THE UNIVERSITY OF TOLEDO
MEDICAL CENTER

Department of Pathology Collection Manual

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Pathology
Collection Manual
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Reviewed: 3/2019

2021 Scope of Services

Mission:

Pathology Vision for the Future: To be a recognized leader in the field of Pathology through teamwork toward a common goal, quality of the highest caliber and service beyond the expected.

The mission of the Department of Pathology is to provide superior diagnostic support, which is timely and effective; and to enhance the health education mission of the University of Toledo Medical Center. In partnership with the University of Toledo, the Department of Pathology continually strives to develop and incorporate advances in health care diagnostic testing and to improve the value and quality of services and patient care.

Description of Department:

The Department of Pathology is a large, diversified hospital laboratory with special function labs providing a wide range of routine and esoteric testing to inpatients, outpatients, as well as inter-institutional reference lab testing. Scope of services and expertise provided cover many areas of laboratory medicine.

AUTOPSY SERVICES (Ext. 7674)
Complete Autopsy services are available performed by UTMC pathologists at the Lucas County Coroner's building with ancillary studies done including toxicology, electron microscopy, cytogenetics and microbiology if needed. Private autopsies can be ordered.

BLOOD TRANSFUSION SERVICES (Ext. 5212)
This laboratory provides the following services:
Blood typing, antibody screening and crossmatch
Blood group antibody identification
Blood transfusion reaction work-up
Medical consultation for blood transfusion indications and blood component therapy

CLINICAL CHEMISTRY (Ext. 7686)
Clinical Chemistry is a fully automated laboratory that performs frequently ordered chemistry tests on blood, urine and other body fluids. Laboratory tests include electrolytes, intermediate metabolites, enzymes, lipids, carbohydrates, electrophoresis, screening for drugs of abuse and therapeutic drug monitoring. The laboratory provides 24 hour service including STAT and profile testing. Clinical consultation is available upon request.

CLINICAL MICROBIOLOGY – (Ext. 6646)
The UTMC microbiology laboratory provides full service bacteriology testing, including aerobic and anaerobic cultures, gram stains, antibiotic sensitivity testing and blood cultures. This laboratory also provides limited mycology, virology, parasitology, and mycobacteriology testing. Clinical consultation is available upon request.

COAGULATION (Ext. 3468)
The Coagulation Laboratory provides physicians and healthcare facilities with a broad range of technologically advanced tests to aid in the diagnosis and treatment of blood coagulation disorders. Tests for the assessment of hypercoagulability, thrombotic risk, abnormal bleeding and platelet function are offered. Services are also provided for individual physician practices and healthcare facilities. We offer specialized test panels to expedite the ordering process. Medical consultation for coagulation abnormalities and coagulation testing is available.

CYTOPATHOLOGY (Ext. 4512)

Clinical diagnostic cytology includes routine Pap smears, Pap Thin Prep Technique, fine needle aspiration biopsy and immunocytochemical applications. Most cytodiagnostic procedures can be done on an outpatient clinic basis.

MOLECULAR DIAGNOSTICS (Ext. 5636)

Services include mutational analysis for inherited hypercoagulability disorders including molecular assays for the Factor V Leiden mutation, the 5,10-methylenetetrahydrofolate reductase (MTHFR) mutation (C677T and A1298C), and the prothrombin 20210 mutation, both standard and ultrasensitive quantitative RT-PCR viral load testing for the human immunodeficiency virus (HIV viral load) and quantitative RT-PCR viral load testing for Hepatitis C RNA. The BK viral load assay is also performed in the Molecular Diagnostics department by PCR, as well as qualitative High Risk Human Papilloma Virus (HR-HPV) and Chlamydia and N. gonorrhea testing.

FLOW CYTOMETRY LABORATORY (Ext. 4212)

The Flow Cytometry Laboratory offers state of the art cell analysis through the use of a laser based flow cytometer.
T-Cell subsets are performed.

HEMATOLOGY AND CLINICAL MICROSCOPY (Ext. 5211)

Hematology is directed by a Board Certified Hematopathologist and provides a complete list of routine and special tests for an accurate hematologic diagnosis. Leukemia diagnosis includes special cytochemical stains in coordination and cooperation with Flow Cytometry, and Electron Microscopy Divisions. Bone marrow diagnostic consultations are welcome. Clinical Microscopy includes urine, feces and fluid analysis.

IMMUNOLOGY (Ext. 4300)

The Division of Immunology performs diagnostic tests for infectious diseases, autoimmune diseases and immune deficiency diseases, as well as cellular immunology and testing for transplant patients. The lab is open Monday through Friday, 6:00 a.m. to 2:30 p.m.

POINT OF CARE TESTING (Ext. 5219)

This Division (POCT) provides oversight and support to all UTMC hospital and clinic sites performing near-patient testing. Tests performed include fingerstick glucose levels (which are available on all nursing units, ED, Medicine clinics, Family Practice Clinic, and Primary Care Clinics), urine dipsticks, fecal occult blood, Hgb A1C, Strep A Screens, urine pregnancy testing, clinical chemistry profiles, PT/INR, trichomonas screens, gastric occults.
PPMP Point of Care Testing performed includes: urine microscopic, vaginal wet prep, KOH, fern testing.
Non-Waived Testing in The Cardiovascular Cath Lab includes: Activated Clotting Time (ACT) and % oxygen saturation.
Non-Waived Testing in the Perfusion Lab includes: Activated Clotting Time (ACT), Arterial/Venous Blood Gas, Electrolytes, hemogram, Plateletworks (indication of platelet dysfunction).

SPECIMEN ACQUISITION AND SPECIMEN PROCESSING (Ext. 3470)

The Specimen Acquisition Department is responsible for inpatient and outpatient phlebotomy, and specimen receipt verification, accessioning and routing of all laboratory specimens to each laboratory division and notifying the outreach courier system. Outpatient phlebotomy centers are located in the hospital clinic area adjacent to the hospital lobby, in the Medical Pavilion and in the Ruppert Health Center. Specimen Acquisition staff is available 24 hrs a day to respond to all inquiries regarding specimens and results. There are also 24/7 specimen courier services available.

SURGICAL PATHOLOGY(HISTOLOGY) (Ext. 5260)

Laboratory diagnosis encompasses all kinds of biopsy and resected samples. Modern, up-to-date ancillary techniques are available - immunocytochemistry, flow cytometry, molecular biologic application and electron microscopic study.

TISSUE TYPING LABORATORY (Ext. 4292)
The Tissue Typing Laboratory offers complete cardiac and kidney; liver and pancreas transplant compatibility testing, lymphocyte crossmatching, HLA typing, and antibody screens, including Panel- Reactive Antibody (PRA) Screens.

ULTRASTRUCTURAL PATHOLOGY (Ext. 3484)
The Division of Ultrastructural Pathology is a fully equipped laboratory with both transmission electron microscopes (TEM) and a scanning electron microscope (SEM) with an ancillary energy dispersive Xray analysis system. Services available include routine and immunocytochemical TEM of biopsy specimens (i.e., renal, muscle, neoplastic), specialized TEM for platelet analysis and virus identification, and SEM for specimen surface analysis and/or elemental composition (i.e., forensics and asbestos) by EDX analysis. Special handling of specimens is required in most instances; call for instructions. The laboratory is open Monday through Friday, 8:30 a.m. - 5:00 p.m.; STAT tests are available upon request and require approximately 5-6 hours turn around time.

Department Integration:

The Department of Pathology is integrated with all other departments in the institution through its provision of clinical services, electronic linkages, and the education of physicians and students. The Department provides consultation on lab testing and also provides opportunities for research. The Department serves a wide range of outside organizations through reference testing and professional affiliations.

Customers:

Patients of UTMC, Dana Cancer Care Center, Northwest Ohio Rehab Hospital, Kobacker Hospital, UTMC Outpatient Clinics, Physicians, Nursing staff, clerical staff, students, and the medical centers in Northwest Ohio utilize our referral services.

Quality Assurance and Performance Improvement Plan:

The Department of Pathology monitors workload, staffing, labor and skill mix data. In addition, HBSI (Healthcare Benchmarking Systems, Inc.) is used to compare lab function with other similar facilities for external benchmarking. Internal quality standards are monitored by indicators for accuracy of specimen identification, specimen handling, and result reporting; Turn-Around-Times for clinical tests, and surgical reports; safety, occurrences, and frozen section, surgical and cytology discrepancies. A hospital-wide Plan-Measure-Analyze-Act-Review (PMAAR Quality Cycle) model is utilized, focusing on high risk or problem-prone areas for quality improvement. Key performance improvement indicators include improving Customer Service, upgrading and improving the LIS connectivity, integration and networking capability and improvements in laboratory efficiency of operations through workflow analysis and integration with regional laboratory services. Proficiency samples are tested for all services offered and quality controls are run as specified by instrument or reagent manufacturer. Clinical correlation and correlation of results between departments is monitored to assure accuracy. National Patient Safety Goals, which include the timely reporting of critical values to patient's licensed caregiver and the use of two patient identifiers, are monitored and reported each quarter.

Population Served:

The Department of Pathology provides complete laboratory support for the University of Toledo Medical Center, and reference laboratory testing for medical centers in northwest Ohio. Pathology receives over 2,000,000 tests annually, 57% inpatient, 37% outpatient tests, and 6% interinstitutional reference tests.

Sites of Care/Services Location:

The Department of Pathology supervises Point-of-Care services at patient bedside for phlebotomy and glucose testing. Outpatient phlebotomy sites are located at the hospital outpatient clinic area, the Medical Pavilion and Ruppert Health Center. Testing labs are centralized in the hospital for most inpatient testing and surgical pathology. Special function laboratories utilized largely for outpatient and referral testing are located in the Health Education Building.

Practice Standards:

The Department of Pathology maintains high levels of excellence through accreditation with CAP,CLIA, JCAHO, ASHI,

Staffing Plan:

AUTOPSY SERVICES
Autopsy Service is staffed by one FTE 7:00am-3: 30pm Monday through Friday. Autopsies are performed between 8:00am to 2:30pm.

BLOOD TRANSFUSION SERVICES
The Blood Bank is staffed by at least one technologist 24 hours a day, 7 days a week for routine and stat testing.
If Disaster or MTP protocol initiated, staff will be brought up to 2 technologists.

CLINICAL CHEMISTRY
Stat and routine testing performed 24 hours per day 7 days per week.

CLINICAL MICROBIOLOGY
Routine hours: 7:30am-4:00pm Sunday - Saturday. Stat testing is available 24/7.

COAGULATION LABORATORY
Routine and stat testing is done 24 hours a day, 7 days per week. Special coagulation tests are done Monday through Friday from 6:00 a.m. to 2:30 p.m.

CYTOLOGY
Routine hours are 7:00am through 3:30pm Monday through Friday.

MOLECULAR DIAGNOSTICS
Routine hours are 8:30am through 5:00pm Monday-Friday. STAT Testing is not available.

FLOW CYTOMETRY
Routine hours: 8:30am - 5:00pm Monday

HEMATOLOGY AND CLINICAL MICROSCOPY
Both areas are staffed 24 hours a day, 7 days a week for routine and stat tests, and 7:00am – 3:00pm for special studies.

IMMUNOLOGY
Routine hours: 6:00am-2:30pm Monday - Friday.

POINT OF CARE TESTING
One technologist is available for consultation Monday – Friday 8:00 AM – 4:30 PM and at all other times available by pager. Perfusion and Cardiovascular Cath Lab personnel perform the only non-waived POCT and are available 24 hours a day, 7 days per week.

SPECIMEN ACQUISITION
Specimen Acquisition staff are available 24 hours a day 7 days per week to respond to all inquiries regarding specimens and results. The outpatient laboratory is open Monday - Friday, 7:00am - 5:00pm and Saturdays 7:00am-3:30pm. IV Service available for inpatients 24 hours a day, 7 days a week, including holidays. IV service also covers the hospital outpatient lab after hours and on weekends.

SURGICAL PATHOLOGY (HISTOLOGY)

Routine hours are 5:00am to 5:00pm Monday through Friday with a technologist on call at all times.

TISSUE TYPING
The Tissue Typing Laboratory is open Monday through Friday 24 hours a day. During the evenings, weekends and holidays, the Tissue Typing laboratory is covered by an on-call system.

PATHOLOGY/SECOND AND THIRD SHIFTS:
Additional on-call staff is available to help Blood Bank when needed.

Availability of Services:

The core hospital laboratory operates on a 24 hour basis and is divided into three shifts:

1st Shift: 6:00 am – 2:30pm
2nd Shift: 2:00pm – 10:30pm
3rd Shift: 10:00pm – 6:30am

Second and third shift, weekends and holidays have reduced staffing to perform most routine tests and any emergency procedures required for the immediate care of the patient.

Education Plan:

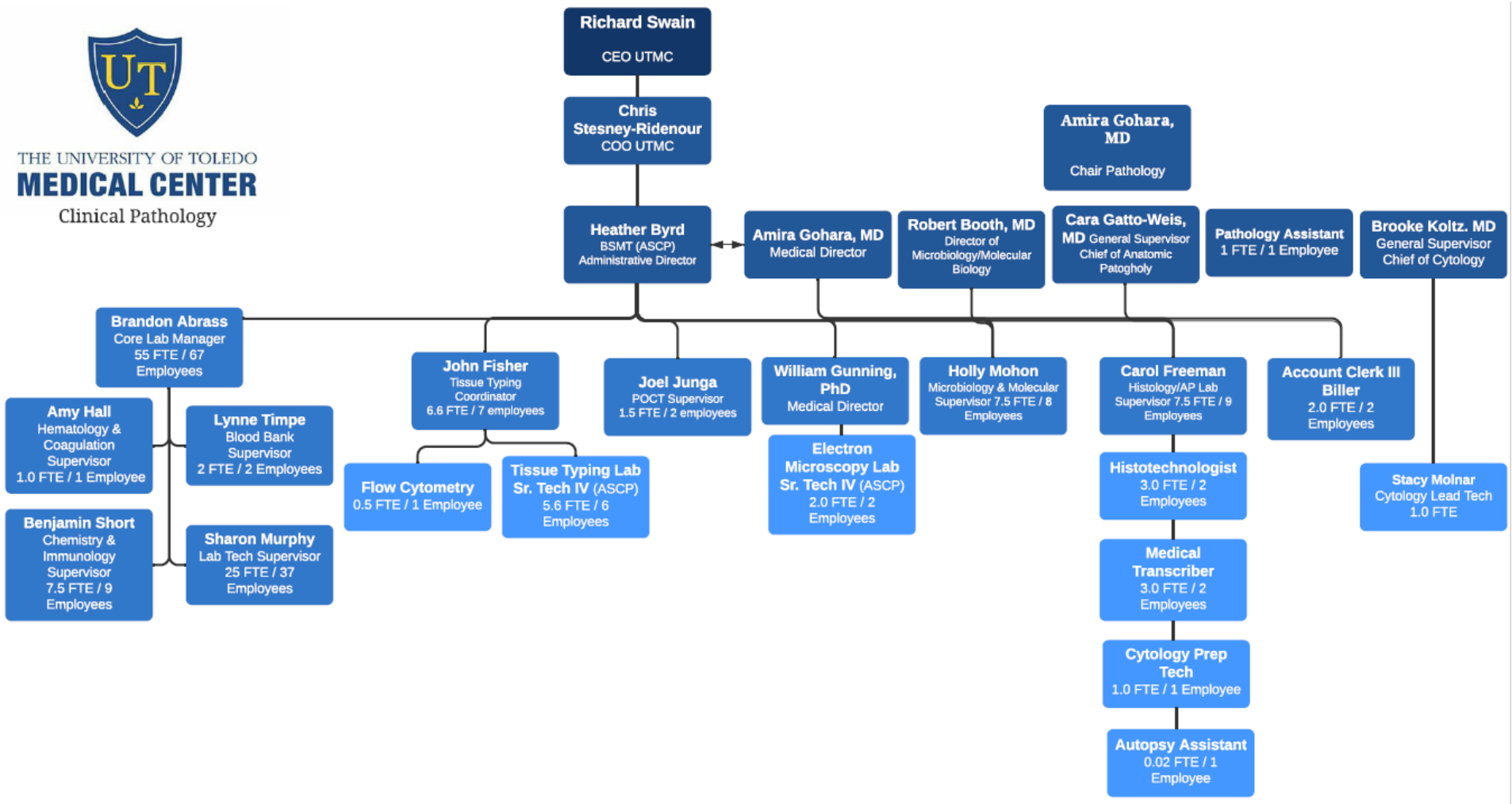
Each employee attends a two-day general orientation, followed by an intensive, comprehensive training program in each department covering procedures, policies, and safety and competency evaluation. Each employee completes an annual competency assessment of the following areas: age-specific when applicable, safety management, hazardous material/waste, life safety and medical equipment, proficiency testing, performance of procedures, knowledge of policies and CAP, JCAHO, AABB, ASHI accreditation review. Annual education includes general laboratory meetings, in-services, safety review and testing, training on principles of PI, and information management.

Departmental Approval

(signature on original)
Signature

Review/Revision Date: 03/2019

THE UNIVERSITY OF TOLEDO
MEDICAL CENTER
Clinical Pathology



Name of Policy:	**STAT Tests Critical Tests and Critical Limits**
Policy Number:	3364-107-107
Department:	Pathology-Laboratory
Approving Officer:	Chief Executive Officer-UTMC
Responsible Agent:	Director, Clinical Pathology Administrative Director, Lab
Scope:	Pathology-Laboratory

THE UNIVERSITY OF TOLEDO 1872

Effective Date: 1/04/2021

Initial Effective Date: 9/4/1989

_____ New policy proposal	__X__ Minor/technical revision of existing policy
_____ Major revision of existing policy	_____ Reaffirmation of existing policy

(A) Policy Statement

Each lab department has established STAT turnaround times for tests and critical limits for tests requiring verification and notification.

(B) Purpose of Policy

To provide physician notification when test results indicate the need for prompt attention and patient care management.

(C) Procedure

1. STAT specimens must be delivered to the department immediately upon receipt and processing in the Central Lab office.
2. STAT tests take first priority over routine tests. Processing of STAT specimens must begin immediately. ED results should be reported within 30- 60 minutes unless manual verification of test results is indicated. All other STAT orders should also be reported within 30- 60 minutes unless manual verification of test results is indicated.
3. STAT results are called and/or electronically sent to the proper station immediately according to instruction. When significant delays are anticipated due to equipment, computer or staffing problems, the appropriate clinician must be notified and the contact documented.

Turnaround times of tests ordered STAT:

CBC	30 minutes
Urinalysis	30 minutes
Serum/Urine Pregnancy test	30 minutes
Type&Screen	40 minutes
Type&Cross	
Basic Metabolic Panel	30 minutes
Cardiac Panel	60 minutes
PT/PTT	30 minutes
Blood Type	15 minutes

Critical Limits/Results:

The following are designated critical limits when seen in a new patient or a patient with marked changes from previous results:

TEST	LESS THAN	GREATER THAN
Chemistry		
Glucose	50 mg/dL	500 mg/dL
Potassium	2.5 mEq/L	6.0 mEq/L
Sodium	125 mEq/L (initial value)	155 mEq/L
Total CO2	15 mEq/L	45 mEq/L
Calcium	6.0 mg/dL	12.0 mg/dL
Total Bilirubin (outpatient)		12.0 mg/dL
Cardiac Markers		
Troponin I		0.1 ng/mL (initial value)
CKMB Index		1.9 if total CK is >200 (initial)
Therapeutic Drugs		
Acetaminophen		150 mcg/mL (4 hour post ingestion)
Carbamazepine (Tegretol)		15 mcg/mL
Digoxin		2.0 ng/mL
Phenytoin (Dilantin)		20 mcg/mL
Phenobarbital		40 mcg/mL
Salicylic Acid (Aspirin)		30 mg/dL
Other Chemistry		
Ammonia		99 umol/L
Lactate		2.5 mmol/L (initial)
Procalcitonin		1.99 ng/mL (initial)
Hematology		
WBC	2000	50,000
Hgb	Less than or equal to 6	
Platelets	20,000	
Coagulation		
Protime		50 secs
INR		4.9
PTT		160 secs.
D-Dimer		Positive (initial)

Differential counts that include blasts on undiagnosed patient or patient in remission.

Microbiology:

1. All STAT gram stains performed whether positive or not, must be called within one hour of receipt in laboratory.
2. Panic Values, call as soon as identification or findings are documented.
   b. Positive direct specimen gram stains from normally sterile body sites and fluids. (CSF, synovial, pleural, pericardial, thoracentesis)
   c. Positive cultures from normally-sterile body sites and fluids. (Blood, CSF, synovial, pleural, surgical sites) For Blood Cultures, call the first positive bottle of each set collected (unless the gram stain shows a different organism), for the first two sets of the calendar date.

d. Positive anaerobic cultures from normally sterile body sites and fluids, even if aerobic bacterial growth has been called. Antibiotic treatment for mixed aerobic/anaerobic infections may not have been started.
e. All stools positive for enteric pathogens or parasites: Salmonella, Shigella, E coli O157:H7, Campylobacter, Yersinia, Giardia, and Cryptosporidium.
f. Positive Legionella or Pertussis
g. First Mycobacterial positive culture and/or smear.
h. ESBL positive Enterobacteriaceae.
i. Multiply resistant Enterobacter species.
j. Multiply resistant Acinetobacter species.
k. Multiply resistant Pseudomonas aeruginosa
l. MRSA
m. Neisseria meningitidis isolates
NOTE: For sputum isolates, notify Infection Control, if possible, before calling floor.
n. All Class A reportable infectious diseases: (Anthrax, Cholera, Yersinia pestis, Diphtheria, Botulism).
o. Listeria
p. Brucella
q. Vancomycin resistant Staph aureus
r. Vancomycin intermediate Staph aureus
s. Filamentous molds from respiratory cultures and normally sterile sites.
t. Positive Clostridium difficile antigen
u. VRE
v. Positive COVID-19

For all underlined panic values from inpatients, notify the Infection Control Department immediately so the infection control measures can be instituted. Document is LIS.

Critical Value Notification:

To notify physician:

- Outpatient - Call physician or RN in clinic for tests drawn in OPD. If there is not an RN working at the clinic, the physician must be notified. If this is an outpatient that has a non UTMC physician, call the physician's office and ask to speak to an RN. If the office is closed or an RN is not available, the patient's physician or covering physician must be notified. At least 2 attempts are to be made to notify attending physician or covering physician via phone, pager, or hospital operator. If unable to locate physician or if no response is received, note failure to communicate result in laboratory computer system and fill out a laboratory occurrence report. Outpatient critical values should be called to the physician within 1 hour of critical result verification.
- In-patient and Emergency Department – Notification should be made to RN responsible for patient. If RN is unavailable notify Hospitalist or physician responsible for unit. Inpatient and Emergency Department critical results should be called to caregiver with 15 minutes of verification of critical result.
- Note in "Test Comments" in the computer the time the results were checked and called and the name of the person receiving the report. Two patient identifiers and all results must be *read back* by the recipient to ensure accuracy and understanding.

Approved by: /s/ Amira Gohara, M.D. Professor Director, Clinical Pathology /s/ Rick Swaine, CPA Chief Executive Officer-UTMC *Review/Revision Completed By:* *Cynthia O'Connell – Administrative Director - Lab*	01/06/2021 Date 02/08/2021 Date
Review/Revision Date: 9/29/92 5/1/2011 9/22/98 3/1/2013 10/06/03 2/20/2015 4/02/2005 5/7/2018 8/10/2005 2/8/2019 8/04/2006 01/04/2021 6/29/2007 6/04/2008	
Next Review Date: 01/04/2023	
Policies Superseded by This Policy: OP-07	

UTMC Clinical Pathology
STAT Testing Available

Clinical Chemistry	Basic Metabolic Panel (Na, K, Cl, CO2, Glu, BUN, Creat)
	Liver Panel (ALB, ALK, ALT, AST, DBil, TBil, TP)
	Cardiac Panel – Troponin, CK, CKMB
	Any component of above panels
	Amylase
	Lipase
	Osmolality – Serum and Urine
	Lactic Acid
	Magnesium
	Phosphorus
	Ammonia
	Carbamazepine
	Digoxin
	Dilantin
	Gentamicin
	Phenobarb
	Theophylline
	Valproic Acid
	Acetaminophen
	Salicylates
	ETOH
	Quantitative/Qualitative Serum Pregnancy
	Urine lytes
	Fluid lytes
	Fluid and CSF protein and glucose
	Drugs of Abuse Screen (Urine)
Hematology	CBC with diff or any component of
Coagulation	APTT
	PT/INR
	Fibrinogen
	D-Dimer
	Platelet function Screen
	Fibrin Spit Products
	Unfractionated Heparin
	LMWH (Low Molecular Weight Heparin)

Urinalysis and Clinical Microscopy	Complete Urinalysis or any component of
	Wet Prep
	Occult Blood or Gastrocult
	Pregnancy Test Qualitative Urine and Serum
	Mono Test
Microbiology	Gram stain
	Strep Screen
	Affirm vaginosis testing
	Influenza Rapid Testing
	Blood Cultures
	Fungal Blood Cultures
Blood Bank/Transfusion Medicine	Blood Type
	Antibody Screen
	Direct Coombs
	Crossmatch
	Transfuse RBC's, platelets, FFP, or Cryo
	Rhogam

***Available on special request.**

Name of Policy:	**Specimen Collection and Acceptance**
Policy Number:	3364-107-112
Department:	Pathology-Laboratory
Approving Officer:	Chief Executive Officer-UTMC
Responsible Agent:	Director, Clinical Pathology Administrative Director, Lab
Scope:	Pathology-Laboratory

THE UNIVERSITY OF TOLEDO 1872

Effective Date: 1/4/2021

Initial Effective Date: 10/4/2004

_____ New policy proposal	_____ Minor/technical revision of existing policy
_____ Major revision of existing policy	X Reaffirmation of existing policy

(A) Policy Statement

Optimal specimens provide optimal results. UTMC laboratory will accept only properly identified and collected specimens.

(B) Purpose of Policy

Procedures must be followed consistently to ensure positive identification of patients and specimens obtained from patients for testing. The Clinical Laboratory will NOT analyze specimens received with incorrect or improper identification. Clinical Laboratory personnel will not label or re-label improperly submitted specimens nor return the specimen to the patient care area.

(C) Procedure

1. Prior to obtaining any specimen, verify the identification of the patient by asking patient to state name and/or reading name from patient identification band or test requisition. For inpatients, also verify the Patient ID number with the patient's band and the test requisition, labels, or electronic orders. For outpatients, verify the birth date. **Two unique identifiers must be matched**. If no ID band is present on an inpatient, do not proceed until Identification band is in place.
2. Refer to Specimen Collection Manual for proper container/tubes to use and special instructions for tests ordered.
3. Label specimens at the patient's side at the time of collection using the labels created by following the procedure for Mobile Care Phlebotomy. The following information is to be included and will print on the label.
    - ✓ Patient's full name (first and last) or temporary BB-ID identification - REQUIRED
    - ✓ Patient medical record number- REQUIRED
    - ✓ Date/time of collection and initials of phlebotomist – specimens will not be processed without this information.
4. Labels obtained from Horizon Lab printers may also be used and will have the above information printed on them.
5. Follow Blood Bank Specimen Collection Protocol for specimens for Blood Bank.
6. Use ball-point pen or indelible marker for labeling tubes.

Specimens will be rejected as unsuitable for analysis under the following conditions:

- Improper or incomplete labeling as stated above.
- Broken or leaking specimens.
- Improperly filled coag tubes or insufficient quantity of specimen for testing.
- Clotted anticoagulant tubes.
- Hemolyzed or contaminated specimens.

Rejected specimens will be marked and placed in designated storage areas in the department for later discard.

****Under NO circumstances are tubes with improper identification to be returned to patient care areas. ONLY tubes lacking date/time or phlebotomist initials may be returned to patient care areas for completion, if information is not verifiable by phone.

"Precious" specimens such as Intra-Op surgical specimens, Bone Marrow, CSF that are received unlabeled or mislabeled may be identified or corrected in the Lab by the personnel who obtained the specimen. Labeling or correction of patient identification on a specimen must be thoroughly documented on the test requisition. DO NOT RETURN THE SPECIMEN TO THE COLLECTION SITE FOR LABELING.

References

Food and Drug Administration, Department of Health and Human Services. Title 42, Code of Federal Regulation, Parts 493 to end. Washington, DC: U.S. Government Printing Office, (revised annually)

Food and Drug Administration, Center for Biologics Evaluation and Research. Guidelines on quality assurance in blood establishments. Rockville, MD: Food and Drug Administration, 1995 (Docket No. 91N-0450).

Approved by:		**Review/Revision Date:**
	01/06/2021	9/30/05 1/4/2021 9/18/06
/s/		9/14/2007
Amira Gohara, M.D. Professor Director, Clinical Pathology	Date	6/10/2008 5/1/2011 3/1/2013 2/20/2015
/s/	02/08/2021	2/13/2017
Rick Swaine, CPA Chief Executive Officer-UTMC	Date	1/19/2019
Review/Revision Completed By: *Cynthia O'Connell - Administrative Director, Lab*		**Next Review Date:** 1/4/2023
Policies Superseded by This Policy: OP-12		

Name of Policy:	**Phlebotomy Guidelines**
Policy Number:	3364-107-109
Department:	Pathology-Laboratory
Approving Officer:	Chief Executive Officer-UTMC
Responsible Agent:	Director, Clinical Pathology Administrative Director, Lab
Scope:	Pathology-Laboratory

THE UNIVERSITY OF TOLEDO 1872

Effective Date: 1/4/2021

Initial Effective Date: 11/6/1995

_____ New policy proposal	_____ Minor/technical revision of existing policy
_____ Major revision of existing policy	X Reaffirmation of existing policy

(A) Policy Statement

The laboratory has a policy for conducting early AM phlebotomy duties for efficient specimen collection.

(B) Purpose of Policy

To provide guidelines for use by laboratory personnel responsible for obtaining specimens from patients

(C) Procedure

1. Early a.m. phlebotomy duties will begin at 0400 for both UTMC inpatients and UTMC extended care clients.

2. Verify you have all required equipment and supplies.

3. **Do not draw patients without ID armband.** Patients lacking identification must be properly armbanded by nursing personnel prior to specimen collection.

    a. UTMC extended care clients and those admitted to Kobacker and Senior Behavioral Health do not utilize armbands. Verify their identification by following outpatient procedures of verbal name and date of birth, with picture ID's provided by unit, or by questioning primary caregiver at facility.

4. Two identifiers must always be used before performing any procedure on a patient including phlebotomy. The patient name and medical record number are used for inpatient phlebotomy procedures. The patient name and birth date are used for outpatient phlebotomy procedures.

5. **P**rior to phlebotomy, scan the patient's armband using the mobile care phlebotomy device and ask the patient to verbally confirm their name and date of birth. Do not proceed until any discrepancies are resolved.

Venipuncture Site Selection: The median cubital and cephalic veins are most commonly used for venipuncture. Alternative sites are the basilic vein on the dorsum of the arm or dorsal hand veins.

These sites are not to be used by the phlebotomy team at UTMC:

a. Any lower extremity, including legs or feet
b. Extensive scarring from burns or surgery
c. The upper extremity on the side that a mastectomy was performed.
d. Intravenous therapy/Blood Transfusions – If it is not possible to draw the opposite arm, then blood should be drawn from BELOW (distal to) the IV. The tourniquet should be applied between the IV site and the venipuncture

site. If drawing above the IV site is the only option, then the IV infusion must be turned off for at least 5 minutes before performing the venipuncture. As there is still a risk that the sample could be contaminated, you must document that the specimen was drawn above (proximal to) an IV site and how many minutes the IV was turned off before the draw occurred. The lab may reject the specimen as contaminated based on the test results.

e. Cannula, Fistula or Vascular Graft

f. Hematoma – A venipuncture should not be performed on a hematoma, regardless of how small it may be. If there is not an alternate vein to draw, the venipuncture should be performed distal to (below) the hematoma.

6. **Wear gloves** when drawing patients and **wash your hands when the blood draw is complete. Always change gloves between patients.**

7. Make attempt to return to patients who were previously occupied or absent on your first visit.

    a. **Misses"** are to be communicated to another phlebotomist as soon as possible to minimize any delays. Known extremely **difficult patients** will be drawn at the end of the phlebotomist's list of draws.

Approved by:		**Review/Revision Date:**
	01/06/2021	09/22/98 1/4/2021 10/06/03 10/4/04 09/30/05 09/18/06 09/14/2007 6/10/2008 5/1/2011 1/10/2012 3/1/2013 2/20/2017 1/19/2019
/s/ Amira Gohara, M.D. Professor Director, Clinical Pathology	Date	
/s/ Rick Swaine, CPA Chief Executive Officer-UTMC	02/08/2021 Date	
Review/Revision Completed By: *Cynthia O'Connell – Administrative Lab Director*		**Next Review Date:** 1/4/2023
Policies Superseded by This Policy: OP-09		

Name of Policy:	**Blood Transfusion Identification Wristbands**	
Policy Number:	3364-107-104	
Department:	Pathology-Laboratory	
Approving Officer:	Chief Executive Officer-UTMC	
Responsible Agent:	Director, Clinical Pathology Administrative Director, Laboratory	**Effective Date: 1/04/2021**
Scope:	Pathology-Laboratory	Initial Effective Date: 3/25/1983

_____ New policy proposal	_____ Minor/technical revision of existing policy
_____ Major revision of existing policy	**X** Reaffirmation of existing policy

(A) Policy Statement

The laboratory has a policy for unique identification of patients and specimens for compatibility testing in the form of Blood Transfusion Identification Wrist Bands.

(B) Purpose of Policy

To ensure proper identification of patients who have orders for a type and screen or compatibility testing for blood transfusion.

(C) Procedure

1. Identify patient by name and number on hospital wrist band by scanning with mobile care phlebotomy device and ask patient to state his/her full name.
2. Explain procedure to patient.
3. Fill in all blanks on wrist band at bedside at time specimen is drawn and before leaving patient.
4. Obtain information from patient's wrist band and use indelible ballpoint pen when filling out label on Blood Bank wrist band. DO NOT use a felt tip pen for any of this labeling.
5. Place the band on the patient's wrist to size and secure with snap closure. Peel off patient identification label and apply to specimen tube. Peel the protective liner from the shield and apply over patient information handwritten on band to protect from smears.
6. Instruct patient not to remove wrist band.
7. Wrist band MUST NOT be cut off until 72 hours following sample collection whether or not patient is transfused.
8. Blood shall not be given if the patient is not wearing the I.D. or its numbers do not correspond with the I.D. number of the unit.
9. If there is any doubt on any of the procedures, call the Blood Transfusion Service, (extension 5212).

Approved by: /s/ 01/06/2021 Amira Gohara, M.D. Date Professor Director, Clinical Pathology /s/ 02/08/2021 Rick Swaine, CPA Date Chief Executive Officer-UTMC *Review/Revision Completed By:* *Cynthia O'Connell – Administrative Director, Lab*	**Review/Revision Date:** 9/29/92 5/1/2011 9/22/98 3/1/2013 10/06/03 2/20/2017 10/4/04 1/19/2019 9/30/05 1/04/2021 9/18/06 9/14/2007 6/10/2008 **Next Review Date:** 1/04/2023
Policies Superseded by This Policy: OP-4	

Detailed Acceptance Criteria for Laboratory Specimens:

1. All specimen tubes or containers must be labeled properly:
   - Patient's last name, first name (not first initial) should be legibly printed on the label
   - Patient's six digit hospital number or date of birth for outpatients.
   - Date and time of collection for outside referral specimens
   - All Blood Bank specimens for crossmatch must have red Blood bank ID numbers on tube
2. All specimens must be submitted with a completed written or electronic requisition
   - Doctor's name, hospital or clinic name or ordering location must be printed on request slip
   - Date of collection must be noted on the requisition.
   - Diagnosis, signs, symptoms or reason for test must be noted on all outpatient requisitions
   - Name of each test requested must be clearly marked or printed on the requisition
   - Bacterial specimens must have patient's name, tests requested and source of specimen (i.e. throat, nose, rectal, sputum) noted on the request slip along with physician's name.
   - Differential smears - label with patient's last and first name. Print name in pencil (NOT PEN OR MARKER) on frosted end of slide.
   - All blood bank specimens for crossmatch must be accompanied by red Blood Bank ID numbers for additional identification
   - When appropriate, additional clinical data should be included on the requisition such as time of draw and last dose for drug levels, AM or PM cortisol levels, specific site for blood cultures, etc.

Upon acceptance of specimens in lab, specimens will be logged into the lab computer and assigned an accession number and label. The assigned numbered label will be affixed to all tubes and containers belonging to the specimen, to include aliquot tubes, and remain affixed until disposal of the specimen. Histology, Cytology, EM will assign their own accession numbers.

3. Specimens should be in proper containers to insure accuracy of tests performed in the lab.
   - Bacterial swabs must be transported in transport media (i.e. culturettes) to insure viability of bacteria.
   - Liquid Bacterial Specimens (i.e. urine, sputum) must be transported in sterile collection cups (available from Lab) to guard against contamination. All lids must be tight-fitting to prevent contamination and leakage.
   - TB cultures must be collected in sterile cup with tight-fitting lid and placed in a plastic bag with requisition slip attached to the outside of the bag.
   - Blood and other body fluids need proper preservatives to insure accurate testing of the specimen.
     a) Hematology (i.e. CBC, Retic, Platelets) needs EDTA as a preservative (lavender stopper tubes) the preservative helps maintain cell size and shape and prevents clotting. The tube should be at least half full to insure that preservative will not damage the specimen. Tube should be gently mixed (inverting 8-10 times) to insure proper mixing of anti-coagulant with blood. Tubes that are clotted will be rejected.
     b) Serum - clotted blood - no preservative. Collection should be drawn in vacutainers with serum separator gel. Mix gently 4-5 times. If testing is delayed for transport purposes, the specimen should be centrifuged. Clot tube should not be subjected to extremes in temperatures (i.e. freezing or extreme heat) as this will cause hemolysis. Store at room temperature or refrigerate if holding longer than 6 hours.
     c) 24-hour urine collections and special tests. Collection cups and preservatives are available in the lab. Check with lab on 24-hour collections, as many require preservatives or are collected in special containers. Call lab for specific instructions.

Criteria for Rejection of Specimens:

All specimens rejected by the laboratory will be documented in the computer and the physician or appropriate clinical staff notified.

a) Specimens not labeled properly as outlined above will be rejected.
b) Leaking bacterial specimens (particularly TB specimens) will be rejected as contaminated. (These are a health hazard to employees.)
c) Blood glucose tubes not at least half full are rejected because they will give inadequate results.
d) Clotted Hematology, coagulation or blood glucose tubes are rejected because they will give inaccurate results.
e) Blood Bank Specimens for crossmatch if not accompanied by red blood bank labels
f) Hemolyzed serum for sodium, potassium and enzymes will be rejected because they will give inaccurate results.
g) Coagulation tubes (blue top) that are not completely filled or hemolyzed may cause inaccurate results
h) Time interval between collection and testing exceeds standards recommended in testing procedures.
i) Specimen storage or transport conditions are not met
j) Specimen not processed properly (centrifuged prior to transport, if required)
k) Quantity not sufficient

CLEAN CATCH URINE COLLECTION:

It is very important that this urine specimen be as free of contaminating material as possible. Therefore, the following instructions should be explained fully to the patient. Place properly labeled specimen and test requisition in the transport bag.

INSTRUCT THE FEMALE PATIENT TO:

1. Wash hands.
2. Open and unfold three (3) towelettes provided.
3. Sit as far back on the toilet seat as possible
4. Cleanse the urinary opening by:
5. Using the fingers of one hand, spread the layers of skin (labia), which cover the urinary opening as far apart as possible and keep them separated until the specimen collection is finished.
6. Use one towelette to wipe across one side of the urinary area from front to back, discard.
7. Use the second towelette to wipe the other side of the urinary area from front to back, discard.
8. Use the third towelette to wipe straight down the middle of the urinary area from front to back, discard.
9. Continue to hold the skin apart and begin to urinate. After passing a small amount of urine, hold the specimen container a few inches from the urinary opening and fill the container about 1/2 full.
10. Finish urinating as usual.
11. Re-cap the specimen container by screwing the lid on tightly.

INSTRUCT THE MALE PATIENT TO:

1. Expose the penis, wash hands.
2. Open and unfold the three (3) towelettes provided.
3. Hold the penis with one hand, retract the foreskin, if necessary.
4. Cleanse the urinary opening by using the three towelettes, one at a time, wiping away from the opening, discard.
5. Begin to urinate. After passing a small amount of urine, hold the specimen container a few inches from the urinary opening and fill the container about 1/2 full.
6. Finish urinating as usual
7. Re-cap the specimen container by screwing the lid on tightly.

24 HOUR URINE COLLECTION

Most urine chemistry tests require a 24-hour collection. Specimen should be kept refrigerated during collection. The following guidelines should be used for proper collection.

1. The first morning urine (on the day of collection) MUST BE DISCARDED. Write the date and time of this void on the specimen container.

2. Collect all urine voids for the next 24 hours.

3. The final collection should be the first morning void of the second morning. Write the date and time of collection on the specimen container.

4. Place specimen in plastic biohazard bag.

5. Submit the container(s) to the Laboratory on the next scheduled pick-up.

**ARUP studies indicate that refrigeration of urine alone, during and after collection, preserves specimens adequately, if tested within 14 days of collection.

***Certain testing is light sensitive. If you do not have a brown collection container then you should store the specimen in a brown paper bag during collection and delivery to the lab.

RE: ARUP Reference Laboratory, Salt Lake City, Utah
http://www.aruplab.com/Specimen-Handling/resources/Urine%20Chart_Oct%2010.pdf

HISTOLOGY OUTPATIENT SPECIMENS

Outpatient specimens for histology should be received in 10% formalin in leak-proof plastic container labeled with patient name, collection date, patient ID #, and ordering physician. Formalin containers are available from Histology Department (419-383-3470). Specimens may be submitted in alcohol. All specimens must be submitted with a requisition containing patient name, ID number, ordering physician and clinical diagnosis and pertinent information detailing specific site/procedure.

Any questions concerning specimen submission, or for special requests, contact the Histology department.

THE UNIVERSITY OF TOLEDO
MEDICAL CENTER

CYP.35/Version #03
Department of Pathology/Division of Cytopathology

Current Written By:	Original Date Adopted:	Supersedes Document #: CYP.02900-.03000	
Stacy Molnar, SCT(ASCP)^{CM}	10/15/12	New ☐	Previous Doc / Version #02

New or revised documents must be signed by Medical Director and authorized Division Director		Signature: Original in Cytology Office
New: ☐ Revised: ☒	Date Approved:	Division Director:
	Date Approved:	Medical Lab Director:
Annual Review	Date Reviewed:	
Annual Review	Date Reviewed:	
Annual Review	Date Reviewed:	
Annual Review	Date Reviewed:	
Annual Review	Date Reviewed:	

1. POLICY
1.1. Specimen Collection and Processing

2. PURPOSE OF DOCUMENT
2.1. To outline the methods for specimen collection and specimen processing.

3. SCOPE OF DOCUMENT
3.1. Cytopathology Director(s), Cytopathologists, Cytotechnologist(s), Cytology Prep Staff.

4. RESPONSIBILITY
4.1. The Cytopathology Director(s) will review and sign all cytology procedures biennially and revise when applicable.

5. PROCESS
5.1. All cytology specimens are required to have two patient identifiers.
5.2. GYN Cytology specimens may be transported and stored at room temperature.
5.3. Fresh non-gyn specimens should be transported to the lab and processed as soon as possible. If transport or processing of the specimen is to be delayed, the specimen should be refrigerated.

5.4. GYN Specimen Collection
5.4.1. ThinPrep Pap Test Collection: Obtain an adequate sample using either the Broom-Like Device protocol (preferred) or the Endocervical Brush/Spatula protocol
a. Broom-Like Device Protocol (preferred)

1. If desired, use lukewarm water to warm and lubricate the speculum. If lubricating gel must be used, it should be a carbomer-free, water-soluble gel. It should be used sparingly and applied only to the posterior blade of the speculum. (*Excess lubricating gel can obscure the Pap test and cause an unsatisfactory result.)
2. Insert the central bristles of the broom into the endocervical canal deep enough to allow the shorter bristles to fully contact the ectocervix. Push gently and rotate the broom in a clockwise direction five times.
3. Rinse the device as quickly as possible into the PreservCyt solution by pushing the broom into the bottom of the vial 10 times, forcing bristles apart. Then, swirl the broom vigorously to further release material. Discard the collection device.
4. Tighten the cap so the line on the cap passes the line on the vial.
5. Label the PreservCyt vial with 2 patient identifiers (i.e. patient name and date of birth, patient name and medical record number).
6. Place vial into specimen bag and submit to the laboratory with the completed GYN cytology requisition.

b. Endocervical Brush/Spatula Protocol
1. If desired, use lukewarm water to warm and lubricate the speculum. If lubricating gel must be used, it should be a carbomer-free, water-soluble gel. It should be used sparingly and applied only to the posterior blade of the speculum. (*Excess lubricating gel can obscure the Pap test and cause an unsatisfactory result.)
2. Select the contoured end of the plastic spatula and rotate it 360 degrees around the entire exocervix while maintaining tight contact with the exocervical surface.
3. Rinse the device as quickly as possible into the PreservCyt solution by swirling the spatula vigorously 10 times. Discard the spatula.
4. Obtain an adequate sample of the endocervix by using an endocervical brush device. Insert the brush into the cervix until only the bottom-most fibers are exposed. Slowly rotate 1/4 to 1/2 turn in one direction. DO NOT OVER-ROTATE.
5. Rinse the device as quickly as possible into the PreservCyt solution by rotating the device in the solution 10 times while pushing against the PreservCyt vial wall. Swirl the brush vigorously to release further material. Discard the brush.
6. Tighten the cap so the line on the cap passes the line on the vial.
7. Label the PreservCyt vial with 2 patient identifiers (i.e. patient name and date of birth, patient name and medical record number)
8. Place vial into specimen bag and submit to the laboratory with the completed GYN cytology requisition.

5.4.2. Conventional Pap Test Collection
a. Obtain an adequate sample using either the Endocervical Brush/Spatula protocol or the Broom-Like device protocol.
b. With a circular and longitudinal motion, spread the scraping on the frosted side of a slide.
c. After even distribution of material and before any air drying effect can take place spray the slide with fixative.
d. Allow fixative to dry, after drying has taken place label slide with patient name.
e. Close slide holder and submit to the laboratory with the proper requisition.

5.5. Non-Gyn Specimen Collection
5.5.1. Breast Secretions:

a. Write the patient name and date of birth or medical record number onto the frosted end of a clean slide.
b. Produce a small amount of secretion and gently directly smear onto the labeled side of the slide.
c. Immediately fix slide with spray fixative and allow to dry.
d. Submit to lab with completed non-gyn cytology requisition.

5.5.2. Bronchoscopy:
a. Bronchial Washings/Bronchoalveolar Lavage: Send unfixed specimen to cytology in a labeled sterile container with no preservative added along with a completed non-gyn cytology requisition. If you are unable to submit the specimen immediately to the lab please make sure it is kept refrigerated until it can be submitted.
b. Bronchial Brushing: Rinse collection device immediately or remove brush tip and place into a labeled CytoLyt collection container. Submit to laboratory with completed non-gyn cytology requisition.

5.5.3. CSF:
a. Send specimen immediately to cytology laboratory with no preservative added. A minimum of 1 mL is preferred.

5.5.4. Serous Fluids:
a. Send unfixed specimen to the laboratory in a labeled container. A minimum of 100-200 ml fresh specimen is preferred. If you are unable to submit the specimen immediately to the lab please make sure it is kept refrigerated until it can be submitted.

5.5.5. Brushing from the Gastrointestinal Tract (including esophageal brushings, gastric brushing, common bile duct brushing, hepatic duct brushing, etc.):
a. Rinse collection device immediately into a labeled CytoLyt collection vial. Remove brush tip and place into vial. Submit to laboratory with completed non-gyn cytology requisition.

5.5.6. Sputum:
a. Have patient rinse mouth with water. Have patient induce a deep cough in order to produce sputum and have them spit sputum into labeled sterile cup. Submit to laboratory with completed non-gyn cytology requisition. If specimen cannot be sent to lab immediately, please refrigerate and submit as soon as possible.

5.5.7. Tzanck Smear:
a. Unroof vesicle and scrape lesion at the base with proper collection device. Rinse the device as quickly as possible into the PreservCyt solution by swirling vigorously 10 times. Discard the device. Alternatively, a glass slide may be prepared by gently smearing the material from the collection device onto a glass slide and fixing immediately in 95% alcohol. The glass slide must be labeled on the frosted end with two patient identifiers. (Labeling alcohol container is not sufficient.) Submit to laboratory with completed non-gyn cytology requisition.

5.5.8. Urine/Bladder Washing:
a. Submit in fresh specimen in a labeled sterile container. If specimen cannot be submitted immediately, refrigerate and submit to lab as soon as possible. Alternatively, specimen may be submitted in CytoLyt solution, which does not require refrigeration. (Note: specimens

submitted in CytoLyt preservative are not suitable for any other lab testing.) For voided urine, use a clean catch/midstream technique. Submit to laboratory with completed non-gyn cytology requisition.

5.5.9. Fine Needle Aspirations (FNAs)

a. FNA specimens may be submitted as smears, in CytoLyt solution, or a combination of both. For smears, the specimen should be smeared onto labeled glass slides. At least half of the slides should be immediately submerged into 95% alcohol for Papanicolaou staining. The remainder of the slides may be air-dried for Diff-Quik staining. After preparing smears, the needle should be rinsed in CytoLyt solution. If smears are not being prepared, the entire specimen should be submitted in CytoLyt solution by expelling the material into the solution and then rinsing the needle. Submit to laboratory with completed non-gyn cytology requisition.
b. GYN Cytology Processing

5.5.10. GYN Cytology specimens will be processed as outlined in CYP.36

5.6. Non-GYN Cytology Processing

5.6.1. Non-Gyn Cytology specimens will be processed as outlined in CYP.43

6. REFERENCES

6.1. CMS/CLIA 493.1242, 493.1251
6.2. COM.04150
6.3. Hologic ThinPrep Pap Test Collection Protocols

7. RELATED DOCUMENTS:

7.1. CYP.36
7.2. CYP.43

Transplant Immunology Laboratory

General Information

The Transplant Immunology/Histocompatibility Laboratory at the University of Toledo Medical Center provides histocompatibility testing to the solid organ transplant programs in Northwest Ohio. The laboratory is accredited by the American Society for Histocompatibility and Immunogenetics (ASHI) and by the College of American Pathologists(CAP).

Technologists are available 24 hours per day, seven days per week for organ donor evaluation. Recipient evaluations are routinely performed Monday through Friday between 6:00 am and 4:30 pm. Emergency coverage is available by paging the on-call technologist.

The laboratory is staffed from:	7:30 am – 4:30 pm Monday through Friday
Telephone	419-383-4292
Fax	419-383-3076

All other hours and holidays covered by on-call. Page the on-call technologist through the UTMC operator:
419 -383-4000 or 1-800-321-8383

HLA Typing by the Polymerase Chain Reaction using Sequence Specific Oligonucleotide Probes

Test Ordering Information:	*HLA ABC*	*complete HLA Class I typing*	*65097*
	HLA DR	*complete HLA Class II typing*	*66002*
	HLA ABC S	*single Class I loci typing*	*30239*
	HLA DR S	*single Class II loci typing*	*30240*

Sample: 1 five (5) ml EDTA or 1 ten (10) ml ACD

Availability: ***HLA typing assays can be drawn at any time. These are routine tests performed during regular business hours. Deceased donor HLA typing is available on a STAT basis.***

Turn-around-time: ***14 days***

Test Performance:

Molecular typing utilizing the polymerase chain reaction is a very powerful tool. Molecular typing for HLA offers many advantages over serologic typing. The sample requirement is much smaller, viable lymphocytes are not required, the technique is very reproducible, samples can be stored for future testing, and the results are much more objective.

The UTMC Transplant Immunology Laboratory performs all routine recipient and living donor typings using Tepnel Lifecodes HLA-SSO(sequence specific oligonucleotide probes) products and performs all analysis using Luminex XY platform technology. The LIFECODES HLA-SSO typing procedure is based on the hybridization of labeled single stranded PCR product to SSO probes.

During the initial cycles of the LIFECODES amplification step, double-stranded DNA is generated. Once the limiting primer is exhausted, the remaining primer uses the double-stranded product as a template for generation of single-stranded DNA. This method generates both double stranded and single stranded products that upon denaturation, will both participate in the hybridization reaction. Each of the different probes may be homologous to a sequence within the amplified DNA that is unique to an allele or group of alleles. In other words, these probes are designed so that each probe preferentially hybridizes to a complementary region that may or may not be present in the amplified DNA. In addition, the amplified DNA is also hybridized to one or more consensus probes homologous to sequences present in all the alleles of a locus. The signal obtained for the consensus probe(s) serves as an indicator of the success of the amplification and hybridization procedures. Also, the signal obtained with the consensus probe can be used to normalize the signal of the allele specific probes and correct for variations in the amount of amplified product in the hybridization reaction. The analysis of the results generated from the SSO typing can be used to determine the presence or absence of particular DNA sequences in amplified DNA and to identify the possible alleles in the sample.

For the LIFECODES HLA-SSO Typing procedure, probes are attached to Luminex100 Microspheres .Up to 100 different populations of Luminex100 Microspheres can be mixed together and analyzed by the Luminex100 Instrument because each population of microspheres can be distinguished by its unique fluorescence signature or color. A different SSO probe can be attached to each color microsphere. Therefore, a mixture of several probes can be distinguished from each other by virtue of their association with particular color microspheres. The Luminex100 Instrument is also able to quantify the relative amounts of labeled PCR product hybridizing to each Luminex100 Microsphere. Therefore, the relative signal obtained with the SSO probes in the LIFECODES assay, as with other SSOP methods, can be used to assign the probes as having positive or negative reactivity with the amplified DNA sample

Limitations:

1. Quality and quantity of DNA - Low WBC count and protein contamination will effect the quality of the results
2. Primer/probe availability and sequence information is necessary to identify the alleles
3. Low resolution testing does not delineate all alleles
4. Allelic ambiguities may be present depending on the primer/probe alignment
5. Temperature variation in the amplification stage is crucial to amplification. Temperature and timing are also critical to the hybridization step.
6. Ambient temperature around the Liqui-chip instrument may effect instrument operation.
7. Beads must be warmed and well suspended prior to use in order to insure that the hybridization components are in solution.

HLA Typing by the Polymerase Chain Reaction using Sequence Specific Primers

Test Ordering Information:	*HLA ABC*	*complete HLA Class I typing*	*65097*
	HLA DR	*complete HLA Class II typing*	*66002*
	HLA ABC S	*single Class I loci typing*	*30239*
	HLA DR S	*single Class II loci typing*	*30240*

Sample: 1 five (5) ml EDTA or 1 ten (10) ml ACD

Availability: ***HLA typing assays can be drawn at any time. These are routine tests performed during regular business hours. Deceased donor HLA typing is available on a STAT basis.***

Turn-around-time: ***14 days***

Test Performance

PCR SSP typing since is a more rapid technique than PCR-SSO. This technique is used in support of routine SSO testing. This technique is also the method of choice for deceased donor typing or other STAT requests. Genomic DNA is extracted from whole blood, lymph nodes or spleen for use in the sequence specific primers polymerase chain reaction. The UTMC Transplant Immunology Laboratory performs low resolution molecular typing for HLA Class I and Class II alleles using commercially purchased Invitrogen Pel-Freez SSP Unitray products. This technique uses the polymerase chair reaction and a sequence specific primer (SSP) amplification method. Amplification of genomic DNA by PCR is a means to exponentially amplify selected DNA fragments. This methodology involves the use of ninety-six formulations of allele or group specific primer sets to amplify genomic DNA using a 96 well thermal tray. Different sets of primer trays are available to test for the alleles of the ABC loci, ABDR loci, and ABDRDQ loci. Multiple small volume reactions are utilized where sequence specific primers amplify segments of DNA a million fold or more. PCR-SSP specificity is derived from matching the terminal 3′-nucleotide of the primers with the DNA sequence. *Taq* polymerase extends 3′-matched primers but not 3′ -mismatched primers, so that only target DNA that is complementary to both primers is amplified. To type an individual, multiple SSP reactions are set up and subjected to the ploymerase chain reaction under the same conditions. The presence or absence of PRC amplification is detected by gel electrophoreses with visualization of the amplicons by ethidium bromide intercalating with the DNA fragment. In addition, each reaction also contains a positive control gene which aids in discrimination between failed PCR reactions and negative results. Each reaction is specific for an allele or group of alleles which correspond to serologic antigens.

Limitations:

1. Quality and quantity of DNA - Low WBC count and protein contamination will effect the quality of the results
2. Primer availability and sequence information is necessary to identify the alleles
3. Low resolution testing does not delineate all alleles
4. Allelic ambiguities may be present depending on the primer alignment
5. Temperature variation in the amplification stage is crucial to amplification

Panel Reactive Antibody Testing

Test Ordering Information: *PRA* *65962*

Sample: two(2) 7 ml plain red top clot tubes

Availability: ***PRA assays can be drawn at any time. These are routine tests performed during regular business hours.***

Turn-around-time: ***21 days***

Test performance

Antibodies to the antigens of the HLA system are produced in response to a number of stimuli, most commonly pregnancy, transfusion and previous transplant. In each of these cases, antigen is presented in a slightly different manner resulting in a variety of different immune responses. The amount of antibody, affinity, immunoglobulin sub-class, the specificity and persistence are all affected. Autologous antibodies may also be produced in certain disease states such as lupus and in response to certain medications.

Alloimmunization from pregnancy usually results in a fully developed immune response that gives rise to a high titer, high affinity antibody of the IgG class. This type of antibody is produced because the antigen challenge is usually large and the individual usually possesses a healthy immune system. These antibodies tend to persist for a long time.

In contrast, when antibody is produced as a result of clinical allograft, the individual is most usually very ill. They may possess a much less efficient immune system and have received a variety of immunosuppressive drugs. In most cases a broad spectrum of ploysspecific antibodes to a wide range of cross reactive antigens is usually produced. These antibodies may persist or they may disappear over time.

Antibody produced in response to blood transfusion falls somewhere between these first two types of allo-immunization. Many times transfusion candidates are immunosuppressed or ill at the time of transfusion. The dose of antigen received through blood transfusion may vary and multiple transfusions are usually necessary to produce a response.

A patient may produce antibodies to either or both of the HLA Class I and Class II antigens. Screening and identification of these antibodies differ somewhat is the techniques and target cells used to define the specificities. The majority of antibodies to HLA antigens are of the IgG subclass. These antibodies are well developed products of a mature immune response. They are extremely stable and persistent. IgM antibodies to HLA have been reported, but they are very rare. Auto-antibody that is identified in cytotoxicity crossmatches and PRA screenings is usually IgM in nature. It does not present a contraindication to transplant and can usually by removed with DTT(dithiothreitol) treatment or heat inactivation. Screening procedures for the detection of these antibodies must be designed to encompass all the possible antibodies, specificities and immunoglobulin subclasses that may occur. Differentiation between allo- and auto- antibodies is necessary as well. Antibody characterization must be sufficient to provide a well

documented antibody picture prior to transplant. A complete antibody profile can be used to predict crossmatch compatibility between donors and recipients.

A variety of tests and methodologies are used to identify the different types of antibodies found in the sera of transplant recipients. This assortment of tests allows the identification of antibodies directed against HLA Class I and HLA Class II antibodies. They also aid in the differentiation of IgM and IgG subclasses. In each of these tests, a patient sera is tested against a panel of HLA antigens that encompasses all the available specificities. The PRA is calculated as a percentage of the cells the patient reacts against. The specificity of the antibody present is determined from examining the positive reactions for common antigens.

Selection of Antibody Screening Methods

The UTMC Transplant Immunology Laboratory employs Luminex bead array techniques for antibody identification. The solid phase assays (Luminex bead assays) are much more sensitive than cytotoxicity assays, however, important information is obtained from including a variety of methodologies in the antibody identification strategy.

Luminex mixed bead screen, Luminex Class I and II PRA beads and Luminex single antigen beads make up the primary testing methods. Each recipient is tested by Luminex Class I and II PRA beads at their initial evaluation. Once listed, single antigen beads are tested. Each month following listing, a sample is received on every recipient for PRA testing and sample storage for future crossmatch testing. These monthly PRAs are tested by Luminex Class I and II PRA beads every 6 months with mixed beads in the intervening months.
Single antigens beads may be substituted at any time. All patients with PRA specificities should have single antigen beads at least annually.

Principles of Luminex Bead Technology

The Luminex Instrument performs simultaneous and discrete measurements of multiple bead-based reactions in a single sample. The Luminex technology is based on flow cell fluorometry with xMAP-specific innovations. The fluidics, optics, robotics, temperature controls, software and Luminex beads work together to enable simultaneous analysis of up to 100 analytes in a single test sample. The UTMC Transplant Immunology Laboratory uses commercially purchased bead kits from Gen-Probe Lifecodes and One Lambda to determine percent PRA and specificity.

PRA Class I and II beads (Gen-Probe) The HLA bead kits use microbeads coated with purified Class I or Class II antigens for the detection of anti HLA Class I and II antibodies in human sera. These beads are then analysed on the Luminex Array Analyser. The beads kits utilize a panel of up to 100 different multi-colored beads coated with HLA antigen. Patient serum is incubated with the beads on a micro-filter plate. Anti-HLA antibody in the patient sera will bind to the appropriate antigen on the color coated bead. The beads are then labeled with R-phycoerytherin (PE) conjugated goat anti-human IgG. The Liminex analyzer detects the fluorescence of the PE bound to the beads as positive reactivity. This reactivity can then be analyzed against the lot specific antigen make up of the beads, providing percent PRA and specificity.

PRA Class I and Class II Single Antigen Beads (Gen-Probe and One Lambda) Single antigen bead testing is performed in the same manner as the Class I and II bead kits. The single antigen beads differ in that each bead is coated with only one HLA Class I or Class II antigen. This allows for the delineation of anti-HLA antibody specificity in high PRA sera.

Mixed Beads (Gen-Probe) The mixed bead assay is performed using the same technique as described above for the PRA Class I and II beads. The difference is that the mixed bead set offers a screening test for Class I and/or Class II antibody. It consists of five Class I coated beads and three Class II coated beads. This assay identifies the presence of Class I and/or Class II antibody but does not provide a percent positive or specificity.

Limitations:

1. Bead counts should be over 50 for the results to be valid. Low bead counts may be due to:
   a. sample loss during the wash steps
   b. improper calibration of the Liqui-Chip
   c. clogging of the sample probe
   d. photo-bleached beads – all beads should be protected from excess light
2. Improper operation and/or maintenance of the instrument
3. Antigen distribution is limited to that provided by the vendor

Post Transplant Donor Specific Antibody by Single Antigen Beads

Test Ordering Information: *PPRA* *30461*

Sample: two(2) 7 ml plain red top clot tubes

Availability: ***PPRA assays can be drawn at any time. These are routine tests performed during regular business hours.***

Turn-around-time: ***4 -7 days***

Test performance

Monitoring transplant recipients for the presence of donor specific antibody following transplant can facilitate the early detection of antibodies that may illicit graft failure. All transplant recipients are screened for DSA at 1 week, 2 weeks, 3 weeks, 4 weeks, 2 months, 3 months, 6 months and 1 year following transplant.

PRA Class I and Class II Single Antigen Beads (Gen-Probe and One Lambda) Single antigen bead testing is performed in the same manner as the Class I and II bead kits. The single antigen beads differ in that each bead is coated with only one HLA Class I or Class II antigen. This allows for the delineation of anti-HLA antibody specificity in high PRA sera.

Lymphocyte Crossmatch

Test Ordering Information:

Sample:	**Living Donor Crossmatch:**	**LIVE CROSSMATCH RECIP**	**30896**
		LIVE CROSSMATCH DONOR	**LD CROSS**
	T-lymphocyte crossmatch**	Donor = 3 ACD	RT
	Flow cytometry	Recip = 1 or 2 plain red	4°C
	B-lymphocyte crossmatch**	Donor = 3 ACD	RT
	Flow cytometry	Recip = 1 or 2 plain red	4°C
	Auto crossmatch		
	Flow cytometry	3 ACD +1 plain red	ACD=RT, Red=4°C
	Deceased donor crossmatch	**X MTCH**	**30897**

T and B crossmatch by flow cytometry 7 ten ml (10 ml) ACD tubes

Availability: *Live donor crossmatches* ***should be scheduled by calling ext 4292. Live donor crossmatches are drawn Monday through Thursday only and are performed during regular business hours.***

Deceased donor crossmatches ***are available 24 hours per day. An on-call technologist is on call at all times to facilitate these crossmatches.***

Turn-around-time: ***Live Donor Crossmatch = 48 hours.***

Deceased Donor Crossmatch < 8 hours

Lymphocyte Crossmatch by Flow Cytometry

Test Performance

The lymphocyte crossmatch serves as the single most important test performed in the Transplant Immunology Laboratory. The crossmatch allows for the identification of pre-formed anti-HLA antibodies that may cause hyperacute rejection or early graft loss. The crossmatch is routinely performed using both T and B lymphocytes to identify both Class I and Class II antibodies. HLA Class I molecules are found on both T and B lymphocytes, with their distribution being higher on B lymphocytes. This makes both T and B lymphocytes excellent target cells for the identification of anti- HLA Class I antibody. HLA Class II molecules are found only on B lymphocytes.

Antibodies other than anti-HLA antibodies may be discovered in the lymphocyte crossmatch. Most commonly these are IgM autologous antibodies and are not contraindications to transplant. Their presence however, may mask the presence of a significant anti-HLA antibody. For this reason, the IgM antibody must be identified and removed before crossmatch for the presence of anti-HLA antibody is performed. IgM autoantibodies are most usually directed against B lymphocytes and are most easily identified through the autologous crossmatch. In this assay the patients serum is tested against the patient lymphocytes. IgM auto-antibody can be removed by treating the serum with heat inactivation or dithiothreitol (DTT).

The lymphocyte crossmatch by flow cytometry provides a very sensitive method to detect low levels of anti-HLA antibody bound to the surface of the lymphocyte. The flow crossmatch is 10-50 times more sensitive that the standard complement dependent, antiglobulin augmented crossmatch. To perform the flow crossmatch, donor lymphocytes and recipient sera are incubated together. The donor cells are washed to remove residual serum. The following monoclonal antibodies are added: fluorescein isothiocyanate conjugated (FITC) rabbit anti-human IgG to detect any IgG anti HLA antibody that might be bound to the cells, phycoerytherin (PE) conjugated anti -CD3 (anti T-cell) to label the T cells and anti-CD19PC5 to label the B cells. This 3-color technique allows for the discrimination of anti-HLA antibody directed against both donor Class I and Class II . When analyzed on the flow cytometer, the cells staining positive with the CD3-PE (T cells) and IgG -FITC, represent positive Class I antigen/antibody reactions. Cells staining positive with the CD19PC5 (B cells) and IgG -FITC, represent positive Class II antigen/antibody reactions.

Limitations

1. Availablity of lymphocytes: low patient white blood cell count, low lymphocyte count, viability
2. Antibodies are light sensitive and may lose reactivity over time
3. Autofluorescense of donor cells due to donor autoantibody may result in increased backgrounds.
4. Recipient autoantibody may result in increased backgrounds.
5. Non-HLA IgG antibodies in the recipient serum may cause false positive results.

6. Platelet and or granulocyte contamination may yield falsely negative results.

Autologous Crossmatch

Sample: one (1) 7 ml plain red top **AND** for (2) 10 ml ACD

The autologous crossmatch provides important information about a recipient's antibody status. In some diseases, such as SLE, viral infection, and with certain medications, a patient may produce an "auto-antibody" that reacts not only with his own cells, but also with allogenic lymphocytes. The identification and removal of this antibody is necessary to identify an allo-antibody that may be masked. In most instances these auto-antibodies are IgM in nature and to do contraindicate transplant. Their identification, however, is necessary to insure compatibility between the recipient and donor. The autologous lymphocyte crossmatch is performed by testing a patient's serum against the patient's own lymphocytes. The recipient's serum can also be tested using unteated and heat inactivated serum.

Limitations

1. Availablity of lymphocytes: low patient white blood cell count, low lymphocyte count, viability
2. Pre test cell viability is critical
3. Number of lymphocytes added to the tray is critical
4. Platelet and or granulocyte contamination
5. Quality of complement may effect strength of reactions
6. Reactivity is known to exist within the HLA system and may conflict results
7. Heat pre-treatment may not remove all IgM activity

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General Culture Collection Guide

BLOOD CULTURES
All blood cultures must be drawn using aseptic technique. For blood cultures collect five ml of blood and place in each aerobic and anaerobic bottles. If an AFB blood culture or fungal blood culture is ordered, 5ml blood in Bactec Myco/F Lytic bottle.

BONE MARROW
Please consult the laboratory before obtaining specimen.

CULTURE FROM SWAB
If fungus is ordered as well as routine culture, please submit a swab for each test ordered. Swabs must be transported in Amies transport medium. Swabs are not acceptable for AFB testing.

URINE CULTURES
Submit urine specimen in sterile plastic urine container only. If AFB or fungus cultures are ordered, please submit entire first morning clean voided specimen. If urine is to be cultured for unusual pathogens (i.e., GC, etc.) please mark requisition.

STOOL CULTURES
Stools are cultured for *Salmonella, Shigella, Campylobacter, Yersinia* and *Escherichia coli 0157:H7* unless otherwise requested. Submit either stool specimen or rectal swab. If isolation of GC is requested, please mark requisition.

CEREBROSPINAL FLUID CULTURES
Submit specimen in sterile spinal fluid container found on collection tray.

SPUTUM
Submit culture in plastic container or in Falcon sputum collection kit. Cultures for AFB or fungi must be submitted only in the Falcon sputum collection kit and should consist of the entire first morning cough specimen; the minimum volume required is 5 mL. No 24 hour specimens will be accepted.

SKIN SCRAPING
Collect in sterile specimen cup and submit to laboratory.

VAGINAL/CERVICAL
Cultures may be submitted to the laboratory for the following:

Genital Culture, includes GC
Limited Genital culture – pathogens except GC
Vaginitis – AFFIRM dna collection kit.

Please indicate which of the above is desired.

SUSCEPTIBILITY TESTS

Cultures routinely include susceptibility tests on all pathogens isolated in significant numbers. Susceptibility tests are not done on normal flora. Susceptibility tests are not performed on bacteria with known sensitive patterns.

SERUM INHIBITORY CONCENTRATIONS (SIC) AND MINIMAL INHIBITORY CONCENTRATION (MIC)

Please contact laboratory.

UNUSUAL PATHOGENS

Please contact laboratory first with special requests for the isolation of unusual pathogens, including but not limited to *Corynebacterium diphtheriae, Bordetella pertussis and Vibrio*.

OVA AND PARASITE (STOOL)

Fresh stool specimen - delivered to laboratory as soon as possible.

OVA AND PARASITE PINWORM

Scotch tape preparation or Swube paddle.

MALARIA SLIDES

1 EDTA tube

GC AND CHLAMYDIA DNA PROBES

Use transport media designed for this purpose. Contact the laboratory for collection kits.

Microbiology
Specimen Collection & Transport

Detailed Instructions

A. General guidelines for proper specimen collection
   1. Collect specimen before administering antimicrobial agents when possible.
   2. Collect specimen from actual site of infection avoiding contamination from adjacent tissues or secretions containing indigenous microbiota to ensure that the sample will be representative of the infected site.
   3. Utilize appropriate collection devices. Use sterile equipment and aseptic technique to collect specimens to prevent introduction of microorganisms during invasive procedures.
   4. Properly complete the test request form and clearly label the specimen container with the patient's name and identification number as well as the date and time of collection.
   5. Collect an adequate amount of specimen. Inadequate amounts of specimen may yield false-negative results.
   6. Identify the specimen source and/or specific site (example: wound, left leg) correctly so that proper culture media will be selected during processing in the laboratory.
   7. If specimen is to be collected through intact skin, cleanse the skin first. For example, use Chlorhexidine gluconate (3.15%) and isopropyl alcohol (70%) swab prior to venipuncture.
   8. Collect the specimen at optimal times (for example, early morning sputum for AFB culture).
   9. Use appropriate collection devices: sterile, leak-proof specimen containers with lids that do not create an aerosol when opened.
   10. Use appropriate transport media (example: anaerobe transport vials, Culturette for bacterial culture, Cary-Blair for stool culture, M4RT for viral and Chlamydia cultures). Check expiration date before inoculating collection device.
   11. Minimize transport time. Maintain an appropriate environment between collection of specimens and delivery to the laboratory.

B. General guidelines for proper specimen transport
   1. Transport all specimens to the laboratory promptly
      a. To ensure the survival and isolation of fastidious organisms and to prevent overgrowth by more hardy bacteria
      b. To ensure the recovery of Clostridium difficile and Fecal Leukocytes
      c. To shorten the duration of specimen contact with some local anesthetics used in collection procedures that may have antibacterial activity
      d. To provide a more accurate diagnosis of the infectious-disease process.

   2. Alternatives to prompt delivery
      a. Refrigerate most specimens at 2º to 8ºC. The following are exceptions:
         1) Blood culture can be incubated at room temperature
         2) Specimens that may harbor temperature sensitive organisms such as Neisseria spp. should be left at room temperature.
         3) For anaerobic specimens, use anaerobic transport system. Transport to the lab immediately

4) Hold CSF specimens at room temperature unless they are to be cultured for viruses, then incubate at 35 to 37°C

b. For bacterial stool culture, mix stool with a transport preservative (Carey Blair).
c. For parasitology examination, mix stool with ECOFIX preservatives.

C. Collection Instructions for Different Anatomic Sites – the specimen collection guidelines in this section are only a brief summary of the procedures used for specimen collection and are not intended to be used as a step-by-step guide for obtaining specimens.
1. Blood cultures
a. Number and timing – Most cases of bacteremia are detected by using three sets of separately collected blood cultures. More than three sets of blood cultures in 24 hours yield little additional information. Conversely, a single blood culture may miss intermittently occurring bacteremia and make it difficult to interpret the clinical significance of certain isolated organisms.
b. Volume of blood
1) Using BD Bactec Peds Plus/F Culture Vials
a) The specimen must be collected using sterile techniques to reduce the chance of contamination.
b) The range of blood volume which can be cultured is 0.5 to 5.0 mL. Optimum results are obtained with 1.0 to 3.0 mL.

2) Using BD Bactec Plus Aerobic/F Culture Vials
a) The specimen must be collected using sterile techniques to reduce the chance of contamination.
b) The recommended specimen volume is 8 to 10 mL.
c) Sample volumes as low as 3 mL can be used, however recovery will not be as great as with larger volumes.

3) Using BD Bactec Lytic/10 Anaerobic/F Culture Vials
a) The specimen must be collected using sterile techniques to reduce the chance of contamination.
b) The recommended specimen volume is 8 to 10 mL.
c) Sample volumes as low as 3 mL can be used, however recovery will not be as great as with larger volumes.

c. Culture medium and culture technique
1) Media to be used for the isolation of aerobic and facultative anaerobic organisms.
a) Bactec aerobic culture bottle
b) Bactec aerobic Pediatric culture bottle

2) Media to be used for the isolation of strict anaerobic organisms - Bactec anaerobic culture bottle.
3) Media to be used for the isolation of fungal or mycobacteria organism – Bactec Myco/F Lytic culture bottle.

d. Blood collection – Blood can be collected by venipuncture of peripheral veins or arteries, from intravascular catheters, or by heel stick.

1) Disinfect the venipuncture site and the stoppers of culture bottles and collection tubes prior to blood collection.
    a) Remove the cap of the blood culture bottles. Scrub the rubber stopper vigorously with the Chlorhexidine pad. If this is unavailable use the 70% alcohol prep pad.
    b) Note: do not use iodine to disinfect the stoppers of Bactec bottles.
2) Clean the site with chlorhexidine gluconate (3.15%) and isopropyl alcohol (70%) swab.
    a) If Chlorhexidine Gluconate cannot be used, then the use of Povidone-Iodine swab sticks has been approved as a substitute.
3) Swab concentrically, starting at the center. If the patient is hypersensitive to chlorhexidine, prepare the skin by using a double application of 70% alcohol.
4) Allow 1-2 minutes for the disinfectant to dry. Note: Do not palpate the vein after disinfecting skin prior to inserting needle.
5) Draw blood through transfer set into a sterile collection bottle. A new transfer set should be used for each venipuncture.
6) After venipuncture and inoculation of blood culture bottles, wipe residual disinfectant from the skin with alcohol to prevent skin irritation. Dispose of collection system in accordance with universal precautions.

2. Central Nervous System (CNS) Specimens
    1) Physicians should wear gowns, masks, and gloves to collect the specimen. Because an open tube is held to collect the fluid, other personnel should stand away or wear masks in order to avoid respiratory contamination.
    2) Clean the puncture site with chlorhexidine gluconate (3.15%) and isopropyl alcohol (70%) swab using an increasingly outward circular movement before needle insertion to prevent introduction of infection.
    3) Insert a needle with stylet at the L3, L4, L4-L5 or L5-Sl interspace. When the subarachnoid space is reached, remove the stylet and spinal fluid will appear in the needle hub.
    4) Slowly drain the CSF into the sterile leakproof tubes. Three tubes are generally required for microbiology, hematology and chemistry testing. The second tube drawn will generally go to microbiology, and the last tube drawn will generally go to hematology. In traumatic taps, the CSF will often clear as the later tubes are collected. Note: Always send the most turbid tube to microbiology. If only one tube of CSF is collected, it should be submitted to microbiology first.
    5) Collect an adequate volume of fluid as recommended below.
        a) bacterial culture > 1 ml
        b) fungal culture 2-5 ml
        c) molecular > 1 ml
        d) mycobacterial culture 5-10 ml
        e) viral culture > 1 ml

    6) Transport immediately at ambient temperature.

b. Other CNS specimens
    1) Brain abscess- 90% of brain abscesses will grow anaerobic bacteria. If an anaerobic transport system is unavailable or unsuitable for the specimen obtained, transport the specimen without delay to the microbiology laboratory

for immediate processing. A physician aspirates material from a lesion and sends it to the microbiology laboratory in an anaerobic transport system.

2) CNS biopsy samples – Obtain a biopsy sample from the lesion at surgery and send it to the microbiology laboratory in an anaerobic transport system. Do not add formalin.

3. Gastrointestinal tract – the gastrointestinal tract includes the esophagus, stomach, duodenum, small intestine and colon.
    a. Fecal specimens – submitted primarily for the detection of Campylobacter, Shigella and Salmonella species and Clostridium difficile toxin and in certain cases to detect Yersinia, Vibrio, Aeromonas, Plesiomonas species and enterotoxigenic E. coli.
        1) General
            a) Keep stool specimens cool; do not incubate them.
            b) Place the specimen in an appropriate stool preservative or transport media, immediately after collection. For ova and parasite, use 10% formalin and modified PVA; for routine stool culture, use Cary-Blair transport media.
            c) Do not use toilet paper to collect stool. Toilet paper may be impregnated with barium salts, which are inhibitory for some fecal pathogens.
            d) Do not submit feces contaminated with urine or toilet water.
            e) Stool samples collected on patients hospitalized longer than 3 days prior to collection are not acceptable for routine enteric culture.
            f) Only loose or diarrheal stools are recommended for routine bacterial and C. difficile cultures. A limit of one sample is tested for C. difficile per week.
            g) If a stool specimen is not available, the following are suitable alternatives for culture:
                (1) A swab of rectal mucus, or
                (2) A rectal swab inserted one inch into the anal canal (not acceptable for Rotavirus/ Adenovirus EIA).

            h) For CMV colitis, culture of biopsy tissue is preferred. Stool is frequently toxic to cultured cells and virus is infrequently recovered from this source.

        2) Have patient obtain stool specimen by one of the following methods.
            a) Pass stool directly into a sterile, wide-mouth, leak proof container with a tight-fitting lid.
            b) Pass stool into a clean, dry bedpan and transfer stool into a sterile leak proof container with a tight-fitting lid.

    b. Rectal swabs
        1) Submitted primarily for the detection of Neisseria gonorrhoeae, Shigella species, herpes simplex virus (HSV) and anal carriage of Streptococcus pyogenes and Streptococcus agalactiae.
        2) Pass the tip of a sterile swab approximately 1 in. beyond the anal sphincter. Carefully rotate the swab to sample the anal crypts and withdraw the swab.

Send the swab in a swab transport or N. gonorrhoeae transport system (jembec).

c. Gastric aspirates – The patient should fast prior to each of the following procedures.
    1) Gastric lavage
        a) Submitted primarily for the detection of Mycobacterium tuberculosis in-patients (most frequently children) unable to produce quality sputum. Should be performed after the patient wakes in the morning so that sputum swallowed during sleep is still in the stomach.
        b) Pass a well-lubricated tube orally or nasally through to the stomach of the patient and perform the lavage. Before removing the tube, release the suction and clamp to prevent mucosal trauma and/or aspiration.

    2) Duodenal aspiration - Submitted primarily for the detection of Giardia species and the larvae of Strongyloides stercoralis and Ascaris lumbricoides.
        a) Pass a tube orally through to the duodenum of the patient.
        b) To aspirate a sample for giardiasis, the tube should be at least in the third portion of the duodenum.

d. Gastric biopsies and washings – The patient should fast prior to each of the following procedures.
    1) Esophageal, stomach or duodenum specimens - Esophageal specimens are primarily used to detect Candida species, cytomegalovirus (CMV) and HSV. Stomach and duodenal specimens are primarily used for the detection of Helicobacter pylori. Duodenal specimens can also be used for the detection of Giardia species and the larvae of S. stercoralis and A.lumbricoides.
        a) Pass an endoscope orally.
        b) Obtain specimens through a channel in the endoscope by using one of the following procedures.
            (1) Using biopsy forceps, obtain samples from the esophagus, stomach or duodenum.
            (2) Using a sheathed brush, brush suspicious areas several times to obtain adequate cellular material.
            (3) Perform a wash by injecting approximately 25 to 30 ml of sterile non bacteriostatic isotonic 0.85% NaCl through the biopsy channel onto the lesion. Collect the specimen by aspirating the fluid through the scope into a sterile trap, which is connected to the suction tubing. Note: If a gastric ulcer is seen, obtain biopsy samples from the base, the surrounding gastric mucosa and each of the four quadrants of the margin.

    2) Rectal biopsy - Submitted primarily for the detection of Entamoeba histolytica, Balantidium coli and HSV. If lesions are not evident, biopsy the posterior rectal mucosa below the peritoneal ref junction (within 7 to 10 cm of the anal verge).
    3) Small bowel biopsy - Submitted primarily for the detection of Giardia, Cryptosporidium and Microsporidium species. Biopsies of the small intestine provide the highest diagnostic yield for Microsporidia species. Biopsies from

other gastrointestinal sites (stomach, colon, rectum) have a much lower yield in comparison. Obtain biopsy sample of lesion at surgery.

e. Sigmoidoscopy - Useful in the detection of E. histolytica and Mycobacterium species and the diagnosis of pseudomembranous colitis associated with C. difficile and possibly Staphylococcus aureus.
    1) Perform flexible or rigid sigmoidoscopy.
    2) Obtain endoscopic pinch biopsy samples of any lesions seen. Additionally, aspirate liquid from the inflamed bowel with a pipette passed through the sigmoidoscope. Transport specimens in a sterile screw-cap container. If biopsy samples are small, add a small amount of sterile non bacteriostatic 0.85% NaCl to prevent the specimen from drying.

4. Genital Tract Specimens
    a. Female - Genital tract specimens are submitted primarily for the detection of sexually transmitted pathogens (such as N. gonorrhoeae, Chlamydia trachomatis, lymphogranuloma venereum, HSV, human papillomavirus, trichomonads, Haemophilus ducreyi, group B streptococci and Candida infections. If infection is not caused by any of these pathogens, anaerobic bacteria may be involved. If an anaerobic infection is suspected, transport the specimen in an anaerobic transport system.
        1) Amniotic fluid - Usually collected by ultrasound method by physician during amniocentesis. For other situations, aspirate fluid by catheter or at cesarean section. Send to lab in capped syringe or anaerobe transport medium.
        2) Bartholin gland - Do not use alcohol for mucous membranes. Decontaminate the skin with povidone-iodine. Aspirate material from Bartholin gland abscess. Send to lab in anaerobic transport medium.
        3) Cervix (endocervix for culture)-
            a) Place the patient in the lithotomy position.
            b) Prepare the speculum, avoiding the use of a lubricant other than warm water.
            c) Insert the speculum and visualize the cervical os.
            d) Remove excess mucus with a cotton ball.
            e) Insert a Dacron swab into the cervical os, rotate gently, and allow to remain for 10 to 30 seconds.
            f) If no exudate is seen, insert a sterile swab into the endocervical canal, and rotate the swab.
            g) Remove swab and place in bacterial transport medium.
            h) Transport at ambient temperature.

        4) Endometrium –
            a) Place the patient in the lithotomy position.
            b) Insert speculum and visualize the cervical os.
            c) Place a narrow-lumen catheter within the cervical os.
            d) Insert the tip of a culture swab through the catheter and collect the endometrial specimen. This method prevents touching the cervical mucosa and reduces the chance for contamination.
            e) Place the culture swab into bacterial transport media and transport at ambient temperature.

5) Fallopian tubes - Obtain aspirates (preferably) or swab specimens during surgery. Bronchoscopy cytology brushes may be used if exudate is not expressed.
6) Rectal swabs: used primarily to detect N. gonorrhoeae, Shigella species, HSV and anal carriage of S. pyogenes and S agalactiae.
    a) Pass the tip of a sterile swab approximately 1 in. beyond the anal sphincter. Carefully rotate the swab to sample the anal crypts and withdraw it. Send the swab in a swab transport, viral transport (for HSV) or on Jembec plate for N. gonorrhoeae.

7) Urethra
    a) Collect specimen 1 h or more after patient has urinated.
    b) Stimulate discharge by gently massaging the urethra against the pubic symphysis through the vagina.
    c) Collect the discharge with a sterile swab.
    d) If discharge cannot be obtained, wash external urethra with betadine soap and rinse with water. Insert an urethrogenital swab 2 to 4 cm into the endourethra, gently rotate the swab and leave it in place for 1 to 2 seconds. Withdraw the swab and submit it in the appropriate transport system for culture.

8) Vagina - Specimens are also useful in the detection of group A streptococci in children.
    a) Use a speculum without lubricant. Collect secretions from the mucosa high in the vaginal canal with sterile pipette or swab.
    b) Vaginal cultures do not often produce meaningful results. Group B Streptococcus will be ruled out on all vaginal cultures. If gonorrhea is suspected, testing by nucleic acid detection is recommended. If yeast infection is suspected, a yeast culture should be ordered rather than a routine culture. Herpes Simplex Virus only will be ruled out on all vaginal viral cultures.

9) Vulva
    a) Clean the surface of the lesion with 0.85% NaCl. If there is a crust on the lesion, remove it.
    b) Scrape the lesion until serous fluid emerges.
    c) Wipe away fluid and debris with sterile gauze. (Try to avoid bleeding.)
    d) Press the base of lesion until clear fluid is expressed.
    e) Aspirate vesicular fluid with a 26- to 27-gauge needle. OR
    f) Touch a slide to the fluid and cover the fluid on the slide with a cover slip (for Treponema pallidum detection). OR
    g) Unroof the vesicle and collect fluid with a sterile swab (for HSV). OR
    h) Scrape the base of an open vesicle with a sterile scalpel blade and then rub the base vigorously with a sterile swab (for HSV and H. ducreyi detection).

b. Male
    1) Anal swab

a) Submitted primarily for the detection of N. gonorrhoeae, Shigella species, HSV and anal carriage of S. pyogenes.
b) Pass the tip of a sterile swab approximately 1 in beyond the anal sphincter. Carefully rotate the swab to sample the anal crypts and withdraw it. Send the swab in a swab transport, viral transport or on Jembec plate.

2) Epididymis - Used primarily to diagnose nonspecific bacterial epididymitis and sexually transmitted epididymitis. Bacterial epididymitis is most commonly due to members of the family Enterobacteriaceae or pseudomonads and generally occurs in men over 35 years of age. M. Tuberculosis infections generally occur after involvement of the prostate or seminal vesicles. Sexually transmitted epididymitis is most commonly due to C. trachomatis and N. gonorrhoeae.
    a) Use a needle and syringe to aspirate material from the epididymis.

3) Penile lesion - Used primarily to detect sexually transmitted pathogens such as N. gonorrhoeae, C. trachomatis, lymphogranuloma venereum, HSV, T. pallidum and H. ducreyi.
    a) Clean the surface of the lesion with 0.85% NaCl. If there is a crust on the lesion, remove it.
    b) Scrape the lesion until serous fluid emerges.
    c) Wipe away fluid and debris with sterile gauze. (Try to avoid bleeding.)
    d) Press the base of lesion until clear fluid is expressed.
    e) Aspirate vesicular fluid with a 26- to 27-gauge needle. Transport syringe to laboratory without needle.
    f) Touch a slide to the fluid and cover the fluid on the slide with a cover slip (for T. pallidum detection). OR
    g) Unroof the vesicle and collect fluid with a sterile swab (for HSV detection). OR
    h) Scrape the base of an open vesicle with a sterile scalpel blade and rub the base vigorously with a sterile swab (for HSV and H. ducreyi detection)

4) Prostatic massage - Used primarily to diagnose acute or chronic prostatitis. For both diseases, Gram-negative enteric organisms are the most frequently isolate pathogens. N. gonorrhoeae is found infrequently but is sometimes implicated in acute prostatitis.
    a) Perform a digital massage through the rectum.
    b) Collect the specimen in a sterile tube or on a sterile swab.

5) Urethra - Used primarily to detect N. gonorrhoeae and C. trachomatis.
    a) Instruct patient not to urinate at least 2 hours prior to sampling.
    b) Insert a thin urethrogenital swab 2 to 4 cm into the endourethra, gently rotate for 3 to 5 seconds, leave it in place for 1 to 2 seconds and withdraw it.
    c) Urethral exudate may be placed directly on a slide for the detection of N. gonorrhoeae.

d) Transfer the specimen swab to a collection tube containing the appropriate transport medium. Swab must remain in the transport tube.
    (1) Close the transport tube securely, label and date.
    (2) Transport the specimen to the lab as soon as possible.
    (3) If the combined storage and transport time is within one hour, store and transport at room temperature (18-25° C).
    (4) If transport to the laboratory is delayed for more than one hour from the time of collection, store and transport swab specimens refrigerated (2-8°C). Swab specimens that cannot be tested within 24 hours from the time of collection can be stored refrigerated (2-8°C) for up to 7 days or frozen (-20°C or colder) for up to 30 days. Routine freezing or prolonged storage of specimens may affect performance.

6) Chlamydia/Gonorrhea Urine Male
    a) Instruct patient not to urinate at least 2 hours prior to sampling.
    b) Provide a plastic, preservative-free, sterile urine collection cup with a secure lid.
    c) Instruct the patient to catch the FIRST 10-50 mL of the urine stream. (You may want to mark the outside of the cup to show the desired volume.) Caution the patient not to begin urinating until the collection cup is in position.
    d) Close the lid securely. Label and date the cup.
    e) Transport the specimen to the lab as soon as possible.
        (1) If testing can be guaranteed within 24 hours of obtaining the specimen, store and transport at room temperature (18-25°C). If testing cannot be guaranteed within 24 hours of obtaining the specimen, refrigerate (2-8°C) immediately.
        (2) If specimens are to be shipped at room temperature, refrigerate until shipment to ensure that total exposure to room temperatures does not exceed 24 hours. Urine specimens that cannot be tested within 24 hours can be stored refrigerated (2-8°C) for up to 7 days or frozen (-20° C or colder) for up to 30 days. Routine freezing or prolonged storage of specimens may affect performance.

5. Ocular specimen
    a. General considerations
        1) Obtain viral and chlamydial samples before topical anesthetics are instilled.
        2) Obtain samples for chlamydia cultures with calcium alginate swabs and for viral cultures with Dacron swabs or cotton swabs with non-wood shafts.
        3) Send prepared smears and inoculated media to the laboratory immediately.

    b. Conjunctival scrapings
        1) One or two drops of topical anesthetic are generally instilled.
        2) Scrape the lower tarsal conjunctiva with a sterilized kimura spatula.
        3) Inoculate the appropriate media directly.

4) Prepare smears by applying the scraping in a circular manner to a clean glass slide or by compressing material between two glass slides and pulling the slides apart.
5) Alternatively, use a calcium alginate swab or a cotton-tipped applicator to swab the inferior tarsal conjunctiva (inside surface of eyelid) and the fornix of the eye. However, organisms are more readily detected in scrapings than from a swab.

c. Purulent conjunctivitis
    1) Collect purulent material with a regular cotton swab.
    2) Place the swab into transport media and transport at ambient temperature.

d. Corneal scrapings
    1) Obtain conjunctival samples prior to corneal scrapings. Sometimes conjunctival cultures are helpful in assessing the possibility of contamination of corneal cultures.
    2) One or two drops of topical anesthetic are generally instilled.
    3) Using short, firm strokes in one direction scrape multiple areas of ulceration and suppuration with a sterilized kimura spatula. (Keep the eyelid open and be careful not to touch the eyelashes.)
    4) Inoculate each scraping directly to appropriate media. (Multiple scrapings are recommended because the depth and extent of viable organisms may vary.)
    5) Prepare smears by applying the scrapings in a gentle circular motion over a clean glass slide or by compressing material between two clean glass slides and pulling the slides apart.
    6) Transport at ambient temperature or 2-8°C for viral cultures.
    7) Gram stain not routinely performed.

e. Intraocular Fluid
    1) Use a needle aspiration technique to collect intraocular fluid.
    2) Inoculate appropriate media directly and/or immediately transport the samples to the laboratory in an anaerobic transport system or a capped syringe with air bubbles expelled.
    3) Prepare smears by spreading a drop of material over the surface of a cleaned glass slide with a sterile kimura spatula or by compressing the material between two glass slides and pulling the slides apart.

6. Respiratory Specimens
    a. General considerations
        1) Twenty-four-hour sputum collections are not recommended for culture.
        2) If Corynebacterium diphtheriae, Arcanobacterium haemolyticum, Bordetella pertussis, N. gonorrhoeae, legionellae, chlamydiae or mycoplasmas are suspected, the physician should contact the clinical microbiology laboratory prior to specimen collection because special techniques and/or media are required for the isolation of these agents.

    b. Lower respiratory tract
        1) Expectorated sputum

a) If possible, have the patient rinse mouth and gargle with water prior to sputum collection.
b) Instruct the patient not to expectorate saliva or postnasal discharge into the container.
c) Collect specimen resulting from deep cough in sterile screw-cap cup or other suitable sterile collection assembly.
d) Expectorated sputum is acceptable for bacterial, mycobacterial, and fungal cultures.

2) Induced sputum
   a) Induced sputum is collected by Pulmonology and nursing staff.
   b) Using a wet toothbrush, brush the buccal mucosa, tongue and gums prior to the procedure.
   c) Rinse the patient's mouth thoroughly with water.
   d) Using an ultrasonic nebulizer, have the patient inhale approximately 20 to 30 mL of 3 to 10% 0.85% NaCl.
   e) Collect the induced sputum in a sterile screw-cap cup or other suitable sterile collection assembly.
   f) Induced sputum is acceptable for Legionella, PCP (on ice), fungal, and AFB testing.

3) Tracheostomy and endotracheal aspirations
   a) Tracheostomy is followed by colonization within 24 hours of insertion of the tube. Results must be correlated with clinical findings such as fever or infiltrate on chest X-ray.
   b) Aspirate the specimen into a sterile sputum trap.

4) Bronchoscopy specimens - Bronchoscopy specimens include bronchoalveolar lavage, bronchial washing, bronchial brushing and transbronchial biopsy specimens.
   a) Pass the bronchoscope transnasally or transorally in nonintubated patients or via the endotracheal tube in intubated patients.
   b) Wedge the tip of the bronchoscope in a segmental (for bronchial wash) or subsegmental (for bronchoalveolar lavage) bronchus.
   c) To obtain specimens - Bronchial wash or bronchoalveolar lavage - Bronchial wash and bronchoalveolar lavage specimens are generally obtained before brushing or biopsy specimens to avoid excess blood in the recovered fluid, because blood may alter the concentration of cellular and noncellular components.
      (1) Inject sterile nonbacteriostatic 0.85% NaCl (generally 5- to 20-mL aliquots) from a syringe through a biopsy channel of the bronchoscope.
      (2) Gently suction the 0.85% NaCl into a sterile container before administering the next aliquot. (In general, 50 to 75% of the 0.85% NaCl instilled is recovered in the lavage effluent.) Keep aliquots separate during collection. Combine aliquots from the same site for microbiology cultures and smears, but aliquots from separate sites should be combined only after consultation with the physician of record.

d) Bronchial brush specimens - Insert a telescoping double catheter plugged with polyethylene glycol at the distal end (to prevent Contamination of the bronchial brush) through the biopsy channel of the bronchoscope.
e) Transbronchial biopsies - Obtain the biopsy sample through the biopsy channel of the bronchoscope and transport it in a sterile container with a small amount of nonbacteriostatic sterile 0.85% NaCl.

5) Lung aspirations - Use a computed topography scan to obtain lung aspirates by inserting a needle through the chest wall into a pulmonary infiltrate. Aspirate material from the lesion. If the lesion is large or if there are multiple lesions, collect multiple specimens from representative site.
6) Lung biopsies - Obtain a 1 to 3 cm square piece of tissue if possible. If the lesion is large or if there are multiple lesions, collect multiple specimens from representative site. Submit in a sterile containers) without formalin.

c. Upper respiratory tract specimens
1) Throat (pharyngeal specimens) – Submitted primarily for the detection of group A streptococci (can also be used to detect N. gonorrhoeae, Haemophilus influenzae (for epiglottitis and A. haemolyticum).
a) Do not obtain throat samples if epiglottis is inflamed, as sampling may cause serious respiratory obstruction.
b) Use a cotton, Dacron, or calcium alginate swab.
c) Use a tongue depressor and a good light source to ensure good visualization.
d) Depress tongue gently with tongue depressor and extend sterile swab behind the uvula and sweep the swab back and forth across both tonsillar fauces, the posterior pharynx, and any ulceration, exudates, lesion or area of inflammation. (Avoid touching the cheeks, tongue, uvula or lips.)

2) Nasal swabs (Nares for surveillance) - Submitted primarily for the detection of staphylococcal carriers.
a) Insert a sterile swab into the nose until resistance is met at the level of the turbinates (approximately I inch into the nose).
b) Rotate the swab against the nasal mucosa.
c) Repeat the process on the other side.
d) Carefully plunge the swab into the media tube.
e) Label the tube with the patient's name, specimen (nares culture) and date.
f) Send to microbiology lab with a requisition slip.
g) Nares swabs are only acceptable for MRSA surveillance, not routine culture.

3) Nasopharyngeal suction - Submitted for the detection of carriers of S. pyogenes, N. meningitidis, C. diphtheriae and B. pertussis.
a) Suction material from the nasopharynx and collect it in a sterile container.

4) Nasopharyngeal swab - Submitted primarily for the detection of carrier of N. meningitides and to diagnose B. pertussis.
    a) Carefully insert a flexible-wire calcium calginate tipped swab through the nose into the posterior nasopharynx and rotate the swab. (Keep the swab near the septum and floor of the nose.)

5) Nasal aspirates/washings - Submitted primarily for viral cultures.
    a) For aspirate, attach mucus trap to suction pump and catheter, leaving wrapper on suction catheter. Turn on suction and adjust to suggested pressure.
    b) Without applying suction, insert catheter into the nose, directed posterior and toward the opening of the external ear.
    Note: Depth of insertion necessary to reach posterior pharynx is equivalent to distance between anterior nares and external opening of the ear.
    c) Apply suction. Using a rotating movement, slowly withdraw the catheter.
    d) Rinse tubing with M4RT for viral culture.
    e) For washings, suction 3-5 ml of sterile saline into a new sterile bulb.
    f) Insert bulb into one nostril until nostril is occluded.
    g) Instill saline into one nostril with one squeeze of the bulb and immediately release bulb to collect recoverable nasal specimen.
    h) Empty bulb into suitable dry, sterile specimen container or add 3 ml or less to viral transport media (M4RT).
    i) Transport immediately at ambient temperature.

6) Sinus aspirates
    a) Using a syringe aspiration technique, a specially trained physician or an otolaryngologist will obtain material from maxillary, frontal or other sinuses.
    b) Place the contents of the syringe into an anaerobic transport system or send the specimen in the syringe without the needle.

7) Bordetella pertussis Culture and PCR
    a) Obtain collection system from Microbiology lab.
    b) Provided in the collection system are: 1 charcoal culture swab for culture; and 1 culture swab for PCR. Store collection system at room temperature.
    c) Use two swabs on a flexible wire handle to collect the specimen. One swab is used to inoculate the charcoal transport medium. The other swab is for PCR testing (Calcium alginate swabs cannot be used for PCR testing.)
    d) Seat the patient comfortably. Tilt the head back.
    e) If available, insert a nasal speculum. Press the swab through the nares until resistance is met due to contact with the nasopharynx.
    f) Rotate the swab gently and allow the swab to maintain contact with the nasopharynx for 20-30 seconds or until coughing is induced.

g) Place the swab into the transport medium. Label the tube with the patient's name and identification number. Leave the swab embedded in the tube during transport.
h) For PCR:
(1) Preferred specimen is a dry swab. Do not use calcium alginate.
(2) Transport immediately.

8) Tympanocentesis fluid - Submitted primarily to diagnose middle ear infections only if previous therapy has failed.
a) Clean the external canal with mild detergent.
b) Using a syringe aspiration technique, the physician will obtain the fluid from the eardrum. Send the specimen in a sterile container or send it in the syringe without the needle.
c) If the eardrum is ruptured, collect exudate by inserting a sterile swab through an auditory speculum.

9) Oral specimens - Used to prepare smears for the detection of yeast or fusospirochetal disease.
a) Rinse mouth with sterile saline.
b) Wipe the lesion with dry sterile gauze.
c) Swab or scrape areas of exudation or ulceration.

7. Sterile Body Fluids
a. Clean the needle puncture site with alcohol and disinfect it with an iodine solution (1 to 2% tincture of iodine or a 10% solution of povidone-iodine) to prevent introduction of infection. (If tincture of iodine is used, remove with 70% ethanol after the procedure to avoid burn.)
b. The physician will aseptically perform percutaneous aspiration to obtain pleural, pericardial, peritoneal or synovial fluids.
c. Expel any air bubbles from the syringe and immediately inject the specimen into an anaerobic transport system or send the specimen in the syringe with needle removed. Transport additional fluid or pus in a sterile screw-cap container.

8. Subcutaneous Tissue and Skin Specimens
a. Burn specimens - The surfaces of burn wounds will become colonized by the patient's microbiota or by environmental organisms. When the organism load is large, infection of underlying tissue may occur and bacteremia may ensue. Cultures of the surface alone are misleading; therefore, biopsies of deeper tissue are often indicated. Additionally, organisms may not be distributed evenly in the burn wound, so sampling of different areas of the burn is recommended.
1) Disinfect the surface of the burn with 70% alcohol and then with an iodine solution. Allow the disinfectant to dry prior to collecting the specimen. Note: Blood cultures should be used to monitor patient status. If tincture of iodine is used, it must be removed with 70% alcohol after the procedure to prevent burns.
2) Collect a punch biopsy sample (3 to 4 mm) for quantitative culture.

b. Superficial wound, bacterial

1) Syringe aspiration is preferable to swab collection.
2) Disinfect the surface of the wound with 70% alcohol and then with an iodine solution. Allow the disinfectant to dry prior to collecting the specimen.
3) Using a 3 to 5mL syringe with a 22 to 23 gauge needle the physician will aspirate the deepest portion of the lesion. If a vesicle is present, collect both fluid and cells from the base of the lesion.
4) If the initial aspiration fails to obtain material, inject sterile, nonbacteriostatic 0.85% NaCl subcutaneously.
5) Repeat the aspiration attempt.
6) If no material is obtained, rinse needle and syringe with broth by drawing the culture medium through the needle into the syringe.

c. Cutaneous (Fungal only)

Hair

1. Scrape the scalp with a blunt scalpel.
2. Place specimen in a dry sterile container.
3. Transport at ambient temperature.
4. The following specimens are also acceptable:
    1. Hair stubs
    2. Contents of plugged follicles
    3. Skin scales
    4. Hair plucked from the scalp with forceps
    Cut hair is NOT an acceptable specimen.

Nails

1. Cleanse the nail with 70-95% ALC.
2. Remove the outermost layer by scraping with a scalpel.
3. Place specimen in a dry, sterile container.
4. Transport at ambient temperature.
5. The following specimens are also acceptable:
    1. Clippings from any discolored or brittle parts of nail
    2. Deeper scrapings and debris under the edges of the nail

Skin

1. Cleanse the skin with 70-95% ALC.
2. Collect epidermal scales with a scalpel, at the active border of the lesion.
3. Place specimen in a dry sterile container. Do not tape specimen to slide.
4. Transport at ambient temperature.

d. Ulcers and nodules
1) Clean the area with 70% alcohol and then with an iodine solution.
2) Remove overlying debris.
3) Curette the base of the ulcer or nodule.

4) If exudate is present from ulcer or nodule, collect it with a syringe or sterile swab.

e. Deep Wounds, Aspirates and Tissue Specimens

1) General Guidelines

a) Tissue collection is an invasive procedure and requires surgery by a trained physician.
b) Collect tissue aseptically. Include material from both the center and the edge of the lesion.
c) Place the specimen in a sterile container on sterile gauze moistened with sterile non-bacteriostatic saline.
d) Transport in less than an hour at ambient temperature, in a manner to ensure recovery of anaerobic organisms. For virology cultures, do not allow the tissue to dry and transport in viral transport media (M4RT).
e) Do not submit tissue in formalin.
f) Swab is not an acceptable transport device.

2) Bite wounds - Aspirate pus from the wound or obtain it at the time of incision, drainage or debridement of infected wound. (Do not culture fresh bite wound, as infectious agents will likely not be recovered.)

3) Bone

a) Obtain bone specimen at surgery.
b) Submit in sterile container without formalin.
c) Specimen may be kept moist with sterile 0.85% NaCl.

4) Deep wounds or abscesses

a) Disinfect the surface with 70% alcohol and then with an iodine solution. Tincture of iodine must be removed with 70% alcohol to prevent burns.
b) Aspirate the deepest portion of the lesion, avoiding contamination by the wound surface. If collection is done at surgery, a portion of the abscess wall should also be sent for culture.

5) Punch skin biopsies

a) Disinfect the skin surface with 70% alcohol and then with an iodine solution.
b) Collect 3- to 4-mm sample with dermal punch.
c) Submit for microbiological analysis in sterile container without formalin.

6) Soft tissue aspirate

a) Disinfect the surface with 70% alcohol and then with an iodine solution.
b) Aspirate the deepest portion of the lesion or sinus tract. Be careful to avoid contamination by the wound surface.

9. Urine (Bacterial, Fungal, AFB, and Viral Cultures)

a. General considerations

1) Never collect urine from a bedpan or urinal.

2) Thoroughly clean the urethral opening (and vaginal vestibule in females) prior to collection procedures to ensure that the specimen obtained is not contaminated with colonizing microorganisms in this area.
3) Soap rather than disinfectants are recommended for cleaning the urethra area. If disinfectants are introduced into the urine during collection, they may be inhibitory to the growth of microorganisms.
4) Transport specimen to laboratory within 2 hours of collection. If it cannot be transported within 2 hours of collection, the urine specimen should be refrigerated. (Bacterial counts remain stable for at least 24 h at 4^0C.) Urine for CMV culture must be received within 1 hour of collection. Do not freeze.
5) Use sterile cups or tubes to transport urine.
6) Transport suprapubic bladder aspirate specimens for anaerobic culture in an anaerobic transport system.
7) Always transport urine for viral cultures on wet ice in a sterile container.
8) Any urine collection procedure involving catheterization must be done with scrupulous aseptic technique to avoid introducing microorganisms.
9) Send the first morning voided urine. Three consecutive first morning urine specimens are recommended for mycobacterial culture.
10) Do not submit 24-h urine collections for culture.

b. Collection techniques
    1) Clean catch urine specimens (female)
        a) The person obtaining the urine specimen should wash hands with soap and water, rinse and dry.
        b) Cleanse the urethra opening and vaginal vestibule area with soap and water or clean gauze pads soaked with liquid soap.
        c) Rinse the area well with water or wet gauze wipes.
        d) Hold labia apart during voiding.
        e) Allow a few milliliters of urine to pass. (Do not stop the flow of urine.)
        f) Collect the midstream portion of urine in a sterile container.

    2) Clean catch urine specimens (male)
        a) The person obtaining the urine should wash hands with soap and water, rinse and dry.
        b) Cleanse the penis, retract the foreskin (if not circumcised), and wash with soapy water.
        c) Rinse the area well with sterile water.
        d) Keeping foreskin retracted (to minimize contamination with skin flora), allow a few milliliters of urine to pass. (Do not stop the flow of urine.)
        e) Collect the midstream portion of urine in a sterile container.

    3) Ileal conduit urine
        a) Remove the external urinary appliance and discard the urine within the appliance.
        b) Gently swab and clean the stomal opening with a 70% alcohol pad and then with an iodine solution.

c) Using sterile technique, insert a double catheter into the stoma. (A double catheter helps to minimize contamination of the specimen with skin flora.)
d) Catheterize the ileal conduit to a depth beyond the fascial level.
e) Collect the urine drained into a sterile container.

4) Straight catheter urine (in/out catheter urine specimens) - In/out catheter urine specimens are useful when clean catch urine cannot be obtained or when results from clean catch urine specimens are equivocal and a diagnosis is critical.
   a) Prior to catheterization, the patient should force fluids until the bladder is full. (Forcing fluids may reduce organism number.)
   b) Clean the patient's urethra open (and in females, the vaginal vestibule) with soap and carefully rinse the area with water.
   c) Using sterile technique, pass a catheter into the bladder.
   d) Collect the initial 15 to 30 ml of urine and discard it from the mouth of the catheter.
   e) Collect a sample from the mid or later flow of urine in a sterile container.

5) Indwelling catheter urine - Indwelling catheters are placed in-patients who are unable to pass urine.
   a) This is not a routine technique and is best performed by an experienced individual.
   b) Clean the catheter collection port with a 70% alcohol wipe.
   c) Using sterile technique, puncture the collection port with a needle attached to a syringe. Note: Do not collect urine from collection bag.
   d) Aspirate the urine and place it in a sterile container.
   e) Faculty approval required for anaerobic culture. Specimen should be submitted in an anaerobic environment if an anaerobic culture is approved.

6) First void urine for nucleic acid amplification tests (Chlamydia/ Gonorrhea).
   a) Patient must not have urinated during the previous two hours.
   b) Collect the first 10 to 50 ml of the urine stream in a clean, empty plastic cup.
   c) Place the lid on the cup.
   d) Transport urine refrigerated in test-specific transport media.

7) Suprapubic aspirate of the urinary bladder - Suprapubic is useful in determining urinary infection in adults in whom infection is suspected and for whom results from routine procedures have been equivocal and diagnosis is critical. Suprapubic is also useful in pediatric patients when clean catch urine specimens are difficult to obtain.
   a) Before suprapubic, the patient should force fluids until the bladder is full. (Forcing fluids may reduce the organism number.
   b) Shave and disinfect the suprapubic skin overlying the urinary bladder.
   c) The physician will make a small lance wound through the epidermis, just above the symphysis pubis.

d) Aspirate urine from the bladder by using a needle aspiration technique.

8) Bladder washout test (Fairly) - The bladder washout test is useful in determining the site of infection in the urinary tract. Results are equivocal in about 10 to 20% of patients.
    a) Prior to test, have the patient force liquids until the bladder is full. (Forcing fluids may reduce organism number.)
    b) Clean the urethra area with soapy water and rinse the area well with water.
    c) Insert an indwelling catheter into the bladder through the urethra.
    d) Collect an initial urine specimen into a sterile container and refrigerate it.
    e) Empty the bladder through the urethra catheter and then irrigate it. (Use a sterile non-bacteriostatic 0.85% NaCl solution to irrigate the bladder.)
    f) Collect three additional specimens (5 to 10 ml each) at 10-min intervals into separately labeled containers after irrigation of the bladder is performed.
    g) Submit the initial and timed collection samples to the microbiology laboratory.
    h) **Note**: it is imperative that each specimen container be clearly labeled with the time of specimen collection.

9) Cystoscopy: bilateral urethral catheterization - Bilateral ureteral catheterization is useful in determining the site of infection in the urinary tract.
    a) Prior to cystoscopy, have the patient force liquids until the bladder is full. Forcing liquids may reduce the organism number.
    b) Clean the urethra area (and vaginal vestibule in female) with soapy water and rinse the area well with water.
    c) Insert a cystoscope (obturator in place) into the bladder.
    d) With sterile technique, collect approximately 5 to 10 ml of urine from open stopcock into a sterile container.
    e) Label the sample CB, for catheterized bladder urine, and refrigerate it. Then irrigate the bladder. (Use sterile non-bacteriostatic 0.85% NaCl to irrigate the bladder.
    f) After irrigation of the bladder and insertion of the ureteral catheters, collect irrigating fluid passing from the bladder through the ureteral catheters by holding the ends of both catheters over an opened sterile container.
    g) Label this sample WB, for washed bladder urine, and refrigerate it.
    h) Pass the ureteral catheters to each mid-ureter or renal pelvis without introducing additional irrigating fluid. Open both stopcocks of the cystoscope to empty the bladder.
    i) Discard the first 5 to 10 ml of urine from each ureteral catheter.
    j) Collect four consecutive paired cultures (5 to 10 ml each) directly into opened sterile containers.

k) Label these specimens LK-1, RK-1, LK-2, RK-2 (LK for left kidney and RK for right kidney). Submit all samples to the microbiology laboratory for culture.

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B. Murray PR, et al. 2007. Manual of Clinical Microbiology 9th ed. American Society for Microbiology, Washington, D.C.
C. Winn, W, et al. 2006. Koneman's Color Atlas and Textbook of Diagnostic Microbiology, 6th ed. Lippincott Williams and Wilkins, Philadelphia, PA.
D. Becton, Dickinson and Company, 7 Loveton Circle, Sparks, Maryland 21152, Product Insert

COAGULATION Guidelines

Blood for coagulation testing is generally drawn in blue topped tubes containing sodium citrate. All other anticoagulants (i.e., oxalate, heparin or EDTA) are unacceptable. The specimen may be obtained by venipuncture or from an indwelling catheter using an evacuated tube system or a syringe.

- If the blood must be drawn through an indwelling catheter, possible heparin contamination should be considered. The line should be flushed with saline and the first 20ml of blood discarded or used for other laboratory tests.
- If the patient has an IV line, the sample should be drawn on the opposite side. If this is not possible, the sample should be drawn below the IV. If this is not possible, the IV should be paused for 2-3 minutes prior to drawing above the IV.
- The coagulation specimen should be the second or third tube obtained, preceded only by non-additive tubes.
- Blood must be immediately added to the tube and the tube inverted quickly but gently three or four times to mix. **Mixing should not be so vigorous as to cause frothing.**

Any blue topped tube that is clotted, hemolyzed or underfilled is not suitable for coagulation testing and will be rejected. The proper proportion of blood to anticoagulant is 9:1.

- Incomplete filling of the evacuated tube may cause variance from this ratio leading to inaccurate results.
    - Since these tubes fill by vacuum, they will draw in air as well as liquid volume. If there are air bubbles in a syringe, the tube will fill with both air and blood. This can cause the tube to be underfilled and require that the patient be redrawn.
    - If using a butterfly, the tubing should be primed by drawing a red or gold tube prior to the blue tube. This removes the air from the line to prevent underfilling from occurring.

- Samples that have visible hemolysis are likewise unacceptable because of possible clotting factor activation and end point interference.
- Samples that are not immediately and properly mixed can result in clotting to occur. This is unacceptable as it causes clotting factor activation and end point interference.

Coagulation testing is often used in the monitoring of anticoagulant therapy. Results are used in order to calculate appropriate dosage and maintain proper anticoagulation in the patient.

- Specimens are to be sent to the lab **as soon as possible** for testing and processing.
- Specimens for patients receiving heparin therapy may be held no longer than **1 hour**.
- Specimens should remain at **room temperature** and should not be stored on ice.
- Specimens should remain capped until processed by the Coag department.

University of Toledo Medical Center Clinical Flow Cytometry Laboratory

The Flow Cytometry Laboratory of The University Medical Center provides state of the art single cell analysis for a limited catalog of tests. (see below) All other flow cytometric assays are send out tests. Most flow cytometric analyses require fresh, viable specimens; hence proper procurement, handling, and transport are essential for obtaining optimal results. For questions regarding sample collection, please contact the laboratory at 419.383.4292.

Tests Performed by UTMC Flow Cytometry Laboratory

T-cell Subset Analysis (*CPT 86359 & 86360*) **-** Assay for the enumeration of Total T-lymphocytes (CD3+), T-Helper cells (CD3+4+) and Cytotoxic T-cells (CD3+CD8+). For absolute counts a CBC and differential must be performed concurrently.

Specimen Requirement: Minimum of 3 ml ACD solution A or B. **Please be sure to fill tube**.
Storage: Room Temperature. **Do not refrigerate**.
Turn Around Time: 24 hours during normal business hours.

Contact Information

University of Toledo Medical Center
Flow Cytometry Laboratory MS 1005
Room 32 Health Education
3000 Arlington Avenue
Toledo, Ohio 43614-5806

PHONE: 419.383.4292
FAX: 419.383.3076

University of Toledo Medical Center
QuantiFERON-TB Gold *Plus*
Collection Instructions

- Samples will be rejected if not received within 16 hours.
- DO NOT refrigerate or centrifuge tubes.
- Label all 4 tubes with name, date, and time of collection.
  Time MUST be included.

  NOTE: ***Please do not completely cover the tubes with the larger labels. Use the smaller labels.***

- Order of draw must be gray, red, purple.
- Tubes will fill slowly to the 1 mL Black Line. Keep tube on needle until it stops filling. The top of line is 1 mL. To be acceptable, the tube must be filled at least to the bottom of black line.
- If a "butterfly needle" is being used to collect blood, a "purge" tube should be used to ensure that the tubing is filled with blood prior to the QFT-Plus Blood Collection Tubes being used.
- Immediately after filling the tubes, shake them ten (10) times just firmly enough to make sure the entire inner surface of the tube is coated with blood. This will dissolve antigens on the tube walls.

  IMPORTANT: ***Overly vigorous shaking may cause gel disruption and could lead to aberrant results***.

- Place tubes back in sample transport bag and send to Lab at room temperature.

UNIVERSITY OF TOLEDO MEDICAL CENTER
Clinical Laboratory Reference Ranges

THE UNIVERSITY OF TOLEDO MEDICAL CENTER

	Test Name	Abbreviation	Male	Female	Units
Hematology	Red Blood Cell Count	RBC	4.3-5.9	3.5-5.5	million/mm3
	Hemoglobin		13.9-16.3	12.0-15.0	g/dL
	Hematocrit		39-55	36-48	%
	Indices - includes:				
	Red Cell Distribution Width	RDW	11.5-16.9	11.5-16.9	
	Mean Corpuscular Volume	MCV	80-100	80-100	CU MICRON
	Mean Corpuscular Hemoglobin	MCH	24-32	24-32	uuG
	Mean Corpuscular Hemoglobin Concentration	MCHC	32-36	32-36	%
	White Blood Cell with differential	WBC	4.0-10.0	4.0-10.0	Thou/mm3
	Platelet count		100-400	100-400	Thou/mm3
	Reticulocyte Count	RET	0.5-1.5	0.5-1.5	%
	Neutrophils or Segs				
	less than 4 yrs		23-45	23-45	%
	5 yrs to 10 yrs		30-60	30-60	%
	11 and older		50-70	50-70	%
	Lymphocytes				
	less than 4 yrs		35-65	35-65	%
	5 yrs to 10 yrs		30-50	30-50	%
	11 and older		20-40	20-40	%
	Monocytes		2-8	2-8	%
	Eosinophils		0-5	0-5	%
	Bands		0-4	0-4	%
	Basophils		0-2	0-2	%
	Sedimentation Rate	SED RATE	0-10	0-20	mm/hr
Coagulation	Prothrombin Time	PT	12.3-14.8	12.3-14.8	seconds
	Act. Partial Thromboplastin Time	APTT	25-35	25-35	seconds
	D-Dimer	Ddi	<0.27-0.49	<0.27-0.49	mcg/ml. (FEU)
	INR		0.91-1.16	0.91-1.16	
	Fibrinogen		150-425	150-425	mg/dL
Electrolytes	Carbon Dioxide		21-31	21-31	meq/L
	Chloride		98-107	98-107	meq/L
	Potassium		3.5-5.1	3.5-5.1	meq/L
	Sodium		136-145	136-145	meq/L
Basic Metabolic	(Includes Electrolytes and the following:)				
	Glucose		70-100	70-100	mg/dL
	Urea Nitrogen	BUN	7-25	7-25	mg/dL
	Calcium		8.6-10.3	8.6-10.3	mg/dL
	Creatinine		0.7-1.3	0.6-1.2	mg/dL
Comprehensive Metabolic	(Includes Basic Met and the following:)				
	Albumin		3.5-5.7	3.5-5.7	g/dL
	Alkaline Phosphatase		34-104	34-104	IU/L
	Total Bilirubin		0.3-1.0	0.3-1.0	mg/dL
	Aspartate Aminotransferase	AST, SGOT	13-39	13-39	IU/L
	Alanine Aminotransferase	ALT, SGPT	7-52	7-52	IU/L
	Total Protein		6.0-8.3	6.0-8.3	g/dL
Lipid Profile	Cholesterol		120-199	120-199	mg/dL
	HDL Cholesterol 20+ yrs		23-92	23-92	mg/dL
	LDL Cholesterol		0-130	0-130	mg/dL
	Triglycerides		48-156	48-150	mg/dL
	VLDL Cholesterol		0-40	0-40	mg/dL
	Cholesterol/HDL Ratio		0-4.5	0-4.5	
Cardiac Profile	Creatine Phospholinase	CK or CPK	30-223	30-223	IU/L
	CPK-MB		0-5.0	0-5.0	ng/mL
	CKMB Index		0-1.9	0-1.9	
	Troponin-I		0.00-0.04	0.00-0.04	ng/mL

UNIVERSITY OF TOLEDO MEDICAL CENTER
Clinical Laboratory Reference Ranges

THE UNIVERSITY OF TOLEDO MEDICAL CENTER

	Test Name	Abbreviation	Male	Female	Units
Thyroid Testing	T3 Free		2.5-3.9	2.5-3.9	pg/mL
	T4 Free		0.71-1.85	0.71-1.85	ng/mL
	Thyroid Stimulating Hormone	TSH	0.34-5.6	0.34-5.6	micro-IU/mL
Markers	Prostate Specific Antigen	PSA	0.4-4.0		ng/mL
	CA-125			0-35	U/mL
	CEA		0.0-3.0	0.0-3.0	ng/mL
Other Clinical Chemistry	Brain Naturietic Peptide	BNP	0-100	0-100	pg/mL
	Lactate Dehydrogenase	LDH	140-271	140-271	IU/L
	Gamma Glutamyl Transferase	GGTP	9-64	9-64	IU/L
	Bilirubin, Direct		0.03-0.18	0.03-0.18	mg/dL
	Phosphorous		2.5-5.0	2.5-5.0	mg/dL
	Magnesium		1.9-2.7	1.9-2.7	mg/dL
	Serum Iron	FE	50-212	50-212	mcg/dL
	Total Iron Binding Capacity	TIBC	250-450	250-450	mcg/dL
	UIBC	UIBC	155-355	155-355	mcg/dL
	Ammonia		16-53	16-53	umol/L
	Amylase		29-103	29-103	Units/L
	Lipase		11-82	11-82	Units/L
	Uric Acid		4.4-7.6	2.3-6.6	mg/dL
	Glycohemoglobin A1C		4.0-6.0	4.0-6.0	%
	Vitamin B12		180-914	180-914	pg/mL
	Vitamin D 25-OH		30-80	30-80	ng/dL
	Folate		>6.6	>6.6	ng/mL
	Ferritin		24-336	11-307	ng/mL
	Homocysteine		4-12	4-10	umol/L
	B-hCG (quantitative)-plasma		0-2	0-5	mIU/mL
	B-hCG (Urine)	B-hCG (Urine)	NA	negative	
	Prealbumin		17-34	17-34	mg/dL
	Beta-hydroxybutyrate	BOHB	0.02-0.27	0.02-0.27	mmol/L
	Lactate		0.5-2.2	0.5-2.2	mmol/L
	Creatinine (Urine-Timed)		960-1820	905-1100	mg/24 hr
Hepatitis	Hepatitis B Surface Antigen		Nonreactive	Nonreactive	
	Hepatitis C Antibody		NEGATIVE	NEGATIVE	
	Hepatitis Core Antibody		NEGATIVE	NEGATIVE	
	Hepatitis B Surface Antibody		NEGATIVE	NEGATIVE	
Routine Urinalysis	pH		5-8	5-8	
	protein		negative	negative	
	Glucose		negative	negative	
	Ketones		negative	negative	
	Hemoglobin or blood		negative	negative	
	Bilirubin		negative	negative	
	Microscopic Exam				
	White cells/HPF		0-2	0-2	
	Red cells/HPF		0-2	0-2	
	Epithelial cells/LPF		few	few	
	Casts, Crystals/HPF		0	0	
	Specific gravity		1.015-1.020	1.015-1.020	
Urine Drug Screen	Alcohol		0	0	%
	Barbiturates		NEGATIVE	NEGATIVE	
	Cannabinoids		NEGATIVE	NEGATIVE	
	Opiates		NEGATIVE	NEGATIVE	
	Benzodiazepines		NEGATIVE	NEGATIVE	
	Amphetamines (derivatives)		NEGATIVE	NEGATIVE	
	Propoxyphene		NEGATIVE	NEGATIVE	
	Cocaine		NEGATIVE	NEGATIVE	

UNIVERSITY OF TOLEDO MEDICAL CENTER
Clinical Laboratory Reference Ranges

THE UNIVERSITY OF TOLEDO MEDICAL CENTER

	Test Name	Abbreviation	Male	Female	Units
Immunoglobulins	IgG		591-1540	591-1540	mg/dL
	IgM		54-285	54-285	mg/dL
	IgA		60-413	60-413	mg/dL
Immunology	C-Reactive Protein	CRP	0.0-7.0	0.0-7.0	mg/L
	Anti-nuclear Antibody	ANA	<1:32, 1:32	<1:32, 1:32	
	Rheumatoid Factor	RA	<20	<20	IU/mL
	Haptoglobin		26-164	26-164	mg/dL
Gonadotropins	FSH		1.0-19.0	2.0-22.0	mIU/mL
	LH		2.0-12.0	0.5-105	mIU/mL
	Prolactin		1.61-18.77	1.39-24.20	ng/mL

Amina Gohara 10/12/20
Signature of Laboratory Director Date

PRINT NAME:

Specimen Transport to UTMC Pathology Department

The University of Toledo Medical Center Pathology department only accepts specimens that have been delivered from the immediate area via courier.

Packaging Instructions

1. Place the primary leak proof container (Vacutainer tube, aliquot tube, or screw top urine container) in a leak proof secondary transport bag with a biohazard sign and seal. Indicate on the outside of the bag the storage temperature requirements; Room Temp, Refrigerated, Frozen.
2. Place a completed requisition in the outside pocket of the plastic bag. The requisition must include the patient's name and demographics and the testing being ordered.
3. If there are several samples from different patients with the same storage temperature requirements then they should be placed in one larger container or bag.
4. If specimens have different storage requirements then a copy of the requisition or transport log should be placed with each sample.

UTMC In-House Test Catelog

University of Toledo Medical Center

Pathology Department
3/2019

Test Name - alphabitized	Specimen:	Specimen Containers:	Reported:	Transport:	Special Instructions
25-HYDROXY VITAMIN D	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
A1 ANTIGEN	BLOOD	PINK	Same Day	Ambient w/in 3 hrs	
ABNORMAL BLEEDING EVALUATION	BLOOD	BLUE and LAV	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
ABO TYPE ONLY	BLOOD	PINK	Same Day	Ambient w/in 3 hrs	
ACETAMINOPHEN	BLOOD	PST,SST, RED	Same Day	Ambient w/in 3 hrs	
ACTIVATED PARTIAL THROMBOPLASTIN TIME	BLOOD	BLUE	Same Day	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
AFB BLOOD CULTURE	BLOOD	MYCO/F LYTIC BLOOD CULTURE BOTTLES	Final at 42 days incubation time	ASAP or w/in 8 hrs Ambient	
ALBUMIN	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
ALBUMIN FLUID	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
ALCOHOL	BLOOD	GRAY	Same Day	Ambient w/in 3 hrs	
ALKALINE PHOSPHATASE BLOOD	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
ALPHA 1 ANTITRYPSIN	BLOOD	SST, RED	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
AMMONIA	BLOOD	GREEN (Li Hep) ON ICE	Same Day	On ice ASAP	
AMYLASE	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
AMYLASE FLUID	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
AMYLASE UR RAND	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
AMYLASE UT	TIMED URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
ANTI CARDIOLIPIN ANTIBODY	BLOOD	RED	5 days	Ambient w/in 4 hrs	
ANTI CENTROMERE ANTIBODY	BLOOD	RED	2-5 days	Ambient w/in 8 hrs	
ANTI DNA	BLOOD	RED	2-5 days	Ambient w/in 8 hrs	
ANTI ENA	BLOOD	RED	2-5 days	Ambient w/in 8 hrs	
ANTI NUCLEAR ANTIBODY	BLOOD	RED	2-5 days	Ambient w/in 8 hrs	
ANTI PARIETAL ANTIBODY	BLOOD	RED	2-5 days	Ambient w/in 8 hrs	
ANTI-BETA 2 GLYCOPROTEIN 1	BLOOD	RED	5 days	Ambient w/in 4 hrs	
ANTIBODY IDENTIFICATION	BLOOD	PINK	Same Day	Ambient w/in 3 hrs	

ANTI-PHOSPHOLIPID ANTIBODY	BLOOD	RED & BLUE	5 days	Ambient w/in 3 hrs	
ANTITHROMBIN III ACTIVITY	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
APC RESISTANCE ASSAY	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
ASO	BLOOD	SST, RED	1-3 days	Ambient w/in 8 hrs	Performed Mon - Friday
B HCG	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
BASIC METABOLIC PANEL	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
BETA HYDROXYBUTYRATE	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
BILIRUBIN DIRECT BLOOD	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
BILIRUBIN TOTAL BLOOD	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
BILIRUBIN TOTAL FLUID	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
BK VIRUS (QUANT) PCR BLOOD	BLOOD	LAV	within 10 days	Ambient w/in 3 hrs	STORE IN REFRIGERATOR
BK VIRUS (QUANT) PCR URINE	URINE	Urine collection container	within 10 days	Ambient w/in 3 hrs	STORE IN REFRIGERATOR
BLOOD CULTURE	BLOOD	AEROBIC AND ANAEROBIC BLOOD CULTURE BOTTLES	Final at 5 days incubation time	ASAP or w/in 8 hrs Ambient	
BLOOD STOOL GUAIAC	STOOL	Urine collection container	Same Day	Ambient w/in 3 hrs	
BLOOD TYPE AND RH	BLOOD	PINK	Same Day	Ambient w/in 3 hrs	
BUN	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
C DIFF DNA AMPLIFICATION	STOOL	Fluid collection container	1 day	Ambient w/in 1 hr	
C3	BLOOD	SST, RED	1-3 days	Ambient w/in 8 hrs	Performed Mon - Friday
C4	BLOOD	SST, RED	1-3 days	Ambient w/in 8 hrs	Performed Mon - Friday
CALCIUM	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
CALCIUM UR RAND	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
CALCIUM UT	TIMED URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
CANCER ANTIGEN 125	BLOOD	PST	Same Day	Ambient w/in 3 hrs	
CARBAMAZEPINE	BLOOD	RED	Same Day	Ambient w/in 3 hrs	
CARBON DIOXIDE FLUID MISC	FLUID, STOOL	Fluid collection container	Same Day	Ambient w/in 3 hrs	
CARCINOEMBRYONIC ANTIGEN	BLOOD	SST, RED	Same Day	Ambient w/in 3 hrs	
CARCINOEMBRYONIC ANTIGEN FLUID	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	

CARDIAC PROFILE	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
CBC	BLOOD	LAV	Same Day	Ambient w/in 3 hrs	
CBC W/DIFF	BLOOD	LAV	Same Day	Ambient w/in 3 hrs	
CHLAMYDIA/GC PCR	URINE	ABBOTT COLLECTION KIT	4 days	Ambient w/in 3 hrs	store in refrigerator if transport is delayed
CHLAMYDIA/GC PCR	GENITAL	ABBOTT COLLECTION KIT	4 days	Ambient w/in 3 hrs	store in refrigerator if transport is delayed
CHLORIDE	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
CHLORIDE CSF	CSF	CSF Collection Tube	Same Day	Ambient w/in 3 hrs	
CHLORIDE FLUID	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
CHLORIDE URINE RANDOM	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
CHLORIDE UT	TIMED URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
CHOLESTEROL	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
CHOLESTEROL FLUID	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
CMV IGG	BLOOD	RED	3-5 days	Ambient w/in 3 hrs	
COMP METABOLIC	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
CORTISOL	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
CPK-MB PROFILE	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
CREAT UR RANDOM	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
CREATINE KINASE BLOOD	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
CREATININE	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
CREATININE FLUID MISC	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
CREATININE URINE TIMED	TIMED URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
CRP	BLOOD	Li Hep, SST, RED	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
CRP HIGH SENSITIVITY	BLOOD	Li Hep, SST, RED	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
CRYPTOCOCCAL ANTIGEN	BLOOD	RED	1 day	Ambient w/in 3 hrs	
CRYPTOCOCCAL ANTIGEN	CSF	CSF Collection Tube	1 day	Ambient w/in 3 hrs	
CSF CELL COUNT	CSF	CSF Collection Tube	Same Day	Ambient w/in 3 hrs	
CYCLOSPORIN MONO	BLOOD	LAV	1 day	Ambient w/in 3 hrs	
D DIMER TEST	BLOOD	BLUE	Same Day	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED

DIC SCREENING TESTS	BLOOD	BLUE and LAV	Same Day	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
DIFFERENTIAL	BLOOD	LAV	Same Day	Ambient w/in 3 hrs	
DIGOXIN	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
DIRECT BILIRUBIN FLUID	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
DIRECT COOMBS	BLOOD	LAV	Same Day	Ambient w/in 3 hrs	
DRVVT SCREEN	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
EB VCA IGG	BLOOD	RED	3-5 days	Ambient w/in 8 hrs	
EB VCA IGM	BLOOD	RED	3-5 days	Ambient w/in 8 hrs	
EBV (includes both VCA IgG and IgM)	BLOOD	RED	3-5 days	Ambient w/in 8 hrs	
ELECTROLYTES	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
EOSINOPHIL COUNT TOTAL	BLOOD	LAV	Same Day	Ambient w/in 3 hrs	
FACTOR II	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
FACTOR IX	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
FACTOR V	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
FACTOR V LEIDEN	BLOOD	LAV	10 days	Ambient w/in 3 hrs	STORE IN REFRIGERATOR
FACTOR VII	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
FACTOR VIII	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
FACTOR X	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
FACTOR XI	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
FAT DROPLETS MISC	MISC	Urine collection container	1 day	Ambient w/in 1 hr	Refrigerate if transport is delayed
FAT DROPLETS STOOL	STOOL	Urine collection container	1 day	Ambient w/in 1 hr	Refrigerate if transport is delayed
FERRITIN	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
FIBRIN DEGRADATION PRODUCT	BLOOD	BLUE	Same Day	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
FIBRINOGEN	BLOOD	BLUE	Same Day	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
FIBRINOLYTIC PROFILE	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
FLUID CELL COUNT	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
FLUID CRYSTALS	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	

FLUID HEMATOCRIT	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
FLUID HEMOGLOBIN	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
FLUID SPECIFIC GRAVITY	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
FLUOR TREPONEMAL ANTIBODY (FTA-ABS)	BLOOD	RED	within 7 days	Ambient w/in 3 hrs	
FOLATE SERUM	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
FREE DILANTIN	BLOOD	GREEN (Li Hep)	Same Day	Ambient w/in 3 hrs	
FREE T3 (TRIIODOTHYRONINE)	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
FREE T4	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
FUNGAL BLOOD CULTURE	BLOOD	FUNGAL BC BOTTLES	Final at 42 days incubation time	ASAP or w/in 8 hrs Ambient	
GAMMA GT	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
GASTRIC OCCULT BLOOD	GASTRIC FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
GENTAMICIN TROUGH	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
GIARDIA/CRYPTOSPORIDIUM ANTIGEN (Ova & Parasite Exam)	STOOL	Stool collection Kit	24 -48 Hours	ASAP or Cary Blair Transport media w/in 24 hrs Ambient	
GLOMERULAR BASEMENT MEMBR	BLOOD	RED	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
GLUCOSE	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	Separate serum/plasma from cells ASAP
GLUCOSE CSF	CSF	CSF Collection Tube	Same Day	Ambient w/in 3 hrs	
GLUCOSE FLUID	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
GLUCOSE UT	TIMED URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
GONORRHEA PCR	GENITAL	ABBOTT COLLECTION KIT	1 day	Ambient w/in 3 hrs	store in refrigerator if transport is delayed
HAPTOGLOBIN	BLOOD	SST, RED	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
HDL CHOLESTEROL	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
HEMATOCRIT	BLOOD	LAV	Same Day	Ambient w/in 3 hrs	
HEMOGLOBIN	BLOOD	LAV	Same Day	Ambient w/in 3 hrs	
HEMOSTASIS SCREEN	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
HEP A IGM	BLOOD	RED	2-5 days	Ambient w/in 3 hrs	Performed Mon, Wed, Fri
HEP B CORE AB	BLOOD	RED	2-5 days	Ambient w/in 3 hrs	Performed Mon, Wed, Fri
HEP C AB	BLOOD	RED	2-5 days	Ambient w/in 3 hrs	Performed Mon, Wed, Fri

HEPARIN PLATELET ANTIBODY	BLOOD	BLUE and RED	5-7 days	Ambient w/in 1 hrs	EXACT VOLUME OF BLOOD REQUIRED
HEPATITIS B SURFACE AB QNT	BLOOD	RED	3-5 days	Ambient w/in 3 hrs	Performed Tues and Thursday
HEPATITIS B SURFACE AG	BLOOD	RED	2-5 days	Ambient w/in 3 hrs	Performed Mon, Wed, Fri
HEPATITIS C VIRAL LOAD	BLOOD	LAV	7-10 days	Ambient w/in 3 hrs	
HGB A1C	BLOOD	LAV	1 day	Ambient w/in 3 hrs	
HIV COMBO	BLOOD	RED	Same Day	Ambient w/in 3 hrs	
HIV QUANT RNA BY PCR-VLOAD	BLOOD	LAV	7-10 days	Ambient w/in 3 hrs	AFTER 2 P.M. M-F AND ON WEEKENDS AND HOLIDAYS, SPECIMEN MUST BE SPUN, PLASMA DRAWN OFF AND FROZEN WITHIN 6 HOURS OF DRAW.
HIV-1/HIV-2 ANTIBODY	BLOOD	RED	3-5 days	Ambient w/in 3 hrs	Performed Tues and Thursday
HLA ABC S	BLOOD	LAV, ACD YELLOW	4 days	Ambient w/in 3 hrs	
HLA B27	BLOOD	LAV, ACD YELLOW	4 days	Ambient w/in 3 hrs	
HLA CLASS I TYPING	BLOOD	LAV, ACD Yellow	4 days	Ambient w/in 3 hrs	
HLA CLASS II TYPING	BLOOD	LAV, ACD Yellow	4 days	Ambient w/in 3 hrs	
HLA DR S	BLOOD	LAV, ACD YELLOW	4 days	Ambient w/in 3 hrs	
HOMOCYSTEINE	BLOOD	RED ON ICE	5-7 days	On ice ASAP	
HSV 1 & 2 by PCR	SWAB	M4 Media	1-4 days	Ambient w/in 3 hrs	sucutaneous and cutaneous lesions only
IGA	BLOOD	SST, RED	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
IGG	BLOOD	SST, RED	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
IGM	BLOOD	SST, RED	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
IMMUNOFIX BL (Code IEP: includes IEP, IGs, kappa/lambda)	BLOOD	RED	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
IMMUNOFIX UR	URINE	Urine collection container	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
IMMUNOGLOBULINS BL (IGs: includes IgG, IgA, IgM)	BLOOD	SST, RED	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
INDIRECT COOMBS	BLOOD	PINK	Same Day	Ambient w/in 3 hrs	
INFLUENZA A&B ANTIGEN (RAPID)	SWAB	DRY TRANSPORT SWAB	Same Day	Ambient w/in 2 hrs	See special collection instructions
INHIBITOR ASSAY FACTOR II	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
INHIBITOR ASSAY FACTOR IX	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
INHIBITOR ASSAY FACTOR V	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
INHIBITOR ASSAY FACTOR VIII	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
INHIBITOR ASSAY FACTOR X	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED

INHIBITOR SCREEN PROTIME	BLOOD	BLUE and RED	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
INHIBITOR SCREEN PTT	BLOOD	BLUE and RED	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
IRON	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
IRON BINDING-INCLUDES IRON	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
KAPPA LIGHT CHAIN	BLOOD	SST, RED	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
LACTATE	BLOOD	GRAY ON ICE	Same Day	On ice ASAP	
LACTATE CSF	CSF	CSF Collection Tube	Same Day	Ambient w/in 3 hrs	
LAMBDA LIGHT CHAIN	BLOOD	SST, RED	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
LDH	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
LDH CSF	CSF	CSF Collection Tube	Same Day	Ambient w/in 3 hrs	
LDH FLUID	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
LDH URINE	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
LEUKOCYTES STOOL	STOOL	Urine collection container	Same Day	Ambient w/in 3 hrs	
LIPASE	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
LIPASE FLUID	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
LIPASE TIMED URINE	TIMED URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
LIPID PROFILE	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
LIPOPROTEIN a	BLOOD	SST, RED	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
LIVER BATT	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
LMWH HEPARIN ASSAY	BLOOD	BLUE	Same Day	Must be received in lab w/in 60 minutes of collection	EXACT VOLUME OF BLOOD REQUIRED
LUPUS ANTICOAGULANT	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
LYME, Total, IgG & IgM	BLOOD	RED	3-5 days	Ambient w/in 3 hrs	
LYMPHOCYTE CROSSMATCH - donor	BLOOD	ACD Yellow	1 day	Ambient w/in 3 hrs	
LYMPHOCYTE CROSSMATCH - recip	BLOOD	RED GLASS	1 day	Ambient w/in 3 hrs	
MAGNESIUM	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
MAGNESIUM URINE RANDOM	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
MAGNESIUM URINE TIMED	TIMED URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	

MICROALBUMIN URINE RANDOM	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
MICROALBUMIN URINE TIMED	TIMED URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
MITOCHONDRIAL AB	BLOOD	RED	2-5 days	Ambient w/in 3 hrs	Performed Mon, Wed, Fri
MONOSPOT	BLOOD	RED	Same Day	Ambient w/in 3 hrs	
MTHFR A1298C	BLOOD	LAV	within 10 days	Ambient w/in 3 hrs	STORE IN REFRIGERATOR
MTHFR C677T	BLOOD	LAV	within 10 days	Ambient w/in 3 hrs	STORE IN REFRIGERATOR
MTHFR C677T AND A1298C	BLOOD	LAV	within 10 days	Ambient w/in 3 hrs	STORE IN REFRIGERATOR
MUMPS VIRUS IGG BLD	BLOOD	RED	1-3 days	Ambient w/in 3 hrs	
MYOGLOBIN	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
OSMO FL	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
OSMO STOOL	STOOL	Fluid collection container	Same Day	Ambient w/in 3 hrs	
OSMOLALITY	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
OSMOLALITY UR	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
PANEL REACTIVE ANTIBODY	BLOOD	GLASS RED	4 days	Ambient w/in 72 hours	Refrigerate if >72 hrs up to 7 days if transport is delayed
PHENOBARB	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
PHOSPHORUS	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
PHOSPHORUS UR RAND	BLOOD	Urine collection container	Same Day	Ambient w/in 3 hrs	
PHOSPHORUS URINE TIMED	TIMED URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
PLATELET AGGREGATION	BLOOD	Eight (8) BLUE	1 day	8 Blue Top tubes must be collected at UTMC	This test must be scheduled with the coagulation department. Testing is performed as scheduled only.
PLATELET COUNT	BLOOD	LAV	Same Day	Ambient w/in 3 hrs	
PLATELET FUNCTION SCR	BLOOD	Two (2) BLUE	Same Day	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
POST TRANSPLANT PANEL REACTIVE ANTIBODY	BLOOD	RED GLASS	4 days	Ambient w/in 72 hours	Refrigerate if >72 hrs up to 7 days if transport is delayed
POTASSIUM	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
POTASSIUM FLUID	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
POTASSIUM STOOL	STOOL	Fluid collection container	Same Day	Ambient w/in 3 hrs	
POTASSIUM URINE RANDOM	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	

POTASSIUM URINE TIMED	TIMED URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
PREALBUMIN	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
PREGNANCY TEST QUAL	BLOOD	RED	Same Day	Ambient w/in 3 hrs	
PREGNANCY TEST QUAL	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
PRO TIME	BLOOD	BLUE	Same Day	Ambient w/in 23 hrs	EXACT VOLUME OF BLOOD REQUIRED
PROTEIN C ACTIVITY	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
PROTEIN C ANTIGEN	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
PROTEIN ELECT PROFILE BL	BLOOD	SST, RED	2-4 days	Ambient w/in 3 hrs	
PROTEIN ELECT URINE PROF	TIMED URINE	Urine collection container	2-4 days	Ambient w/in 3 hrs	
PROTEIN S ACTIVITY	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
PROTEIN S ANTIGEN FREE	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
PROTEIN S ANTIGEN TOTAL	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
PROTHROMBIN 20210A	BLOOD	LAV	within 10 days	Ambient w/in 3 hrs	STORE IN REFRIGERATOR
PSA	BLOOD	SST, RED	Same Day	Ambient w/in 3 hrs	
RETIC COUNT	BLOOD	LAV	Same Day	Ambient w/in 3 hrs	
RH ONLY	BLOOD	PINK	Same Day	Ambient w/in 3 hrs	
RHEUMATOID FACTOR (RA)	BLOOD	SST, RED	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
RPR	BLOOD	SST, RED	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
RUBELLA, IgG	BLOOD	RED	1-3 days	Ambient w/in 3 hrs	
RUBEO IGG (MEASLES)	BLOOD	RED	1-3 days	Ambient w/in 3 hrs	
SALICYLATE	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
SEDIMENTATION RATE	BLOOD	LAV	Same Day	Ambient w/in 3 hrs	
SERUM-FREE LIGHT CHAINS (includes kappa & lambda)	BLOOD	SST, RED	1-3 days	Ambient w/in 3 hrs	Performed Mon - Friday
SGOT(AST)	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
SGPT(ALT)	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
SICKLE CELL PREPARATION	BLOOD	LAV	Same Day	Ambient w/in 3 hrs	
SIROLIMUS	BLOOD	LAV	1 day	Ambient w/in 3 hrs	
SJOGRENS ABS	BLOOD	RED	2-5 days	Ambient w/in 3 hrs	
SMOOTH MUSCLE AB	BLOOD	RED	2-5 days	Ambient w/in 3 hrs	

SODIUM	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
SODIUM FLUID	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
SODIUM STOOL	STOOL	Fluid collection container	Same Day	Ambient w/in 3 hrs	
SODIUM UR RAND	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
SODIUM UT	TIMED URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
T CELL SUBSET ANALYSIS	FLUID	Fluid collection container	4 days	Ambient w/in 8 hrs	
T CELL SUBSET ANALYSIS	BLOOD	ACD Yellow	4 days	Ambient w/in 8 hrs	
T PROTEIN	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
TACROLIMUS	BLOOD	LAV	1 day	Ambient w/in 3 hrs	
TB QUANTIFERON *Plus*	BLOOD	TB COLLECTION TUBE KIT	3-5 days	Ambient w/in 8 hrs	See special collection instructions
THEOPHYLLINE	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
THROMBIN CLOTTING TIME	BLOOD	BLUE	Same Day	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
TOBRAMYCIN TROUGH	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
TOT PROTEIN CSF	CSF	CSF Collection Tube	Same Day	Ambient w/in 3 hrs	
TOTAL PROTEIN FLUID MISC	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
TOTAL PROTEIN UR TIMED	TIMED URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
TOTAL PROTEIN URINE RAND	URNE	Urine collection container	Same Day	Ambient w/in 3 hrs	
TOX PANEL 1 UR	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
TRANSFERRIN	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
TRIGLYCERIDES	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
TRIGLYCERIDES FLUID	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
TYPE AND CROSSMATCH	BLOOD	PINK	Same Day	Ambient w/in 3 hrs	Patient must be banded when drawn
TYPE AND SCREEN	BLOOD	PINK	Same Day	Ambient w/in 3 hrs	
UFH HEPARIN ASSAY	BLOOD	BLUE	Same Day	Must be received in lab w/in 60 minutes of collection	EXACT VOLUME OF BLOOD REQUIRED
UREA NITROGEN FLUID MISC	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
UREA NITROGEN URINE RANDOM	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
UREA NITROGEN URINE TIMED	TIMED URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
URIC ACID	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	

URIC ACID FLUID	FLUID	Fluid collection container	Same Day	Ambient w/in 3 hrs	
URIC ACID URINE RANDOM	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
URIC ACID URINE TIMED	TIMED URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
URINALYSIS	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
URINALYSIS,MICROSCOPIC REQUIRED	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
URINE ELECTROLYTES RANDOM	URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
URINE ELECTROLYTES TIMED	TIMED URINE	Urine collection container	Same Day	Ambient w/in 3 hrs	
VAGINITIS DNA PROBE	GENITAL	Affirm collection kit	Same Day	With additive- ambient within 8 hours	Without additive - specimen must arrive in lab w/in 1 hour at ambient temp or up to 4 hours if kept refrigerated
VALPROATE	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
VANCOMYCIN	BLOOD	PST,SST, RED	Same Day	Ambient w/in 3 hrs	
VARICELLA IGG	BLOOD	RED	1-3 days	Ambient w/in 3 hrs	
VITAMIN B12	BLOOD	PST, SST, RED	Same Day	Ambient w/in 3 hrs	
VON WILLEBRAND FACTOR ACTIVITY	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
VON WILLEBRAND FACTOR ANTIGEN	BLOOD	BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED
VON WILLEBRAND PROFILE (Includes a Plt Function Test)	BLOOD	Four (4) to five (5) BLUE	5-7 days	Ambient w/in 3 hrs	EXACT VOLUME OF BLOOD REQUIRED

UTMC Pathology
Specimen collection Kits and swabs

Chlamydia and GC by TMA

Unisex Swab Kit – for the collection of **endocervical and male urethral specimens.**

These swabs are supplied in a purple box and have white labels with purple lettering.

Multitest Swab Kit – for the collection of **vaginal specimens.**

These kits are supplied in an orange box and will have orange labels with black lettering

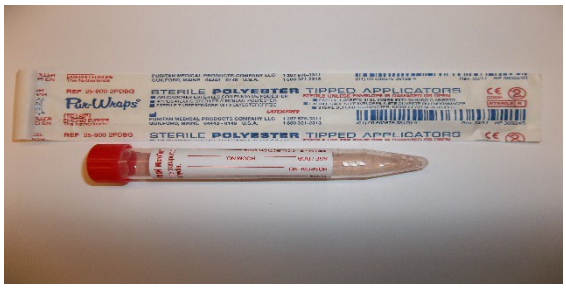
Urine collection:

Due to the change in testing methodology, urine specimens can no longer be accepted in swab collection tubes. **Please provide urine specimens in a sterile collection cup and store refrigerated.**

Test codes:
The test codes for *Chlamydia trachomatis* (CT) and/or *Neisseria gonorrhoeae* have been changed to reflect the new test method. Please order using the new test code on and after January 1st, 2019.

	Old code	New code
Test for CT/GC	30113	**31627**
Test for CT only	30111	31626
Test for GC only	30112	31625

Viral Cultures

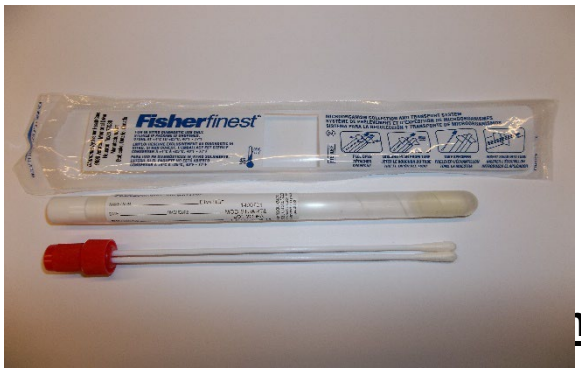


This is used for any viral culture
Cannot be used for PCR testing
Maintain at room temperature

Aerobic/Anaerobic Culture

This swab has **GEL** in the bottol and is used for all general aerobic and anaerobic culture requests.
Maintain at room temperature.

Red Culture swab for Rapid Strep and MRSA culture



This swab is used for Rapid Strep testing and MRSA testing.
It does **NOT** contain gel.
The second swab should be placed back into the container in a sterile manner so that it can be used for a throat culture if needed.
Maintain at room temperature.

ng

The cap may be blue or clear.
Label will state DRY TRANSPORT.
This swab is **DRY** and is used for the Rapid Flu test.
Maintain at room temperature.
This is **NOT** a nasopharangeal swab.
Only swab the nostril area.

Stool Collections

Stool Culture	Room Temp
Fecal WBC	Room Temp Refrigerated
C diff	Refrigerated
Giardia Crypto	Refrigerated

Yellow Cap = C&S Medium

TEST	STORAGE
Stool Culture	Room Temp
Fecal WBC	Room Temp Refrigerated
C diff	Refrigerated
Giardia Crypto	Refrigerated

White Cap = Clean Vial

STORAGE

TEST	STORAGE
Stool Culture	Room Temp
Fecal WBC	Room Temp Refrigerated
C diff	Refrigerated
Giardia Crypto	Refrigerated

Pink Cap = 10% Formalin Fix