must use an outside hospital laboratory or even a commercial laboratory for routine diagnostic services. However, the exercises below should be applicable to all facility types.

Exercise #3: Find out what laboratory your facility uses for routine diagnostics and set up a tour with the manager or director. Then complete Table 3.

Table 3: Hospital laboratory information. Abbreviations include: PCR (polymerase chain reaction), MRSA (methicillin-resistant *Staphylococcus aureus*), VRSA (vancomycin-resistant *Staphylococcus aureus*), VRE (vancomycin-resistant *Enterococcus*), ESBL (extended spectrum beta lactamase), WPHL (Wyoming Public Health Laboratory).

Hospital Laboratory Questions	Answers
What tests are performed in the laboratory?	
Who is your reference lab?	
What is the turnaround time for results from the reference lab?	
Who performs viral and fungal tests?	
Does your facility or reference lab perform PCR test? If so, which tests?	
What type of test is used to determine if a patient has *Clostridium difficile*?	
What tests are typically performed on patients with gastrointestinal diarrhea?	
What are the specimen requirements (i.e. blood, swab for culture or urine)?	
How long does it take to get a report (ex. cultures, flu PCR testing, etc.)?	
Are there age criteria for certain test procedures?	
What is the notification process for results like MRSA, VRSA, VRE, ESBLs, carbapenem resistance?	

Are any samples referred to the CDC / State microbiology laboratory? ***Note: samples can only be referred to the CDC through the WPHL. Samples cannot be sent directly to the CDC.**	
Who can help with the antibiotic summary data for the antibiogram?	

Wyoming Public Health Laboratory

The state public health laboratory is a great resource for IPs, laboratorians, and healthcare providers. Certain infectious diseases must be confirmed through the submission of a specimen or isolate to the Wyoming Public Health Laboratory (WPHL). Refer to the list of Reportable Diseases and Conditions in Wyoming in Appendix C. The most current version of this list can be accessed at: www.health.wyo.gov/phsd/epiid/reporting.html.

Exercise #4: Through discussions with your laboratory mentor, IP/CNO/DON mentor, or by contacting the WPHL directly, complete Table 4.

Table 4: Wyoming Public Health Laboratory (WPHL) information. Abbreviations include: MRSA (methicillin-resistant *Staphylococcus aureus*), VRSA (vancomycin-resistant *Staphylococcus aureus*), VRE (vancomycin-resistant *Enterococcus*), ESBL (extended spectrum beta lactamase),CNO (chief nursing officer), DON (director of nursing).

Wyoming Public Health Laboratory Questions	Answers
What tests are referred to WPHL?	
What is the protocol for sending samples to WPHL on week-days versus week-ends? Who is the courier and when are samples picked up?	
What is the protocol for sending samples to WPHL during an outbreak?	
What is the collection requirement for samples which must be transported to WPHL?	
How long does it take to get a report from WPHL?	
Does WPHL do a viral panel on respiratory samples? Is there a criterion around this procedure? (e.g. is it done only on patients less than 5 years and over 75 years)?	
Are samples for MRSA, VRSA, VRE, ESBLs, carbapenem resistance sent to the WPHL	

routinely?	
Are any samples referred to the National Microbiology Laboratory?	
Discuss with your CNO/DON mentor about a tour of the WPHL	

Microbiology

Specimen collection and transportation

Specimen collection and transport to the lab is an **essential part of the culture process**. All specimens should be collected aseptically and placed in a sterile container; some specimens may be placed directly into culture media (e.g., blood cultures, genital cultures). Special handling techniques may be necessary for some specimens such as those for anaerobic culture. Prompt delivery to the laboratory is essential to prevent the death of pathogenic organisms or the overgrowth of commensal organisms. Some specimens may be refrigerated (e.g., urine, stool, sputum) while others should be maintained at room temperature (e.g., genital, eye, or spinal fluid) while awaiting transport.

Exercise #5: In Table 5, describe the appropriate method for the collection, storage and transportation of specimens to the bacteriology portion of the laboratory.

Specimen collection and transport are institution dependent. Refer to your institution's laboratory manual for procedures and protocols.

Table 5. Specimen collection and transportation information. Abbreviations include: C & S (culture and sensitivity), O & P (ova and parasite), MRSA (methicillin-resistant *Staphylococcus aureus*), VRE (vancomycin-resistant *Enterococcus*), AFB (acid-fast bacilli) smear.

Test	Usual transport medium	Important points on collection of the specimen	Common problems with specimen collection and transportation to lab	Usual test result time
Blood culture				
Wound culture				
Urine culture				
Stool for C & S				
Stool for O & P				
Stool for *Clostridium difficile*				
MRSA screen				
VRE screen				
Throat culture				
Eye culture				
Sputum culture				
AFB smear/culture				

Testing for bacteria

The IP should know the general and specialized methods used to detect and identify bacteria. Please refer to Appendix B for more detailed information.

Exercise #6: In Table 6, give explanations for the following questions. Use the required readings listed at the beginning of this chapter, the texts listed at the end of the chapter under helpful resources, and discussions with your laboratory and/or IP mentor.

Table 6. Bacteriology test methods.

Bacteriology Test / question	Explanation
Colony count	**What is it?** **How is it performed?** **Other important considerations?**
Antibiotic sensitivities	**What is it?** **How is it performed?** **Other important considerations?**
What is/are the clinical implication(s) of resistance to antibiotics?	
Why are different growth media needed?	
Why is full work-up on stool not sufficient to guide the lab staff? Is it for *C. diff*, *salmonella*, ova and parasites, etc.?	

Exercise #7: With the assistance of the microbiology laboratory manager and/or your IP mentor, complete Table 7.

Table 7. Test methods to detect and identify bacteria.

Test Methodology	Indications	Limitations / Special Comments
Colony Count		
Urine colony count		
Selective media		
Differential media		
Enriched media		
Antimicrobial susceptibility		
Disk susceptibility		
Micro-titer plate		
PCR		
Germ tube		
Gram Stain		
AFB stain		
India Ink stain		
D-test		
E-test		

Modified Hodge test		
Catalase test		
Oxidase test		
Agar dilution		
Broth dilution		
Muller-Hinton agar		
Screen test for beta strep		

Interpretation of Microbiology laboratory results

The IP should know how to submit laboratory results and interpret results. Please refer to Appendix A for tips and suggestions.

Exercise #8: Review 2 or 3 microbiology requisitions and determine the laboratory significance of each piece of information listed in Table 8.

Table 8. Laboratory submission and interpretation.

Microbiology reports	Laboratory significance
Demographics	
Date collected	
Time collected	
Diagnosis	
Gender	
Person ordering the test	
Date received in lab	

Microbiology reports	Laboratory significance
Time received in lab	
Date reported	
Gram stain	
Mixed count	
Amount of growth	
Specimen number	
Cell count	
Organism	
Sensitivity	
Intermediate sensitivity	
Beta lactamase positive	
Resistance	
Thymidine dependent strain (TFG)	
Source of the specimen leg, vagina, etc. –	
Type of test required	

Common Microbiology Requisition Problems

Awareness of common problems in microbiology submissions will help the IP avoid them and determine areas for improvement. Common problems include the denial of testing, the in ability to accurately interpret results, or other issues.

Exercise #9: Discuss with your laboratory if there are requisition problems commonly experienced in the microbiology lab and how they affect the testing methods and possibly the results. Use the information in this discussion to complete Table 9.

Table 9: Common microbiology requisition problems and suggestions for improvement.

Problems	Suggestions for improvement
Information not filled in correctly	

Virology / Serology

Specimen collection and transport

The IP should know the protocol for specimen collection and transportation, testing and interpretation of results when a viral etiology is suspected or when the only test method available is serology.

Exercise #10: In Table 10, describe appropriate methods for the collection, storage and transportation of specimens to the virology and/or serology laboratory. Use the required readings listed at the beginning of this chapter, as well as the texts listed at the end of the chapter under helpful resources.

Table 10. Specimen collection and transportation information. Abbreviations include: CSF (cerebral spinal fluid), RSV (respiratory syncytial virus).

Test	Usual transport medium	Important points on collection of the specimen	Common problems with specimen collection and transportation to lab	Usual test result time
CSF for viral studies				
Nasopharyngeal swab for RSV				
Nasopharyngeal swab for influenza				
Varicella zoster swab from vesicle				

Herpes simplex 1 & 2				
Buccal swab for mumps				
Stool for norovirus				
Stool for rotavirus				

Testing for viruses

Unlike most bacteria, viruses are not complete cells that can function on their own. They cannot convert carbohydrates to energy, like bacteria and other living cells do. Viruses depend on other organisms for energy, and cannot reproduce unless they get inside a living cell. There are three categories of diagnostic tests for viruses: 1) direct examination of the specimen, 2) virus isolation (a.k.a. cell culture) and 3) serology (a.k.a. testing for the antibodies against the virus). Because cell cultures take a long time they are not used often. Serology forms the mainstay of viral diagnosis. Following exposure, the first antibody to appear is immune globulin M (IgM), which is followed by a much higher titre of immune globulin G. Detection of rising titres of antibodies between acute and convalescent stages of infection, or the detection of IgM in primary infection are techniques often used for diagnosis of viral infections. The IP should know these test methods.

Exercise #11: Using your required readings, helpful resources, and discussions with your laboratory mentor describe the three methods for identifying viruses in the lab. Complete Table 11.

Table 11. Methods for virus identification.

Test method	Give examples of two diseases where this testing is used	Type of sample required (urine, blood, nasopharyngeal)
Direct examination methods:		
1. Antigen detection immunofluorescence		
2. Molecular techniques for the direct detection of viral genomes		
3. Electron Microscopy		
Virus isolation methods:		
1. Cell culture		

Test method	Give examples of two diseases where this testing is used	Type of sample required (urine, blood, nasopharyngeal)
Serology methods:		
1. Enzyme-linked immunosorbent assay (ELISA)		
2. Particle agglutination		
3. Western Blot		

Interpretation of virology/serology laboratory results

In addition to many of the pieces of information required for microbiology testing, there are several specific pieces of information important for virus testing.

Exercise #12: Review 2 or 3 virology requisitions and determine the laboratory significance of each piece of information listed in Table 12.

Table 12. Laboratory submission and result report pieces of information and the significance of each in both submitting specimens and in interpreting the results.

Piece of information	Significance on report
Date reported	
PCR report	
IgM	
IgG	

Common Virology/Serology Requisition Problems

Awareness of common problems in virology submissions will help the IP avoid them and determine areas for improvement. Common problems include the denial of testing, the in ability to accurately interpret results, or other issues.

Exercise #13: Discuss with your laboratory if there are requisition problems commonly experienced in the virology lab and how they affect the testing methods and possibly the results. Use the information in this discussion to complete Table 13.

Table 13: Common microbiology requisition problems and suggestions for improvement.

Problems	Suggestions for improvement
Information not filled in correctly	

Hematology

The IP should become familiar with: the hematology area. The hematology laboratory performs the Complete Blood Count (CBC), hemoglobin and hematocrit, and the differential (diff). The CBC includes the white blood count (WBC). The hemoglobin and hematocrit tests determinate red blood cells. The differential provides a percentage concentration of various cellular components of the white blood cells (neutrophils, lymphocytes, monocytes, eosinophils, basophils, and platelets). The results of these tests will give information regarding the potential for a bacterial vs. viral infection.

Exercise #14: Meet with the section head of hematology to review the CBC for various patients in the hospital. Explain what is meant by each term listed in Table 14.

Table 14. Terms used in the hematology laboratory.

Term	Definition
Left Shift	
Atypical or reactive lymphocyte	
Band or Stab	
Hyper-segmented neutrophil	
Megakaryocyte	
Eosinophilia	

Nucleated Red Blood Cell	

Documentation and Reporting

Documentation and reporting is a large part of the IP's and the laboratorian's job. The laboratory must be able to provide documentation and report specific processes, and testing results to the IP. For example, the laboratory may be responsible for reporting quality assurance and quality control to the IP and the quality improvement team. The laboratory may be required to report certain microorganisms (e.g. drug-resistant organisms) or the results of specific tests (e.g. Hepatitis) to the IP as soon as available. It is essential for the IP to know the reporting mechanisms for the laboratory. The IP must know the WDH reportable conditions and diseases, notification times, and phone numbers. Please see the list in Appendix C. Numerous institution-specific responsibilities exist for using, handling, and summarizing laboratory reports. Such responsibilities include those listed in Table 15.

Exercise #15: From discussions with the laboratory director or manager, describe the laboratory reporting mechanisms and criteria listed in Table 15.

Table 15. Laboratory reporting mechanisms. Abbreviations include: TB (tuberculosis), GAS (group A *Streptococcus*), MRSA (methicillin-resistant *Staphylococcus aureus*), VRE (vancomycin-resistant *Enterococcus*), ESBL (extended spectrum beta lactamase), and VRSA (vancomycin-resistant *Staphylococcus aureas*).

Criteria	Description
Determine what lab reports are sent to IP on a daily basis	
How are routine reports sent to IP?	
Is there a process for stat reports to be sent to the IP for organisms such as TB, GAS, MRSA, VRE, ESBL, carbapenem resistance?	
How long does the lab keep specific samples such as MRSA, VRSA, VRE, ESBLs?	
Who in the laboratory is responsible for reporting diseases and conditions listed on the Wyoming Department of Health Reportable Diseases and Conditions list? Or is this the responsibility of the IP?	

Exercise #16: Through discussions with the laboratory director or manager, with your IP mentor/supervisor, and reviews of policies in your institution, complete answer each question in Table 16.

Table 16: Use, handling, and summarizing of laboratory data/reports.

Responsibility of the IP	Description/answer
Is there a designated surveillance program for certain microorganisms such as drug-resistant organisms?	
How are laboratory reports stored? (i.e. in a database?)	
Who is responsible for entering the data?	
Who is responsible for analyzing the laboratory data collected?	
Are there reports generated from the data and to whom are these reports sent?	

Other Issues

Clinical laboratories have guidelines and standards to assure the information or test results they provide are performed correctly and are accurate. Two methods for assuring testing results are by adhering to the Clinical and Laboratory Standards Institute guidelines and by performing quality control checks.

Clinical and Laboratory Standards Institute

Clinical and Laboratory Standards Institute (CLSI) develops standards for antimicrobial susceptibility testing of bacteria isolates from clinical specimens. The IPs need to know the CLSI guidelines. The CLSI standards guide laboratories in the use of breakpoints for antibiotic susceptibility testing; the most common method is the use of MICs (Minimal Inhibitory Concentration). The standards guide has information on the appropriate antibiotics to report for a specific organism. For example *Klebsiella* species are naturally resistant to ampicillin, thus ampicillin susceptibility patterns should not be reported. The information from the CLSI guide should be reviewed annually to assure the most accurate organism

sensitivities are being reported. These Standards can be found on the CLSI website clsi.org/standards/, purchased by the laboratory from CLSI, or obtained from the Wyoming Public Health Laboratory.

Quality Assurance/Quality Control

Laboratories assess quality daily to assure the tests are accurate and performing correctly. Laboratory Quality Assurance (QA) encompass activities that enable laboratories to achieve and maintain accuracy and proficiency despite changes in test methods and the volume of specimens tested. A good QA system does four things:

- establishes standard operating procedures (SOPs) for each step of the testing process, ranging from specimen handling to instrument performance validation;
- defines administrative requirements, such as mandatory recordkeeping, data evaluation, and internal audits to monitor adherence to SOPs;
- specifies corrective actions, documentation, and the persons responsible for carrying out corrective actions when problems are identified; and
- sustains high-quality employee performance.

Ethics

Discuss with your ICP mentor the steps which have been taken at your facility to ensure the confidentiality of reports.

Resources

Helpful/Related Readings

- Bennett J and Brachman P, eds. *Bennett & Brachman's Hospital Infections. 6th Edition.* Philadelphia, PA: William R Jarvis; 2014.
    - Chapter 11, The Role of the Laboratory in Prevention of Healthcare-Associated Infections, by MA Pfaller and DJ Diekema
    - Chapter 15, Multidrug-Resistanct Organisms: Epidemiology and Control, by MY Lin, RA Weinstein and MK Hayden
    - Chapter 22, Clinical Laboratory-Acquired Infections, by ML Wilson and LB Reller
- Bennett G, Morrell G, and Green L, ed. *Infection Prevention Manual for Hospitals; revised edition.* Rome, GA: ICP Associates, Inc.; 2010. Section 7: pages 11-13.
- Bennett G. *Infection Prevention Manual for Ambulatory Care.* Rome, GA: ICP Associates Inc.; 2009. Section 7: pages 9-11.
- Bennett G and Kassai M. *Infection Prevention Manual for Ambulatory Surgery Centers.* Rome, GA: ICP Associates, Inc.; 2011. Section 7: page 12
- Heymann D. *Control of Communicable Diseases Manual. 19th Edition.* Washington, D.C.: American Public Health Association; 2008.
- Pickering L., et al, eds. *Red Book: 2012 Report of the Committee on Infectious Diseases. 29th Edition.* Elk Grove Village, IL: American Academy of Pediatrics; 2012.
- Mandell G, et al, eds. *Mandell, Douglas and Bennett's Principles and Practice of Infectious Diseases. 7th Edition*. Philadelphia, PA: Churchill Livingstone Elsevier; 2010.
- Lautenbach E, Woeltje KF, and Malani PN, eds. SHEA Practical Healthcare Epidemiology (3rd Edition). University of Chicago Press, Chicago, IL 2010
    - Chapter 8 Twenty-First Century Microbiology Laboratory Support for Healthcare-Associated Infection Control and Prevention, by LR Peterson and MO Wright
    - Chapter 9 Molecular Typing Systems, by JHafkin, L Chandler and J Maslow

Helpful Contacts (in WY or US)

- Leslie Teachout MT(ASCP), CIC, Infection Prevention at Riverton (307) 857-3552 and Lander (307)335-6442 Hospitals, leslie.teachout@lpnt.net, cellphone (406)570-9321
- Emily Thorp, MS, Infectious Disease Surveillance Epidemiologist and HAI Prevention Coordinator, Wyoming Department of Health, 307-777-8634, emily.thorp@wyo.gov

Related Websites/Organizations

- Wyoming Department of Health, Public Health Laboratory: www.health.wyo.gov/PHSD/lab/index.html
- The Clinical and Laboratory Standards Institute: clsi.org/
- Wyoming Department of Health, Infectious Disease Epidemiology Unit, Healthcare-Associated Infection Prevention: www.health.wyo.gov/phsd/epiid/HAIgeneral.html
- Mountain-Pacific Quality Health – Wyoming: www.mpqhf.com/wyoming/index.php
- APIC Professional Practice Resources: www.apic.org/Professional-Practice/Overview

My Facility/City/County Contacts

Hospital/clinical laboratory

Title:	Name	Phone	Email
Pathologist (Physician head of laboratory):			
Laboratory Director:			
Chemistry Supervisor/Charge:			
Hematology Supervisor/Charge:			
Microbiology Supervisor/Charge:			
Blood Bank Supervisor/Charge:			
Note who does the "send out" tests:			
Note who does the serology and virology tests:			

Wyoming Public Health Laboratory

Key contacts	
Name:	
Location:	
Phone:	
Email address:	

Appendices

Appendix A: Reviewing and Interpreting Culture Results

1. Gather as much information as possible.
2. Know the difference between “normal flora” and potential “pathogens.”
3. Some specimen types, such as sputum and feces, will always contain organisms as “normal flora” and potential pathogens must be separated from them (i.e. coughing up sputum will always be contaminated with saliva and potentially non-pathogenic organisms).
4. Specimens such as blood and CSF are normally sterile so any growth needs to be evaluated.
5. Is it clinically significant? (Is the person sick with symptoms?)
6. Is it a contaminant? (Skin contamination with blood collection.)
7. Is it a transient loss of sterility? (Transient bacteremia after brushing teeth.)
8. The quantity of organisms is expressed as colony forming units per liter (CFU/L) which helps in identifying contamination from infection. When used for urine testing (for example), counts > 100,000 are usually considered a potential urinary tract infection (UTI).
9. Number of positive cultures is important. For example, the same organism isolated from blood and another site suggests bacteremia arising from infection at that site.
10. Clinical findings are also important in interpreting cultures. For example, signs and symptoms of dysuria and fever are as important as a urine culture in diagnosing UTI.
11. A person’s history is also important. For example, the presence of a prosthetic heart valve increases the likelihood of coagulase negative staphylococcus (CNS) in a blood culture representing endocarditis than when the person has no history of heart surgery.
12. Keep in mind that some heavily colonized wounds will heal spontaneously, and conversely, some organisms are able to cause serious infection at much lower levels of colonization. Infection depends on the pathogenicity of the organism, the type of wound, and the patient’s response.
13. Persons who are immunosuppressed, on steroids, or are found neutropenic, have a greater chance of infection with “opportunistic pathogens.” For example, *aspergillus* in the sputum of a neutropenic person has more serious implications than in a normal host.

Appendix B: Important Notes for Wound, Blood, Urine and Sputum Cultures.

Wound culture

- If necessary, remove debris from the wound base
- Cleanse the wound with sterile normal saline or sterile water prior to culture collection.
- **NOTE: Do not swab superficial eschar, or other necrotic tissue**
- Use appropriate sterile swab and culture medium – usually a sterile C&S swab.
- If wound is dry, moisten swab tip with sterile normal saline without preservative.
- Use sufficient pressure to cause tissue fluid to be expressed.
- For small wounds, using the side of the swab tip; roll it for one full rotation over the granulation tissue that has the most obvious signs of infection (avoid slough and surface purulent discharge).
- For larger wounds rotate swab over wound surface using a 10 point zigzag pattern.
- Place swab into culture medium.

Blood culture

- Preparation of the site will decrease the potential for a contaminated specimen. Tincture of iodine, isopropyl alcohol, chlorhexidine, or povidone-iodine combined with ethyl alcohol rather than povidone-iodine alone should be used for skin antisepsis prior to venipuncture for blood cultures, recognizing that studies have shown significantly reduced rates of contamination with use of these agents.
- 2 cultures taken from 2 separate sites, one of which is drawn from a peripheral vein by percutaneous venipuncture.
- At least 20 ml (preferably 30 ml) is required (each specimen containing 10-15 ml, inoculated into aerobic and anaerobic media).
- Up to 30% of blood cultures positive for coagulase-negative *staphylococcus* (CNS) represent true infection, however, the majority of single positive cultures represent contamination, a finding that should reemphasize the need to obtain cultures from two separate sites whenever BSI is suspected.

Urine culture

Clean-catch midstream specimens

- clean perineal area with skin antiseptic
- expose urethra with clean fingers
- void a small amount of urine before collecting to clear urethra of skin contaminants
- collect specimen from urine stream

Sterile specimens from an indwelling catheter or ileal conduit

- use sterile technique
- sample from diaphragm of catheter tubing
- Catheters that have been in place for an extended period of time may not reflect the microbiological status of the patient's urinary tract.
- urine should be obtained after catheter replacement for more reliable result

Transport urine specimens to the lab as soon as possible. Culture within 2 hours of collection or refrigerate with no preservative.

Sputum culture

- best collected early morning
- mouth should be rinsed and teeth or dentures cleaned
- sputum may need to be induced or suction used
- special precautions (airborne) should be taken when TB is suspected
- if results show predominantly oral flora, the test is non-diagnostic
- transport promptly to the lab

Appendix C: Wyoming Department of Health Reportable Diseases and Conditions

The most current list can be obtained at: http://www.health.wyo.gov/phsd/epiid/reporting.html

Wyoming Department of Health Reportable Diseases and Conditions

Commit to your health.

A report is required by law (State Statute § 35-4-107) from **both** the **attending healthcare provider/hospital and the laboratory performing diagnostic testing.**
Wyoming laboratories are responsible for reporting results when a reference laboratory is used.
Mail reports to: Wyoming Department of Health, 6101 Yellowstone Road Suite 510, Cheyenne, WY 82002 OR
Fax reports to our secure fax machine at **(307) 777-5573** OR
*electronic reporting at https://prismdata.health.wyo.gov is preferred for diseases marked with *
For all LABORATORY questions please call (307) 777-7431; REPORTING please call (307) 777-7953

DISEASES IN RED: Immediate Notification at 1-888-996-9104
Diseases in Black: Reportable within **24 hours** of diagnosis by fax or telephone
Diseases in Green: Reportable within 7 days of diagnosis by fax, phone, or mail
LAB: In addition to reporting, **submit an isolate or other appropriate material,** in accordance with IATA Dangerous Goods Regulations to: State Public Health Laboratory, Combined Laboratories Facility, 208 S College Dr., Cheyenne, WY 82002

- Amoebiasis (*Entamoeba histolytica*)
- Anaplasma/Ehrlichiosis
- ANTHRAX (*Bacillus anthracis*)
- Babesiosis (*Babesia* sp)
- Bartonellosis (*Bartonella* sp)
- BOTULISM (*Clostridium botulinum*)
- LAB Brucellosis (*Brucella* sp)
- California Serogroup Virus (Jamestown Canyon, La Crosse, others); neuro- and non-neuro invasive
- LAB Campylobacteriosis (*Campylobacter* sp)

Cancer

- *Chancroid (*Haemophilus ducreyi*)*
- **Chlamydia trachomatis* Infection*
- LAB Cholera (*Vibrio cholerae*)
- Coccidioidomycosis (*Coccidioides immitis*)
- Colorado Tick Fever
- Creutzfeldt-Jacob Disease (including classic CJD and variant CJD)
- Cryptosporidiosis (*Cryptosporidium* sp)
- Cyclosporiasis (*Cyclospora cayetanensis*)
- Dengue Fever
- DIPHTHERIA (*Corynebacterium diphtheriae*)
- Eastern Equine Encephalitis Virus (neuro- and non-neuro invasive)
- Ehrlichiosis/Anaplasma
- Encephalitis
- LAB *Escherichia coli*, shiga toxin-producing (0157:H7, non-0157:H7, or untyped)
- Giardiasis (*Giardia lamblia*)
- LAB Glanders (*Burkholderia mallei*)
- *Gonorrhea (*Neisseria gonorrhoeae*)*
- LAB *Haemophilus influenzae* (sterile site)
- Hantaviral Disease
- HEMORRHAGIC FEVER VIRUSES
- Hemolytic Uremic Syndrome
- Hepatitis A, B*, D, E

Hepatitis C

HIV/AIDS (Positive/reactive detection tests, All CD4's, and all viral loads)

- Influenza (lab confirmed, including rapid test positives)
- Influenza-Associated Deaths
- Kawasaki Syndrome
- Legionellosis (*Legionella* sp)
- Leprosy (*Mycobacterium leprae*)
- Leptospirosis (*Leptospira interrogans*)
- LAB Listeriosis (*Listeria monocytogenes*)
- Lyme Disease (*Borrelia burgdorferi*)
- LAB Malaria (*Plasmodium* sp)
- Measles
- LAB Melioidosis (*Burkholderia pseudomallei*)
- Meningitis (all types)
- LAB Meningococcal Disease (*Neisseria meningitidis*)
- Methicillin-Resistant *Staphylococcus aureus* (MRSA) Related Cases, Clusters, and Outbreaks ONLY
- Mumps
- LAB Pertussis (*Bordetella pertussis*)
- PLAGUE (*Yersinia pestis*)
- Poliomyelitis/Poliovirus Infection
- Powassan Virus (neuro- and non-neuro invasive)
- Psittacosis (*Chlamydophila psittaci*)
- Q-Fever (*Coxiella burnetii*)
- Rabies (human and animal)
- Relapsing Fever (*Borrelia* sp)
- Reyes Syndrome
- Rocky Mountain Spotted Fever (*Rickettsia rickettsii*)
- Rubella
- LAB Salmonellosis (*Salmonella* sp)
- SEVERE ACUTE RESPIRATORY SYNDROME (SARS)
- St. Louis Encephalitis Virus (neuro- and non-neuro invasive)
- LAB Shiga toxin (stool, broth, isolate, etc.)
- LAB Shigellosis (*Shigella* sp)
- SMALLPOX
- Streptococcal Disease, sterile site only
- *Syphilis (*Treponema pallidum*)*
- Tetanus (*Clostridium tetani*)
- Toxic-Shock Syndrome (Streptococcal, Staphylococcal)
- Trichinellosis (*Trichinella* sp)
- LAB Tuberculosis (*Mycobacterium tuberculosis* complex)
- TULAREMIA (*Francisella tularensis*)
- LAB Typhoid Fever (*Salmonella typhi*)
- Typhus (*Rickettsia* sp)
- LAB Vancomycin-Intermediate *Staphylococcus aureus* (VISA)
- LAB Vancomycin-Resistant *Staphylococcus aureus* (VRSA)
- Vancomycin-Resistant Enterococcus (VRE) Related Cases, Clusters, and Outbreaks ONLY

Varicella (chickenpox only)

- LAB Vibrio sp (including non-cholera)
- West Nile Virus (neuro- and non-neuro invasive)
- Western Equine Encephalitis Virus (neuro- and non-neuro invasive)
- Yellow Fever
- LAB Yersiniosis (*Y. enterocolitica, Y. pseudotuberculosis*)

Other Reportable Conditions

- Animal Bites
- Exposures Requiring Rabies Prophylaxis

Blood Lead (All levels)

- Clusters/Outbreaks (GI, respiratory, other illness)
- Methemoglobinemia/Nitrate Poisoning
- SUSPECTED BIOLOGICAL, CHEMICAL, OR RADIOLOGICAL INCIDENT
- TOXIN-ASSOCIATED ILLNESS
- UNEXPLAINED DEATH
- UNUSUAL ILLNESS OF PUBLIC HEALTH IMPORTANCE

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WIPAG welcomes your comments and feedback on these sections.
For comments or inquiries, please contact:

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