Clinical Pathology Core Rotation

Faculty:
Stacy G. Beal, MD
Neil Harris, MD
Ken Rand, MD
William Winter, MD

1. Rotation Description
   a. This resident serves as a Junior Director and assists in many aspects of laboratory directorship alongside the medical directors.
   b. This rotation is an opportunity for the resident to acquire a set of tools that will enable the resident to develop and maintain a level of expertise in clinical pathology appropriate to the professional responsibilities undertaken as a practicing pathologist. This could range from understanding the role of fundamental analytical and quality principles that underlie laboratory techniques employed in the clinical laboratories (clinical chemistry, hematology, microbiology, and others) to full direction of a clinical laboratory.

2. Broad objectives
   a. Understand how to fully evaluate send out test requests, contact the treating team, discuss with Pathology attending, and solve any logistical issues with laboratory staff.
   b. Be able to independently advise a colleague in another department regarding the results obtained in the corresponding laboratory (e.g. Microbiology – Blood culture results; Clinical Chemistry – Protein electrophoresis).
   c. Understand the role of a Pathologist as a Medical Director of a clinical laboratory (including laboratory management).
   d. Assist laboratory staff with clinical correlation of a result, logistical issues (such as specimen labeling), or advanced interpretation of a result (such as abnormal findings on a peripheral blood smear).
   e. Serve as a consultant for colleagues in other departments. This includes guidance regarding test selection and interpretation, and answering questions regarding operation of a clinical laboratory.
   f. Understand Informatics and how it applies to the clinical laboratory.
   g. Learn time management skills.

3. Duties and Responsibilities. Residents are encouraged to set a schedule for themselves. This could be achieved by reviewing all meetings and conferences they have scheduled and then scheduling all other responsibilities around these at the beginning of each week (i.e. on Mondays; or perhaps prepare by designing your schedule on Friday afternoon for the next week.).
   a. Microbiology lab rounds
      • 11 am daily
      • Check in with all managers and supervisors each day
      • Discuss current events, interesting cases, diagnostic dilemmas, etc.
      • Walk around the lab and say hi to med techs; ask if they have any interesting or difficult cases
   b. Microbiology cases and presentation at Infectious Disease Plate Rounds
      • See Micro Module. Meet with Dr. Rand to discuss cases at the end of the 3rd week.
      Together, choose 1 or 2 cases to present at Microbiology Plate Rounds during the 4th week.
   c. Micro exam – every rotation when determined by Dr. Rand
d. Core Lab (Chemistry, Hematology, Urinalysis, Electrophoresis)
   - Electrophoresis: Get service schedule from faculty; touch base with faculty in the morning to
     confirm sign out time (usually around 2:30 pm).
   - Peripheral smears and general rounds: After morning conference, around 9:15, round in the
     Core lab: Check in with hematology techs regarding any Path Reviews; discuss any
     outstanding send outs with the send out techs; and check in with other techs and supervisors
     - Smears should be previewed, history should be reviewed, and the path review report
       should be fully written up in Epic before contacting the attending
     - If anything urgent is detected, contact faculty on service right away
     - Review smears with faculty either at previously designated time or right away if urgent

e. Call pager: All calls/emails from other physicians and laboratory staff will be directed to the CP Core
   Resident
   - With specific knowledge of the individual patient, up to date scientific knowledge (e.g.,
     review of the medical literature, assessment of evidence-based medical practice), and clinical
     judgment; the resident will:
     - Determine the appropriate course of further laboratory evaluation, applying an
       appropriate decision tree, and oversee progress at each decision level with attention
       to inappropriate testing and the quality of results
     - Create a differential diagnosis, or specify a single diagnosis, based upon the
       interpretation of the laboratory findings in light of the individual patient case history
     - Recognize the potential effects on this interpretation as a result of pre-analytical
       factors and an estimate of the likelihood that such effects might affect the
       interpretation of the findings in the individual patient
     - Counsel and educate the patient’s attending physician(s) and residents concerning
       proper laboratory evaluation and interpretation of results in that specific case

f. Review send outs
   - Introduce yourself to Jackie and Shirley, send out lab techs
     - Visit them at least once per day to review pending send out reviews and discuss any
       ongoing issues
     - Respond to emails when you get them to let them know you are working on them
   - Consider the impact of the test result on patient management in light of:
     - The patient’s clinical history, signs/symptoms, and other laboratory and radiologic
       findings
     - The test’s limitations (sensitivity, specificity)
     - The turn-around time for the test
     - The sample type
     - Any other factors based on your discussion with the patient’s care team
     - Genetic test resource: https://www.concertgenetics.com/
   - If you cancel a test, put a note in the chart including who you talked to and brief reasons why
     it is not indicated; let the CP faculty who is cosigning the note know that it is ready to be
     signed
   - Client numbers:
     - ARUP 191716
     - Mayo C7025954

g. Topics with Dr. Winter – Schedule 2 meetings per week to review topics of interest to the resident
h. Meetings: Obtain date/time/location information from Gena
   • Lab/IT Collaboration (once per month)
   • Medical Directors Faculty Meeting (once per month – 4th Monday 10 am)
   • Core Lab Management (once per month – 1st Friday 9 am)
   • Microbiology Management (once per month – 1st Thursday 10 am)
   • Quality Assurance (once per month – 3rd Tuesday 1:30 pm)
   • Ad-hoc meetings (e.g. Renovation, CAP readiness, etc.)

i. Conferences
   • Microbiology Plate Rounds
   • Infectious Diseases Conference – Tuesdays 12:30 pm and Fridays 12 pm, D2-15
   • Adult Benign Heme Conference – Thursdays, 8 am, 4th Floor ARB Conference room
   • Peds Heme Conferences – Tuesdays, 8 am, HD610
   • Internal Medicine Grand Rounds – Thursdays, 11 am, C1-11 (See Department of Medicine website for topics)
   • Internal Medicine M&M

j. Additional possible opportunities:
   • Attend rounds with a clinical team once per week
     ○ The resident should serve as a consult to the team by providing information about lab testing of the patients
     ○ Offer to give the team a tour of the laboratory
     ○ Follow up on lab results and any unanswered questions after rounds
   • Micro unknown surg path cases

Topics to be covered (by completion of all 3-4 CP Core rotations)

Hematology
   Peripheral blood smears, body fluids, joint crystals
   Bethesda inhibitor assay
   Lupus anticoagulant
   TEG Interpretation
   Platelet function test
   Hemoglobin analysis
   Clotting factor assays (if problematic)

Lab Management
   Review of Quality Control and CAP Proficiency testing
   Attend Quality Assurance and other management meetings

Chemical Pathology (Clinical Chemistry) Core Curriculum Subjects

Analytical principles: PGY-1, 2
   Spectrophotometric techniques
     Spectrophotometer design - light sources, cuvettes, wavelength selection, photomultiplier tubes
     Dye binding techniques: total protein, albumin, Ca++, Mg++
     Use of enzymes to measure analytes, e.g., glucose, urea, creatinine, uric acid, cholesterol, triglycerides, etc.
     Chemical reactions: bilirubin (total and direct)
     Enzyme measurements: CK, AST, ALT, LD, alkaline phosphatase, amylase, lipase
     Enzyme kinetics
Direct spectroscopy: Hemoglobin saturation, BU, BC (neonatal bili)
Fluorometry: FPA
Atomic absorption and flame photometry

Electrochemistry
Blood gases: pO2, pCO2, pH
Electrolytes: Na+, K+, Cl-, CO2, Li++, iCa++, iMg++

Immunoassays
Precipitin curves
Ouchterlony double diffusion
Radial immunodiffusion
Rocket electrophoresis
Counter immunoelectrophoresis
IEP, IFE, western blots
Nephelometry, turbidimetry
RIA (competition assays), Immunometric (double antibody) assays (IRMA, ICMA), CEDIA, EMIT, FPIA, FPA, chemiluminescence, electrochemiluminescence

Radioactivity and radiomeasurements
Electrophoresis - serum, urine, CSF
Chromatography (L/S ratio, TLC, HPLC, GC)
Mass spectroscopy applications, tandem mass spectroscopy and GC-MS, LC-MS

Laboratory automation in chemistry: review of all major systems (including dry-slide technology)
Verification of results
Method validation: reproducibility, accuracy, linearity, carry-over, etc.

Laboratory Mathematics and assay assessment: PGY-1, 2
Basic statistics
Mean, median, mode, SD, parametric distributions, nonparametric distributions
Assay performance
Sensitivity, specificity, positive predictive value, negative predictive value, efficiency (accuracy)
Linearity: defining the upper linear limit
Defining the lower limit of detection
Determining reference intervals
ROC curves
Run-to-run carry-over

Quality assurance PGY-1, 2
Quality assurance
Quality control: Precision, Accuracy, Westgard rules
Proficiency testing

Management principles PGY-1, 2
Lab licensing
CLIA
Lab certification
Lab billing

Preanalytic variation PGY-1, 2

Principles of therapeutic drug monitoring: PGY-3, 4
indications for therapeutic drug monitoring, peak, trough, half-life, steady state, therapeutic index

Analytes: understand measurement, preanalytic confounders (e.g., hemolysis and K+), causes of depressed concentrations, causes of elevated concentrations, and diseases where the analyte displays an abnormal concentration or is measured for diagnostic or management purposes

PGY-1,2:
Blood gases: pH, pO2, pCO2 (base excess), HCO3-, carboxyhemoglobin, methgb
Electrolytes: Na+, K+, Cl-, CO2 (anion gap), plasma osmolality (see: www.osmolality.com)
Energy homeostasis: glucose, lactate, pyruvate, beta-hydroxybutyrate, fructose, galactose, hemoglobin A1c, fructosamine, insulin antibodies and insulin autoantibodies, islet autoantibodies (ICA< GADA, IA-2A, IAA)

Minerals: Ca++ (iCa++), PO4---, Mg++ (iMg++), vitamin D and metabolites

Renal function: Cr, BUN, BUN/Cr ratio, CrCl, eGFR, Fractional excretion of Na+, urinalysis, urine microscopy, urine electrolytes, microalbumin measurement, UPE, urinary nitrogen excretion

Metabolic intermediaries: bilirubin (total and direct), phenylalanine, tyrosine, ammonia, bile acids, uric acid, porphyrins (delta-amino levulonic acid, porphobilinogen, urine porphyrins, free erythrocyte porphyrins, etc.), free fatty acids, 5-hydroxy indoleacetic acid (5-HIAA),

Enzymes (clinical enzymology): AST, ALT, LD (LD isoenzymes), alkaline phosphatase (isoenzymes), GGT, acid phosphatase (PAP), CK, aldolase, lipase, amylase, pseudocholinesterase

Cardiac markers: CK, CK-MB, CK isoforms, myoglobin (nonspecific), troponin I, troponin T, BNP, NT-proBNP

Iron status: serum iron, transferrin/TIBC, ferritin, serum transferrin receptor; biology: ferroportin, DMT-1, hepcidin, hephaestin, etc.

Proteins: SPE, prealbumin, retinol-binding protein, albumin, A-1-AT, TBG, CBG, orosomucoid (a1-acid-glycoprotein), A-2-macroglobulin, haptoglobin, ceruloplasmin, transferrin, hemopexin, immunoglobulins

Other proteins: C-reactive protein, fibrinogen, beta-2-microglobulin, serum amyloid A (SAA)

Immunologic procedures: IFE, IEP, IEF, 2-D gel electrophoresis

Immunoproteins: C3, C4, complement cascade, IgG, IgM, IgA, IgD, IgE, IgG subclasses

Lipids: cholesterol, triglycerides, apolipoproteins (apo A1, apo B, apo CII, apo E), HDL, LDL, VLDL, IDL, chylomicrons, Lp(a), Lp(X), LPE, ultracentrifugation, Friedewald equation, Frederickson classification, NCEP cutpoints, hsCRP, homocysteine

Hormones and binding proteins:
- Beta cell: insulin, C-peptide, proinsulin, IAPP (amylin)
- Alpha cell: glucagon
- Delta cell: somatostatin
PP cell: pancreatic polypeptide
Parathyroid gland: intact PTH (Ca++, PO4--, Mg++) versus true-intact, bio-active, cyclase-activating PTH
C-cells: calcitonin
Thyroid: T4, unbound T4, T3, unbound T3, rT3, TSH, TBG, TBPA (tranthyretin), T-uptake, T3-resin uptake, albumin, thyroglobulin, thyroid microsomal autoantibodies, thyroperoxidase autoantibodies, thyroglobulin autoantibodies, thyroglobulin, calcitonin
Adrenal cortex: cortisol, transcortin (CBG), aldosterone, DHEA and androstenedione, ACTH, CRH, 17-ketosteroids, 17-ketogenic steroids, 17-hydroxycorticosteroids (adrenal hypo and hyper function and endocrine hypertension)
Mineralocorticoid control: renin, angiotensinogen, angiotensin I, angiotensin II
Adrenal medulla: dopamine, HVA, norepinephrine, epinephrine, metanephrines, VMA, urine v. plasma assays, plasma free metanephrine
GH axis: GH, IGF-1, ALS, GHRH, somatostatin
Prolactin
Gonads: GnRH, LH, FSH, sex steroids (estrone, estradiol, estriol, testosterone, unbound testosterone, loosely-bound testosterone, dihydrotestosterone, inhibins)
Other hormones and hormone systems
  Anti-diuretic hormone (ADH) and water balance
  Oxytocin
  hCG and pregnancy
  Gastrin
  VIP (vasoactive intestinal polypeptide)
Note: understand all common hormone stimulation and suppression tests, e.g., ACTH stimulation test (1 hour and variations), overnight dexamethasone suppression test, low dose/high dose dexamethasone suppression test, metyrapone test, insulin tolerance test, arginine tolerance test, GH stimulation and suppression tests, calcitonin stimulation testing, GnRH test, IPSS testing, OGTT

Body fluids:
  Transudate v. exudate
  Chylous effusions
  CSF: electrophoresis, glucose, protein, cell counts, myelin basic protein, oligoclonal bands, CSF-transferrin
  Fecal fatty (24 hour)
  Fetal lung maturity testing: FLM, PG, L/S ratio, lamellar body counts

PGY-3, 4

Amino acids: inborn errors of metabolism: plasma/serum amino acids, urine organic acids, carnitine, long chain fatty acids

Bone markers: bone-specific alkaline phosphatase, osteocalcin, urinary hydroxyproline, N-telopeptides, C-telopeptides, pyridinium crosslinks: pyridinoline, deoxypyridinoline

Tumor markers
  PSA, free PSA, CEA, AFP, hCG, beta-hCG, CA125, CA19-9, CA15-3, estrogen and progesterone receptor measurements

Therapeutic drug monitoring
  Acetaminophen, salicylates, Theophylline, dilantin, phenobarbital, primidone, carbamazepine (Tegritol), clonazepam, ethosuximide, valproic acid, Li++, cyclosporin A, FK506 (tacrolimus), digoxin, quinidine, procainamide, NAPA, lidocaine, amikacin, gentamicin, kanamycin, tobramycin, vancomycin, methotrexate

Toxicology testing
  Cocaine, opiates (natural: codeine, morphine), synthetic and semi-synthetic opiates, barbiturates, benzodiazepines, alcohol, non-ethanol alcohols (osmolar gap), phencyclidine (PCP), LSD, GHB, hallucinogens, amphetamines, meperidine, methadone, EMITS, tox-lab TLC testing,
  Heavy metals: aluminum, cadmium, lead, arsenic, chromium, cobalt, copper, nickel, mercury, thallium

Viral serologies:
  HAVAb, HACAb-IGM, HBsAg, HBsAb, HBeAg, HBCAb-IgM, HBcAb, HBeAb, HCV Ab, HDV Ab, HDV Ab-IgM, RIBA, HIV EIA, HIB WB.
### Bench Rotation Checklist

<table>
<thead>
<tr>
<th>Specimen Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observe plating of various types of specimen (sputums, urine, wounds, etc).</td>
</tr>
<tr>
<td>Understand the use of each of the following media:</td>
</tr>
<tr>
<td>- Blood agar</td>
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<tr>
<td>- MacConkey agar</td>
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<tr>
<td>- Chocolate agar</td>
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<tr>
<td>- BCYE</td>
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<tr>
<td>- CAMPY</td>
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<tr>
<td>- Theyer Martin</td>
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<tr>
<td>- Anaerobic media (PRAS – PreReduced Anaerobically Sterilized)</td>
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<tr>
<td>- Thio</td>
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<tr>
<td>- Fungi - IMA, BHI, CHROMagar Candida, Sabouraud agar</td>
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<tr>
<td>Understand the specimen processing chart (what types of media are used for each culture type).</td>
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<tr>
<td>Observe a tech load a blood culture bottle into the instrument.</td>
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<tr>
<td>Look at several gram stains with med techs.</td>
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<tr>
<td>Perform a gram stain of your own throat swab.</td>
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</tbody>
</table>

### Blood Cultures

| Understand the principles of the BACTEC Fx instrument. |
| Learn the process of incubation, gram stain, plating, work up of isolates, and reporting. |
| Understand the use of the following media: Blood, Chocolate, MacConkey. |
| Observe a tech loading the blood culture instrument. |
| Read and interpret several Gram stains. |
| Understand how the Gram stain directs further work up (media selection, use of BCID). |
| Learn the Gram reaction and colony morphology for the most common organisms found in blood: |
| - Streptococcus |
| - Staphylococcus |
| - Enterococcus |
| - Corynebacterium (“Diphtheroids”) |
| - Bacillus |
| - Gram negative rods |
| Understand the use of biochemical tests in the identification of blood pathogens, for example: |
| - Catalase |
| - Coagulase |
| - Indole |
| - Oxidase |
| - PYR |

Know the common blood culture contaminants and what clues you can use to determine if they are contaminants vs. true pathogens.

### Urine Cultures

| Understand the use of the following media: Blood, MacConkey. |
| Learn the Gram reaction and colony morphology for the most common organisms found in urine specimen: |
| - E. coli and other Gram negative rods |
| - Corynebacterium |
| - Lactobacillus |
| - Staphylococcus |
| - Streptococcus |
| - Enterococcus |
| - Candida |
**Proteus**

Understand the use of biochemical tests in the identification of urinary pathogens, for example:
- Urea
- Nitrate
- Bile esculin
- Spot indole
- Oxidase
- Catalase
- PYR
- Motility
- VITEK

Understand the use and methods of quantitative cultures.

Observe and understand the use of the germ tube.

### Mycology

Understand the use of fungal media which includes:
- Cornmeal agar
- BHI – Brain Heart Infusion Agar
- IMA – Inhibitory Mold Agar
- CHROMagar Candida
- Potato dextrose
- Potato flake
- Sabouraud agar

Learn the most common yeasts that cause human disease and laboratory methods used to identify them, for example:
- Candida albicans
- Candida glabrata
- Other Candida species
- Cryptococcus
- Malassezia

Understands the use of tests for the identification of yeast such as:
- API
- Germ tubes
- Cornmeal Agar
- BCID
- MALDI-TOF
- CHROMagar

Observe the Lactophenol cotton blue procedure used to identify molds

Observe the performance of susceptibility testing on yeast using the Sensititre

Understand the method for processing and setting up fungal blood cultures

Learn the colony morphology and microscopic appearance of the common molds, for example:
- Aspergillus fumigatus
- Aspergillus flavus
- Aspergillus niger
- Aspergillus terreus
- Scedosporium apiospermum
- Fusarium
- Penicillium
- Dematiaceous molds: Alternaria, Curvularia, Bipolaris
- Zygomycetes: Rhizopus, Mucor, Absidia
- Dermatophytes: Microsporum, Trichophyton, Epidermophyton

Learn the colony morphology and microscopic appearance of the dimorphic fungi, for example:
- Histoplasma
- Blastomyces
<table>
<thead>
<tr>
<th>Coccidioides</th>
<th>Penicillium marneffei</th>
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<tbody>
<tr>
<td><strong>AFB</strong></td>
<td></td>
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<tr>
<td>Understand the use of AFB media which includes:</td>
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<tr>
<td>Middlebrook 7H11/S7H11</td>
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<tr>
<td>Chocolate agar</td>
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<tr>
<td>Lowenstein Jensen</td>
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<tr>
<td>MGIT</td>
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<tr>
<td>Read and understand the process of the Kinyoun stain</td>
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<tr>
<td>Read and understand the use of the Auramine-rhodamine stain</td>
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<tr>
<td>Understand precautions for working with possible contagious agents</td>
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<tr>
<td>Observe AFB processing and the importance of NALC and NaOH reagents</td>
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<tr>
<td>Understand approximate incubation times and temperatures for various AFB</td>
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<tr>
<td>Understand the principles of the BACTEC MGIT instrument</td>
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<tr>
<td>Understand the process for sending out mycobacteria for identification</td>
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<tr>
<td>Understand the process for requesting susceptibility testing</td>
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<tr>
<td>Observe and understand the use of the MTB amplification test</td>
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<tr>
<td><strong>Parasite ID</strong></td>
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<tr>
<td>Note- traditional Parasitology is no longer performed; only Blood parasite screen and Screen test for Strongyloides</td>
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<tr>
<td>Review the procedure for the BinaxNOW Malaria test</td>
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<tr>
<td>Read blood smears for the presence of blood parasites, such as:</td>
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<tr>
<td>Plasmodium</td>
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<td>Babesia</td>
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<tr>
<td>Microfilaria</td>
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<tr>
<td>Review CAP proficiency slides (stool O&amp;P, blood parasites) with a med tech</td>
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</tbody>
</table>
### Misc Bacteriology

Understand the principles and use of the following specialized tests: Modified Hodge, D test, RapID NH

Understand CLSI and laboratory guidelines for result interpretation and reporting

Understand the use of the CarbaR GeneXpert assay

#### Anaerobic Cultures

Understand the use and purpose of the following media:
- Anaerobic Brucella Blood agar
- Anaerobic PEA
- Anaerobic Brucella laked blood agar with kanamycin and vancomycin
- Bacteroides Bile esculin

Learn the Gram reaction and colony morphology of clinically important anaerobes:
- Clostridium
- Propionibacterium (Cutibacterium) acnes
- Bacteroides fragilis group
- Actinomyces
- Fusobacterium nucleatum
- Fusobacterium necrophorum
- Lactobacillus

Observe the use and interpretation of a rapid ANA test

#### Body Fluid Cultures

Understands the use and purpose of the following media: Blood, Chocolate, MacConkey, Thioglycollate broth.

Understands the interpretation of body fluid gram stains and how it affects the work-up of isolates.

Recognize Gram reactions and colony morphology of common organisms (pathogens and contaminants), for example:
- Staphylococcus aureus
- Coagulase negative staphylococci
- Group B Streptococcus
- Viridans Streptococcus
- Enterococcus
- Gram negative rods: Enterobacteriaceae (“enteric”)
- Pseudomonas
- Candida

Wound gram stains

Observe and understand the use of the Cryptococcus antigen test

Lactoferrin

#### Respiratory Cultures

Set up and read your own throat swab.

Understand the use of the following media: Blood, Chocolate, MacConkey.

Understand the utility of a direct gram stain; learn how to assess specimen quality.

Read and interpret several Gram stains.

Learn the Gram reaction and colony morphology for the most common organisms found in respiratory specimen:
- Streptococcus
- Staphylococcus
- Haemophilus
- Moraxella
- Klebsiella
- Pseudomonas aeruginosa
- Acinetobacter
- Eikenella
<table>
<thead>
<tr>
<th>Others: Nocardia, Actinomyces, Stenotrophomonas maltophilia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognize a Gram stain of an aspiration pneumonia.</td>
</tr>
<tr>
<td>Understand the different techniques and pathogens for patients with cystic fibrosis, for example:</td>
</tr>
<tr>
<td>Burkholderia cepacia</td>
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<tr>
<td>Mucoid Pseudomonas</td>
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<tr>
<td>Understand the use of biochemical tests in the identification of respiratory pathogens.</td>
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<tr>
<td>Understand the use and methods of quantitative cultures for certain specimen, including bronchioalveolar lavages.</td>
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<tr>
<td>Understand the difference in work up between throat cultures, sputum cultures, BAL cultures, etc.</td>
</tr>
</tbody>
</table>

### Wound Cultures

| Understands the use and purpose of the following media: Blood, Chocolate, MacConkey. |
| Understands the quantitation of organisms respective of specimen type: |
| By quadrant |
| > or < # of colonies (catheter tips) |
| Recognize Gram reactions and colony morphology of common organisms (pathogens and contaminants), for example: |
| Staphylococcus aureus |
| Staphylococcus epidermidis |
| Group A Streptococcus |
| Group B Streptococcus |
| Viridans Streptococcus |
| Enterococcus |
| Pseudomonas |
| Eikenella |
| Pasteurella |
| Corynebacterium (“Diphtheroids”) |
| Bacillus |
| Candida |

### Rapid Molecular Testing

| Become familiar with the following commercial testing systems: |
| VITEK II |
| RapID |
| Know the common wound culture contaminants and what clues you can use to determine if they are contaminants vs. true pathogens vs. normal flora. |

### STD Testing

| Focus Assay |
| HSV (will change to moderately complex test, no extraction required; live date to be determined) |

| Observe an RPR |