

## Hemodialysis: Central Venous Catheter (CVC) Blood Sampling

### Site Applicability

SPH In-Centre Hemodialysis Unit and PHC Community Dialysis Units

### Practice Level

Specialized: Nurses who have completed the required education, and provide nursing care in the Providence Health Care Renal Program, IV Therapy nurses, and Critical Care nurses.

### Need to Know

1. Sterile technique must be maintained when accessing the patient's vascular system (see [B-00-12-10043](#) or [B-00-12-10144](#))
2. Staff and patients must wear a mask. Nurses must also wear either goggles or face shield for protection from blood splatters.
3. Blood collection tubes shall be drawn in a specific order when obtaining multiple specimens (see [Appendix E](#))
4. Blood culture collection in-centre can be different from CDUs (see Appendices [A](#) and [B](#)).
5. IGRA is a relatively new test to detect infection with TB bacteria by measuring the level of interferon-gamma in a patient's blood sample after exposure to antigens specific to *M. tuberculosis*. Results are interpreted as positive, negative or uninterpretable.
6. New dialysis patients are screened for TB by performing IGRA only with exceptions that include patients who had previous documented reactive IGRA and/or documented TB or LTBI treatment within one week of their first chronic dialysis start.
7. Air embolism is a potential catastrophic complication of hemodialysis that can lead to death. To prevent air embolism from occurring, catheter ports must never be left unattended and open to air; port clamps must be closed when not being used to access the patient's bloodstream
8. Following aspiration of blocking agents from catheter lumens, an extra 5 mL of blood from each lumen should be withdrawn and discarded. The re-infusion method should not be used due to the risk of blood contamination and introduction of air embolism and blood clots. (A discard sample of blood is not required when obtaining blood cultures).
9. Collection of blood specimen(s) requires the use of a vacutainer or syringe and the appropriate blood specimen tube(s) (see [Appendix E](#)).
10. Alcohol based cleansing agent is used when cleaning hemodialysis catheter limbs and ports, only if 2% Chlorhexidine gluconate (CHG) with 70% isopropyl alcohol swabs is not available.
11. Hemodialysis catheters are available in variable lengths. The volume of each lumen is stamped on the lumens or lumen clamps. Prior to obtaining blood samples, the blocking agent must be removed and discarded.
12. Blocked or dysfunctional central venous catheters (CVC) are identified by difficult instillation or aspiration of contents in catheter lumen(s).

13. If unable to withdraw blocking medication from one or more lumens, attempt to flush CVC lumen(s), as per procedure [B-00-12-10144](#)
14. TEGO connectors: manufacturer recommends scrub each port with alcohol swab or CHG swab prior to assessing patency and obtaining blood specimen(s).
15. EDTA is a stronger calcium chelator and can lead to falsely low serum calcium levels if proper steps prior to blood draw are not taken

## Equipment and Supplies

1. Hemodialysis on-tray (if needed)
2. Masks (2)
3. Face shields or goggles
4. 10 mL luer lock syringes (2)
5. Alcohol swabs (6) if needed
6. Chlorhexidine Gluconate 2%(CHG) with Isopropyl Alcohol 70% swabs ( if needed)
7. Sterile gloves (if using see [B-00-12-10043](#))
8. Clean gloves (if using TEGO connectors)
9. 10 mL (2) or 20 mL (1) luer lock syringes [Extras for obtaining blood cultures]
10. Sharp needles 21G 1 TW (0.8 mm x 25 mm) (2) [if required in obtaining blood cultures from non-needle less port]
11. Sterile female transfer vacutainer device (Ref. # 8881225241)
12. Blood specimen tubes (see SPH: Phlebotomy quick reference guide)
13. IGRA tube sets
14. Specimen labels
15. Biohazard Ziplock bag (only if needed)

## Assessment

1. Assess integrity of CVC: dressing, lumens, lumen clamps.
2. Assess catheter-blocking agent: citrate 4%; heparin; antibiotic lock solution; KiteLock (EDTA)
3. Assess patency of CVC: blood supply from each lumen.

## Procedure

### A. For KiteLock [EDTA] Blocking Agents:

1. Withdraw blocking agent (5 mL of blood) from both catheter lumens and discard. This action prevents leaching of blocking agent from one lumen to another and also prevents contamination of blood specimen.
2. Withdraw 10mL of blood from both lumens and discard; then flush each lumen with prefilled 20 mL NS syringe.
3. Attach 10 mL syringe to each lumen and do in and out motion three times; then draw bloodwork Continue using [B-00-12-10144](#) as required.
4. Label all blood specimen(s) and send to laboratory as per unit specific protocol (See [Appendix C](#)).

**B. For Heparin Blocked Catheters:**

1. Perform heparin extraction method if INR bloodwork is required.
2. Hold the loading dose of heparin for that dialysis run and label/mark the blood specimen tube to indicate heparin contamination if heparin block is not removed from both catheter lumens and are flushed with normal saline; thus heparin may still be active systemically.

**Documentation****For Cerner Sites:**

1. Document procedures 2 & 3 in Cerner Nursing narrative notes for KiteLock (EDTA) blocking agents

**For Non-Cerner Sites:**

1. Hemodialysis Log – assessment, interventions, blood specimens obtained, type and amount of blocking agent used if appropriate.
2. Interdisciplinary Progress Notes – Same as above for patients who are admitted to hospital.
3. PROMIS Renal database – blood sample collected automatically entered by specific laboratory agencies

**Related Documents**

1. [B-00-12-10144](#) - Hemodialysis: Flushing and Capping Central Venous Catheters (CVC)
2. [B-00-12-10043](#) – Hemodialysis: Central Venous Access Dressing
3. [B-00-12-10058](#) - Hemodialysis: Alteplase (rt-PA, Cathflo): Instillation into Blocked Hemodialysis Catheter
4. [Laboratory accessioning document](#), Procedure and Criteria for Blood Specimen Collection, Sections 2 & 5

**References**

1. BC Centre for Disease Control Provincial Health Services Authority (2019). Retrieved July 21, 2022 from <http://www.bccdc.ca/resource-gallery/Documents/Communicable-Disease-Manual/Chapter%204%20-%20TB/4.0b%20TB%20Screening%20DST.pdf>
2. BC Centre for Disease Control Provincial Health Services Authority (2019). *Interferon Gamma Release Assay Testing Resource: Public health and Community Health Nurses in BC*. Retrieved on July 21, 2022 from [http://www.bccdc.ca/resource-gallery/Documents/Communicable-Disease-Manual/Chapter%204%20-%20TB/CPS\\_TB\\_IGRA\\_PublicHealth.pdf](http://www.bccdc.ca/resource-gallery/Documents/Communicable-Disease-Manual/Chapter%204%20-%20TB/CPS_TB_IGRA_PublicHealth.pdf)
3. BC Provincial Renal Agency Provincial Standards and Guidelines (2019). *Tuberculosis Screening & Follow-Up for Hemodialysis*. Retrieved on July 21, 2022 from <http://www.bcrenal.ca/resourcegallery/Documents/Tuberculosis%20Screening%20and%20Follow%20Up%20For%20Hemodialysis.pdf>

4. Counts, C. (Ed.) (6th Edition) (2015). Core Curriculum for Nephrology Nursing. Pitman, NJ: Anthony J.
5. Central Venous Catheter Blood Sampling. Elsevier Clinical Skills (2022). St. Louis, MO. Elsevier. Retrieved July 6 2022 from [www.elsevierskills.com](http://www.elsevierskills.com)
6. Infusion Nurses Society (INS). (2011). Infusion Nursing Standards of Practice. Practice criteria: blood sampling via a vascular access. Journal of Infusion Nursing, 34(1S), S1- S110, page S79.
7. Jang, W. (2011). Catheter exit site swab collection and blood culture collection, 6D hemodialysis [PowerPoint slides]. PHC Microbiology Laboratory and PHC Renal Education.
8. Jang, W. (2016). Labeling requirement- blood culture bottles [Email Memorandum]. Department of Pathology and Laboratory Medicine, PHC.
9. Molzahn, A., & Butera, E. (Eds.). (2006). Contemporary Nephrology Nursing: Principles and Practice. Pitman, NJ: Anthony J. Janetti.
10. PHC-Laboratory Services-Accessioning Manual (2021). Accessed at [www.connect.phcnet.ca](http://www.connect.phcnet.ca)

## Appendices

[Appendix A](#) – Hemodialysis In-Centre Blood culture

[Appendix B](#) - Guidelines for collecting blood cultures in CDUs using Life Labs

[Appendix C](#) - SPH- Blood Culture Specimen Labelling

[Appendix D](#) - TB T-SPOT (TB Gold IGRA) COLLECTION

[Appendix E](#) - SPH Phlebotomy and CVAD Quick Reference Guide

## Appendix A: Hemodialysis In-Centre Blood Culture

### Access

- From two different lumens of CVC – **no waiting time** between collections; indicate on the label if taken from arterial or venous lumen. **A syringe draw** should always be performed.
- From hemodialysis line (arterial port) – need to wait 5 minutes between collection if two sets are ordered. A syringe with sharp needle gauge #21 should always be used for non-needle less arterial port of the hemodialysis line. Use a luer lock syringe only with a needle-less arterial port.

### Exit site

- **Exit Site Form** – To be filled out each HD run
- **Exit Site Swabbing** – Clean first with sterile normal saline or sterile water; then take swab for culture and sensitivity.
- **Specimen labeling** – apply on the middle of the swab stick and ensure that expiry date and lot number are not covered. Mark specimen as collected and specify collection time if labels are printed prior to specimen collection; write "Hemodialysis catheter /HDC" on Sunquest generated label (2nd label)
- **Topical antibiotic** - do not apply unless ordered by MD/NP

### Culture bottles

- **Collect blood culture first** if other blood work is required. Use **two 10 mL luer lock syringes** or **one 20 mL luer lock syringe** to draw blood specimen from the access.

Use only **70% Isopropyl Alcohol swab** disinfect culture bottle



- Use **female transfer device** vacutainer to instill blood specimen into the culture bottles
- Transfer blood specimen into **orange culture bottle first** by using the **female transfer Device** to minimize putting air into the orange culture bottle (anaerobic)

## Appendix B: Guidelines for collecting blood cultures in CDUs using Life Labs

1. Please remember that **2 sets** of blood cultures must be obtained. At Life Labs the **first set** consists of **one anaerobic and one aerobic bottle** and the **second set** consists of **two aerobic bottles**. Collect anaerobic bottle first
2. The minimum wait time between drawing the two sets of blood cultures is **30 minutes**. If the patient refuses to wait 30 minutes or if other circumstances prevent you from waiting 30 minutes (e.g. patient decompensates), space the collections as far apart as possible.
3. To obtain an adequate yield, draw 10 mL of blood for each bottle.

### Culture bottles:

- Disinfect the rubber port of the culture bottle with 70% alcohol prior to filling. Use one swab per bottle and allow it to dry completely. Do NOT touch the area after cleaning.
- Always collect blood cultures prior to other blood specimens.
- 1 x 20 mL or 2 x 10 mL syringes may be used to collect the blood. If using a 20 mL syringe, inject 10 mL of blood into the anaerobic bottle first to avoid injecting air. If using 2 x 10 mL syringes, use caution to avoid injecting air into the anaerobic bottle.
- If using a syringe to collect the specimen (e.g. from the arterial port of the extracorporeal circuit), do not change the needle before filling the bottles. Indicate on the requisition or bottle that a syringe was used.
- Use large blood collection set with male adapter vacutainer that fits culture bottles Mix the blood and culture medium by swirling the bottles 8 to 10 times. The blood must be fully mixed to prevent clotting and to neutralize bacterial inhibitors.

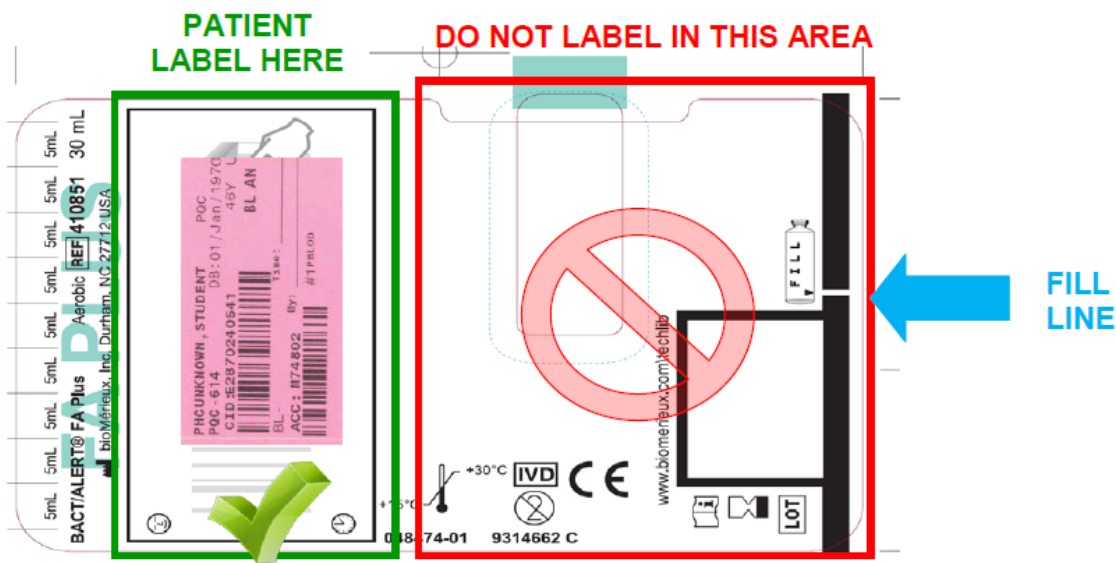
### SCM for Non-Cerner Sites

- Enter order as blood culture x 2 in SCM with priority HD stat or time critical.
- Generic labels will be printed but DO NOT use these labels.
- Release the order from SCM and two sets of bar code labels with an accession number will be printed
- In SCM, mark the blood collected and send specimen bottle to laboratory

## Appendix C: SPH- Blood Culture Specimen Labelling

- Gently mix bottles by inversion (8 to 10 times) to prevent clotting
- Label bottles [check name, date of birth(DOB)/unique patient identification number- medication record number(MRN)] with SCM collection
- With the introduction of the new automated blood culture system, label blood cultures accordingly:
  - Indicate date/time and initial each bottle
  - Patient label barcode is applied vertical
  - Avoid “volume window” o Avoid 2D barcode, bottle lot# and expiry date
  - One label for each bottle. Try to label over bottle label (not too high, not too low)
  - Inoculate bottles to the “**Fill**” line to indicate the required volume of blood for collection (adults 8-10 mL per bottle)

Paediatric (PF Plus) and TB (Myco/F Lytic) bottles do not have a fill line.



Please don't hesitate to contact me if you have any questions. I can be reached by email [wliang@providencehealth.bc.ca](mailto:wliang@providencehealth.bc.ca) or by phone at 604-806-8369.



**Appendix D: QuantiFERON® TB Gold Plus Collection and Tube Handling Technique**

1. Samples for QuantiFERON® TB Gold Plus should always be collected before dialysis, **NOT during or after dialysis.**
2. Wait for next dialysis run to collect the sample pre dialysis, if hemodialysis has already commenced or completed. No collections from 1500 to 1700 hour on Saturdays/Sundays and STAT holidays
3. The volume of the samples is critical to be on the black mark line (correct vacuum should only fill to the black line of the tube). To ensure proper fill, wait for full second after blood flow stops.
4. Mix blood well (fully invert 10 x) in order to coat the entire glass surface.
5. Send to laboratory immediately after collection since the test is time critical and the tubes require to be placed inside the incubator within twelve hours of collection.
6. May use the tube system to send the specimens.
7. Ensure that sample collections for the weekends (Saturday & Sunday) during the day should be sent to the laboratory on or before 1400 hour due to laboratory staffing time schedule.
8. Send the specimen via pneumatic tube as soon as possible.
9. For Sunday evenings (e.g. for Nocturnal shift) collections should be done after 2030 hour and ensure that blood specimens are sent to laboratory as soon as possible via the pneumatic tube system or within the twelve hours of collection time



# Blood collection and tube handling technique

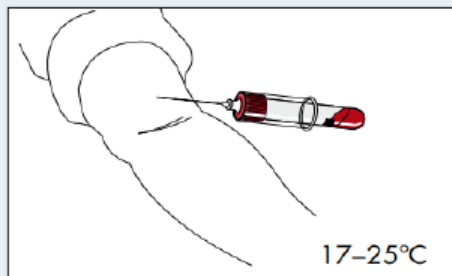
## QuantIFERON®-TB Gold PLUS

### Labelling specimens:

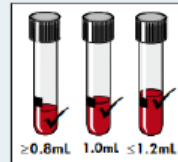
- DO NOT cover visible tube window or black fill mark
- Record collection date & time on requisition

### 1. Blood Collection

**BEFORE DIALYSIS**



Collect 1 mL into each tube. Hold tube on needle for 2-3 seconds after flow ceases. Repeat tube if not close to black fill line.

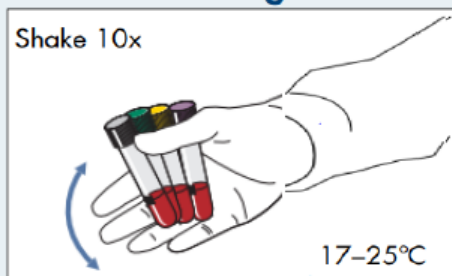


### Order of collection:

1. Tall Green (purge)
2. Gray Tube
3. Green Tube
4. Yellow Tube
5. Purple Tube



### 2. Tube Shaking



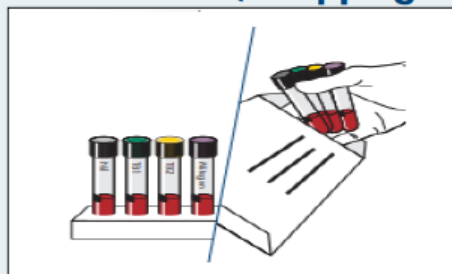
Immediately after filling tubes, shake them ten (10) times, just firmly enough to ensure entire inner surface of tube is coated with blood, to solubilize antigens on tube wall.



Tubes should be between 17-25°C at time of blood filling.

Over-energetic shaking may cause gel disruption and could lead to aberrant results.

### 3. Incubation / Shipping



**Incubate at laboratory.** Ship tubes to laboratory at 17-27°C (blood must be incubated at 37°C as soon as possible and within 16 hours of collection). Record as "not incubated".

Comprehensive instructions for use can be found in the QuantIFERON®-TB Gold Package Insert, which is available in 25 different languages, on [www.QuantiFERON.com](http://www.QuantiFERON.com).





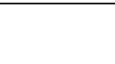




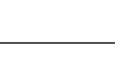







Contact us today or visit [www.QuantiFERON.com](http://www.QuantiFERON.com)



## Appendix E – SPH Phlebotomy and CVAD Quick Reference Guide

SPH Phlebotomy and CVAD Quick Reference Guide

January 2019

Order of Draw	Tube Top Colour (additives) – label code	Tests available via SCM at St. Paul's Hospital Laboratory	Mix tube # of times
<b>NOTE: Perform line maintenance procedures as per practice guidelines before accessing CVAD.</b>			
	<b>Green</b> – Aerobic resin <b>Orange</b> – Anaerobic <b>Yellow</b> – Additive <b>Black</b> – Mycobact (TB)	<ul style="list-style-type: none"> <li>* Blood Cultures: <ul style="list-style-type: none"> <li>&gt; <b>Vacutainer / Butterfly (Wingset) Method</b> – 1<sup>st</sup>: <b>Green (aerobic)</b> 2<sup>nd</sup>: <b>Orange (anaerobic)</b></li> <li>&gt; <b>Syringe Method with Transfer Device</b> – 1<sup>st</sup>: <b>Orange (anaerobic)</b> 2<sup>nd</sup>: <b>Green (aerobic)</b></li> </ul> </li> </ul>	8
	<b>Dark Blue</b> (no additive) – NVY	<ul style="list-style-type: none"> <li>Copper, Selenium, Zinc</li> </ul>	0
	<b>Dark Blue</b> (K2EDTA) – DKBLUE	<ul style="list-style-type: none"> <li>Aluminum (Tube supply kept in Accessioning Supervisor office). <b>Collect separately from other samples.</b></li> </ul>	3
	<b>Light Blue</b> (Sodium citrate) – BLUE	<ul style="list-style-type: none"> <li>INR, PTT, Fibrinogen, D-Dimer, TT, Low Molecular Weight Heparin</li> <li>Clotting factors, Protein C &amp; S, Von Willebrand Factors,</li> <li>DRVVT, INHIBS, platelet aggregations, HITS</li> </ul>	3-4
	<b>Plain Red</b> (clot activator) – RED	<ul style="list-style-type: none"> <li>Calcitonin (on ice), Progesterone, Estradiol, Cryoglobulin (special collection), Tricyclic Screen</li> <li>Amitriptyline, Desipramine, Imipramine, Nortriptyline, Olanzapine, CAS, Tissue Typing, CH50</li> </ul>	5
	<b>Gold</b> (SST = gel & clot activator) – GOLD	<ul style="list-style-type: none"> <li>Ionized calcium (whole tube), IPTH</li> <li>α-1-Antitrypsin (AAT), Ceruloplasmin, Complement (C3, C4)</li> <li>Electrophoresis, Free Hemoglobin, Haptoglobin, Total Protein</li> <li>Immunoglobulins (A, G, M), Lithium, Pre-albumin, B12, Cortisol, DHEA</li> <li>Digoxin, Ferritin, FSH, FT3, FT4, Growth Hormone, LH, Prolactin, PSA</li> <li>Testosterone, TSH, Thyroglobulin, ATPO (Thyroperoxidase antibody)</li> <li>Apo-A, Apo-B, Cholesterol, HDL cholesterol, Triglycerides (fasting), C-Peptide (fasting), IGF1, Insulin (fasting), 25-hydroxy Vitamin D</li> <li>Lipoprotein A (LPa), IgG subclasses,</li> <li>MONO, Heparin induced thrombocytopenia by Elisa (HITE)</li> </ul>	5
	<b>Gold (Micro &amp; Virol)</b> (SST = gel & clot activator) – GOLD	<ul style="list-style-type: none"> <li>Cryptococcal Antigen, Hepatitis A/B/C antibody &amp; serology</li> <li>CMV serology, HIV serology, Varicella Zoster</li> </ul>	
	<b>Gold (Send out)</b> (SST = gel & clot activator) – GOLD	<ul style="list-style-type: none"> <li>Syphilis, FTA, Toxoplasmosis, H. Pylori, Rubella, Herpes Simplex, Epstein-Barr Virus, Gastrin (Ice – fasting)</li> <li>AMA, APCA, ASMA, Anti-neutrophilic cytoplasmic antibody (ANCA), DSDNA (double strand), CPLX, GBM, Liver Kidney Microsomal (LKM1), Anti S. Cerevisiae (ASCA), Tissue Transglutaminase (TTG), Anti-cardiolipin Ab, Anti-histone, ANAEB (ENA, ANA)</li> </ul>	5
	<b>Light Green</b> (PST = lithium heparin & gel) – LT GRN	<ul style="list-style-type: none"> <li>Albumin, Alkaline phosphatase, ALT, Amylase, AST, BUN (urea), BNP</li> <li>Carboxyhemoglobin, Calcium, Chloride, Carbon Dioxide, CPK</li> <li>Creatinine, CRPB, GGT, Glucose (random or fasting), HCG Lipase, LD</li> <li>Magnesium, Methemoglobin Sodium, Potassium, RNLP, Phosphorus</li> <li>Transferrin, Total bilirubin, Troponin-T, Uric Acid,</li> <li>Acetaminophen, Ethanol, Salicylates, Ketone, Osmolality</li> <li>Carbamazepine, Phenytoin, Valproic Acid, Tobramycin, Vancomycin</li> </ul>	8-10
	<b>Light Green (Sendout)</b> (PST = lithium heparin & gel) – LT GRN	<ul style="list-style-type: none"> <li>Gentamicin, Rheumatoid Factor (RF), Phenobarbital, Theophylline</li> <li><b>Ammonia (on ice), Direct Bilirubin</b></li> </ul>	
	<b>Dark Green</b> (Sodium heparin) – DRK GRN	<ul style="list-style-type: none"> <li>Lead, Mercury</li> <li>Immune Cell Marker, Cytogenetic testing</li> <li><b>Hepatitis for Hemodialysis patients only</b></li> </ul>	8-10
	<b>Dark Green (Send out)</b> (Lithium heparin) – DRK GRN	<ul style="list-style-type: none"> <li>TB Interferon Gamma Release Assay (by special request).</li> <li>TB Quantiferon TB Gold TBQS – 3 tube special set – supply in Accessioning Supervisor's Office.</li> </ul>	8-10
	<b>Lavender 3 mL</b> (EDTA) – LAV	<ul style="list-style-type: none"> <li>Apolipoprotein E Genotype, Alpha 1 Antitrypsin Phenotype, Hgb A1C</li> <li>Homocysteine (on ice), ACTH (on ice), Renin (on ice), Aldosterone</li> <li>Cyclosporine, Tacrolimus</li> <li>CBC + Diff, HSR, Reticulocytes, Morphology, Malaria, Coombs (DAT)</li> <li>Hemoglobin electrophoresis, Sirolimus, HLA B5701</li> </ul>	8-10
	<b>Lavender 6 mL</b> (EDTA) – TALL LV	<ul style="list-style-type: none"> <li>Hepatitis B DNA, HHV 8 DNA PCR, HCV RNA PCR, HCV RNA Genotype, HIV DNA PCR, HIV Genotyping, CMV Antigenemia</li> <li>HIV Viral Load, BK virus PCR</li> <li>Prothrombin Gene mutation (TDNA), Factor 5 Leiden (TDNA)</li> <li>Crossmatch (XMATCH)</li> </ul>	8-10
	<b>Black</b> (Sodium citrate) – BLK	<ul style="list-style-type: none"> <li>ESR</li> </ul>	3-4
	<b>Yellow ACD A 8.5 mL</b> (Acid Citrate Dextrose)	<ul style="list-style-type: none"> <li>HSPP (on Friday after 1400hr and weekend only)</li> </ul>	8-10
	<b>Yellow ACD B 6mL</b> (Acid Citrate Dextrose)	<ul style="list-style-type: none"> <li>B27</li> </ul>	8-10
	<b>Grey</b> (Fluoride K Oxalate) – GREY	<ul style="list-style-type: none"> <li>Lactate</li> </ul>	8-10

For any test not listed, please call St. Paul's Lab at 604-682-2344 Local 63612. For more complete test menu, <http://www.providencelaboratory.com/index.php>

**Developed By:**

Nurse Educator, Renal Program

**Persons and Groups Consulted**

Renal Clinical Practice Group

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