







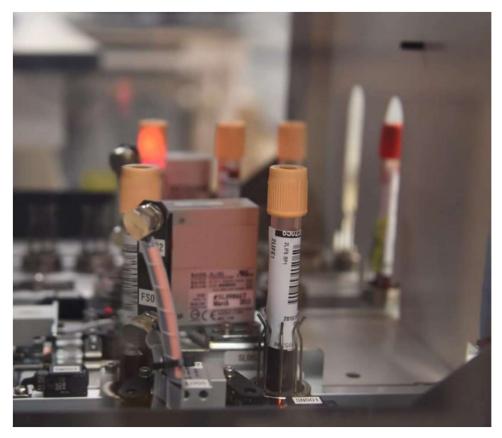
IN THE DEPARTMENT OF LABORATORY MEDICINE...

To better serve our patients in the hospital and in our healthcare system, and to process the samples efficiently, we equipped our laboratory with Laboratory Automation System and other instruments.





Better equipment comes with more complex technologies

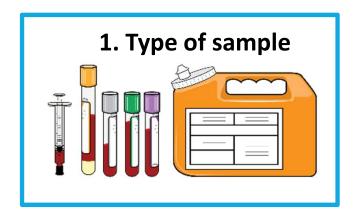


We have barcode readers and sensors to automate the process.

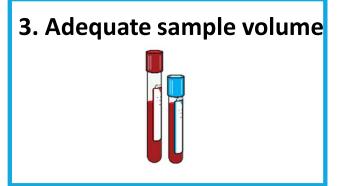
AUTOMATION = FASTER TAT!

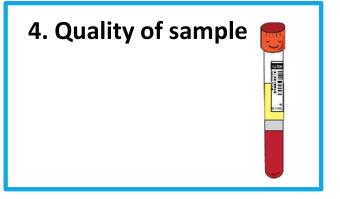


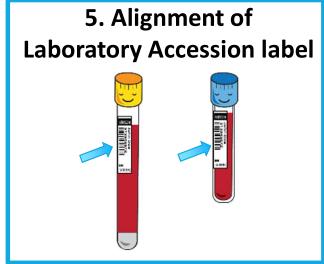
Points to Note for Good Sample Results



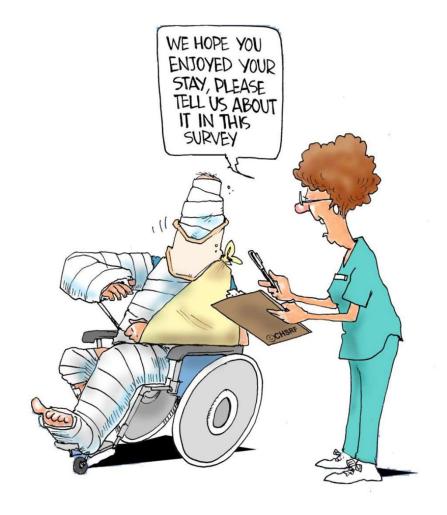












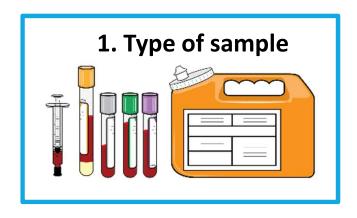
PLEASE HELP US TO HELP YOU...

To IMPROVE PATIENT'S EXPERIENCE DURING THEIR STAY:

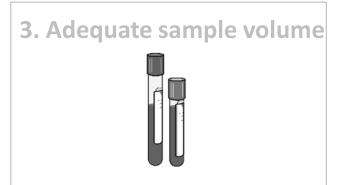
- Reducing redraw
- Improving the results TAT



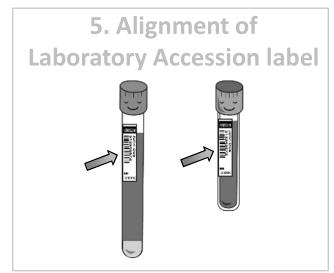
Points to Note for Good Sample Results













1. Type of Sample

It is important to ensure the correct type of sample is collected and sent to our laboratory as soon as possible for analysis.

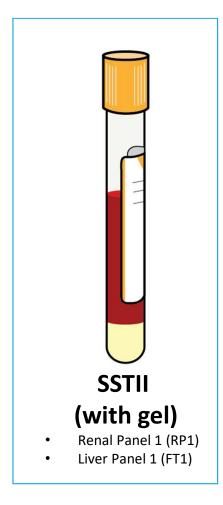
- 1. Samples with correct tube type
- 2. Samples with correct preservative

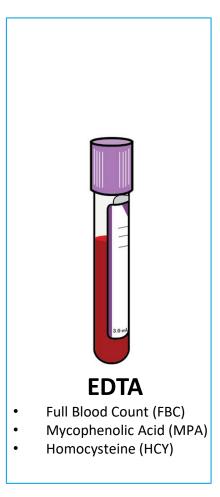


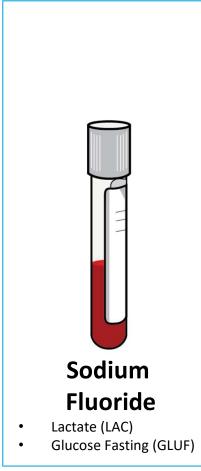
Please refer to our test catalogue for additional information on sample requirements, collection procedures, reference ranges as well as relevant information on our services.



1. Type of Sample – Tube Type







- ✓ Check which tube type is appropriate for which test before collecting sample from patient
- ✓ Different tube types contain different preservatives which may interfere with results

Please refer to our test catalogue for additional information on sample requirements, collection procedures, reference ranges as well as relevant information on our services.



Urine Samples – Correct Preservatives





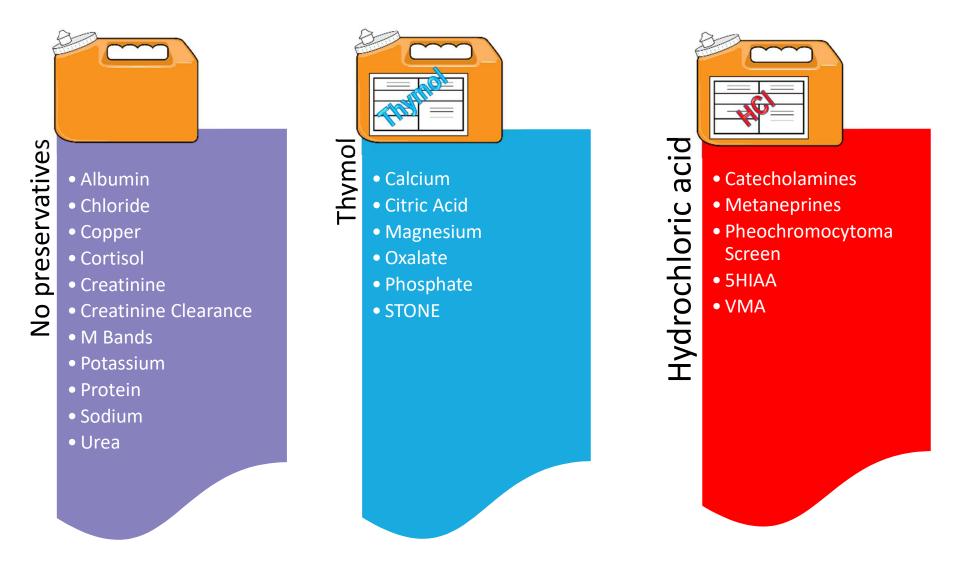


Screw cap securely, but do not over tighten → Avoid leakage

- Containers cannot be use interchangeably
- Boric acid interferes with pH results and denatures protein



Use Correct Preservatives to Avoid Recollection



Please refer to our test catalogue for additional information on sample requirements, collection procedures, reference ranges as well as relevant information on our services.



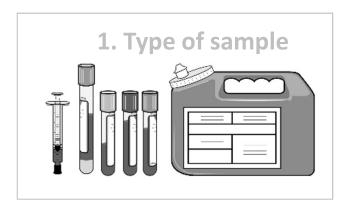
Urine Preservative Guide

In cases whereby there is a combination of tests for urine samples, please refer to the guide for appropriate preservatives.

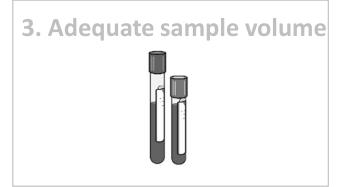
Test	Random	24h Urine	Diet/Drug Restrictions	No preservative	3 g Thymol	20 mL 6N HCI	10 g Boric Acid
Albumin	Y	Υ	NIL	OK	OK		
Amylase	Υ	N	NIL	OK			
5HIAA	N	Υ	Diet			OK	
Aldosterone	N	Y	NIL				OK
Calcium	Y	Y	Drug		OK	OK	
Catecholamines	Υ	Y	Drug			OK	,
Chloride	Y	Υ	NIL	OK			
Citric acid	N	Υ	NIL		OK	OK	
Copper	N	Υ	NIL	OK			
Cortisol	N	Υ	NIL	OK			
Creatinine	Υ	Y	NIL	OK	OK	OK	
M Bands	N	Υ	NIL	OK			
Magnesium	N	Υ	NIL		OK	OK	
Metanaphrines	Υ	Y	Drug			OK	
Oxalate	N	Υ	Drug		OK	OK	
Phosphate	N	Υ	NIL		OK	OK	
pH, Urine	Y	N	NIL	OK	OK		
Potassium	Y	Y	NIL	OK	OK		
Sodium	Y	Y	NIL	OK	OK		
Total Protein	Υ	Υ	NIL	OK	OK		
Urea	N	Υ	NIL	OK	OK	OK	
Uric Acid	N	Υ	Diet		OK		
Vanillyl Mandelic Acid/ Homovanilic Acid	Y	Υ	Diet			OK	
Panel/Profile							Ī
Creatinine Clearance Test	N	Y	NIL	OK	OK	OK	
Creatinine Clearance & Protein, Urine Profile	N	Y	NIL	ОК	OK		
Pheochromocytoma Screen	N	Y	Drug			OK	
Stone Panel	N	Y	Diet/Drug		OK		
Neuroblastoma	Y	N	NIL	OK			

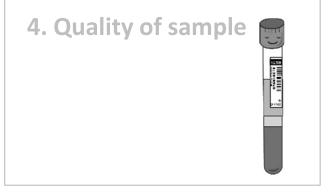


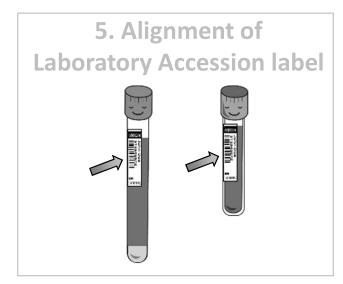
Points to Note for Good Sample Results





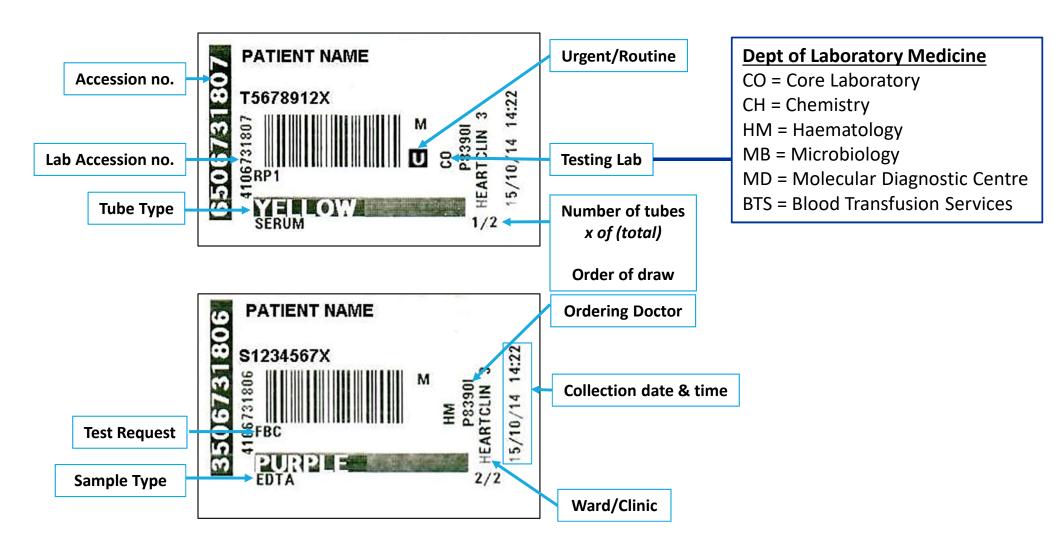






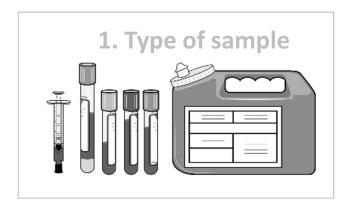


2. Information on iSMART Label

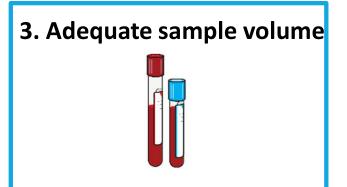




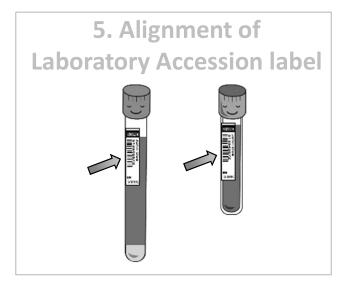
Points to Note for Good Sample Results





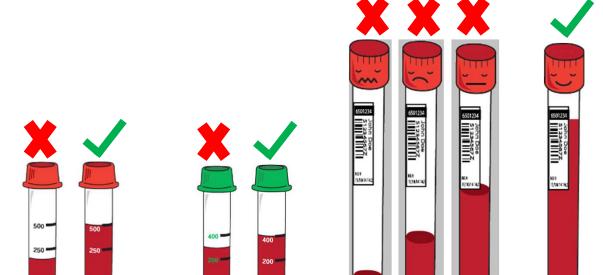




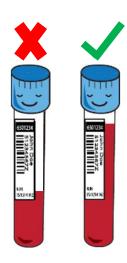




3. Adequate Sample Volume



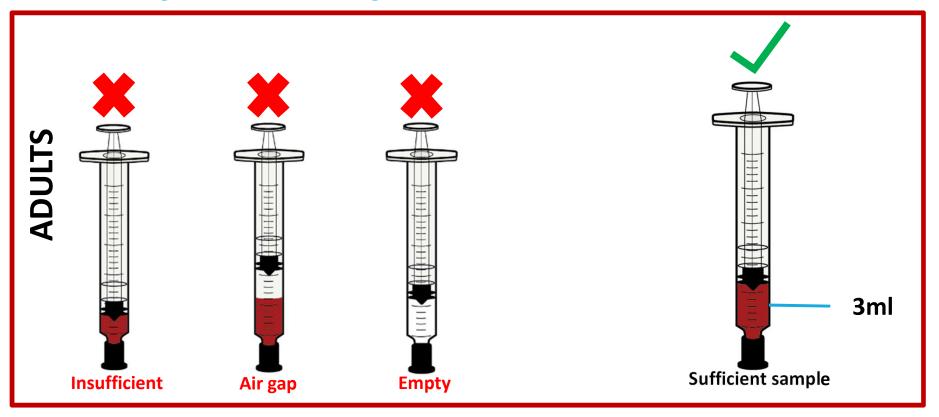
Having sufficient blood/specimen levels ensure patients' samples can be processed on the Laboratory Automation as soon as possible, without manual intervention.

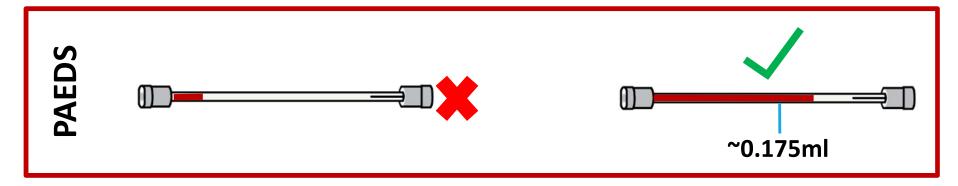


Sodium Citrate Tube Needs to be 90% filled Having sufficient blood/specimen ensures the correct blood:anticoagulant ratio to prevent dilution of coagulation factors.



3. Adequate Sample Volume – Blood Gases

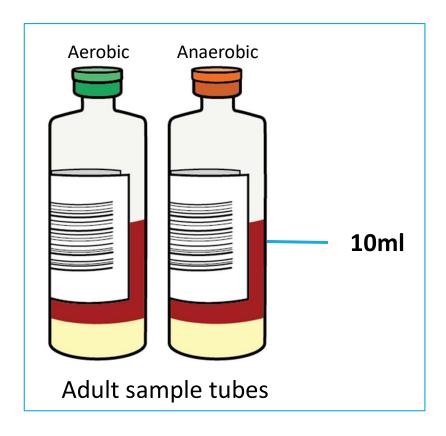


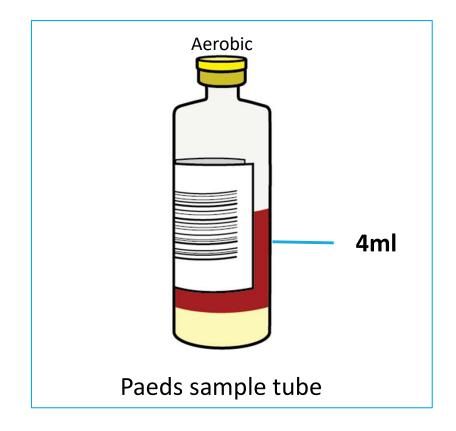




3. Adequate Sample Volume – Blood Cultures

Blood Culture bottles needs to be sufficiently filled



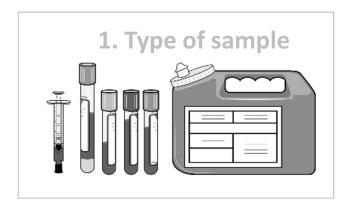


Lower blood volumes leads to

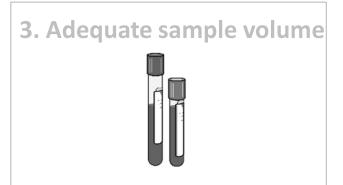
- False negative results
- Slower time to detection and recovery of organisms

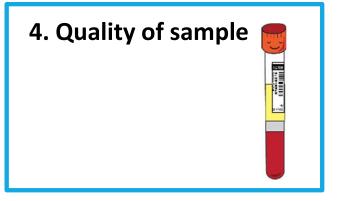


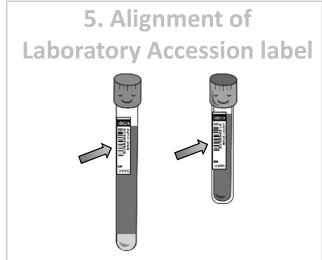
Points to Note for Good Sample Results







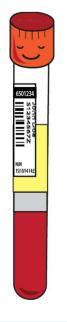






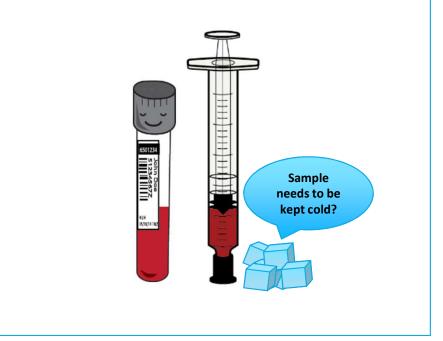
4. Quality of Sample

Recommended to separate serum/plasma from blood cells within **TWO hours** of sample collection.



Appropriate condition of the sample for the test

- **✓** Temperature
- ✓ Wrapped with foil



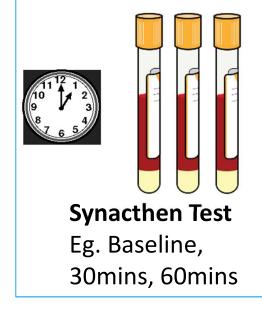
Please refer to our test catalogue for additional information on sample requirements, collection procedures, reference ranges as well as relevant information on our services.

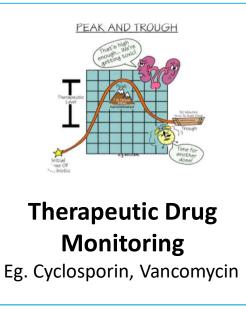


4. Quality of Sample - Collecting at the right time





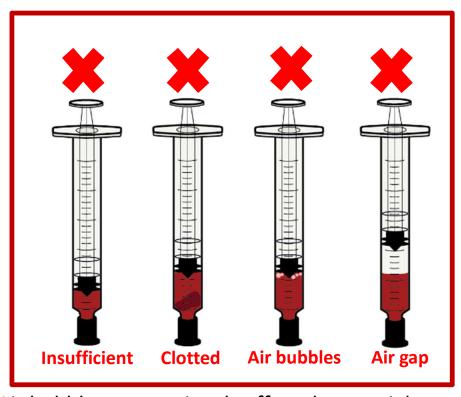


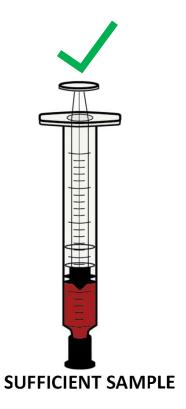






4. Quality of Sample – Blood Gases



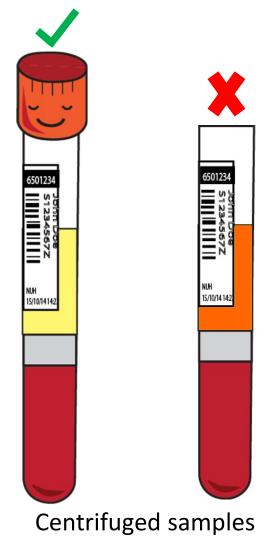


Air bubbles may seriously affect the arterial sample, parameters related to pO2 will be biased

$$\longrightarrow \uparrow pO_2, \downarrow pCO_2, \uparrow O_2$$
 saturation



4. Quality of Sample



What causes haemolysed samples?

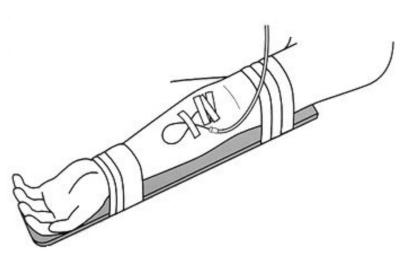
- Leaving tourniquet on for extended time (> 1 minute)
- Excessive fist clenching
- Vigorous mixing of blood tube
- Purging blood from syringe to vacutainer via needle
- Residual alcohol from wet swab
- Traumatic draw (collapsed vein/excessive probing)

Consequences of haemolysed samples

- Falsely elevated Potassium and enzyme levels
- Inaccurate results
- Result will be invalidated if there is gross haemolysis
- A repeat sample may be required



4. Quality of Sample



What causes drip arm contaminated samples?

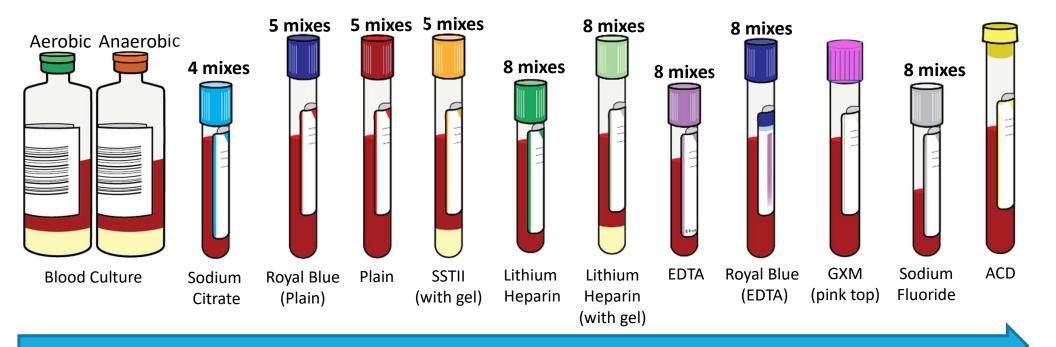
Blood taken from the arm which an IV drip line was inserted

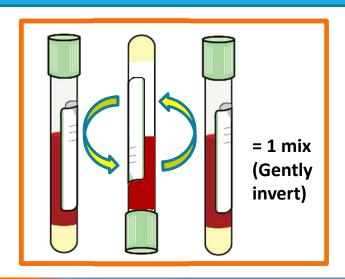
Consequences of drip arm contaminated samples

- Increased drip analytes e.g. Glucose, Potassium
- Dilutional effect which lowers other analyte concentrations
- A repeat sample must be taken



Order of Draw



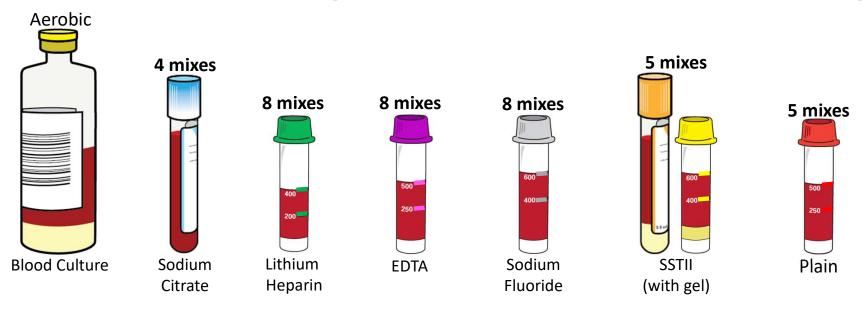


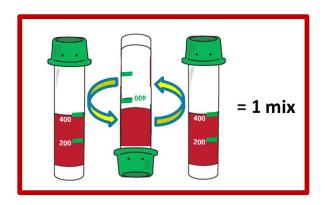
NOTE:

- 1. Tourniquet time ≤ 1 minute
- 2.Use a **plain (red)** discard tube when using a **butterfly needle** if the first tube collected is **sodium citrate (blue)**
- 3. **Draw blood culture bottles first** (Aerobic followed by Anaerobic)



Order of Draw (Microtainer/Paeds Tube)





MIX ADEQUATELY!

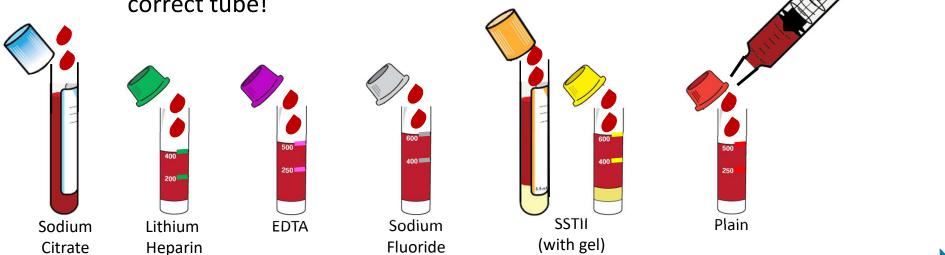
If not mixed adequately, tubes with anticoagulants (SSTII and red tubes) will not clot completely.



Order of Draw (Microtainer/Paeds Tube)

✓ If aliquoting from syringe, DO NOT purge blood from syringe to vacutainer via needle as it will cause hemolysis of the precious paeds blood sample.

✓ BE ALERT to cap the correct colour cap to the correct tube!

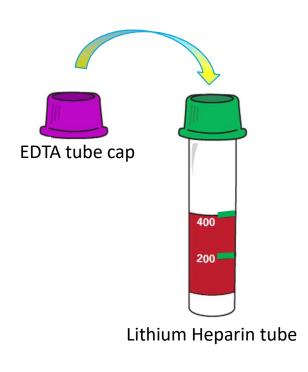


Remember to gently invert tubes after aliquoting to mix the anticoagulant.

Please refer to Lab Medicine > Test Catalogue > Test Collection Information > Paediatrics Collection Guide for more information on number of blood tubes to collect for tests required.



4. Quality of Sample – Order of Draw



What causes EDTA contaminated samples?

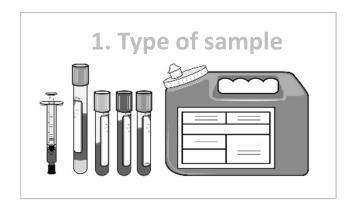
- 1. Incorrect order of draw (EDTA tube drawn before SST or Red top tube)
- 2. The wrong (EDTA) cap is being replaced on the lithium heparin green top tube for plasma collection
- This causes EDTA contamination in serum tubes.

Consequences of EDTA contaminated samples

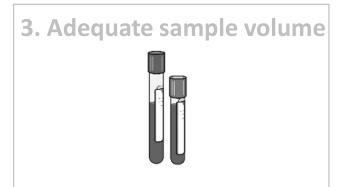
- Falsely elevated Potassium
- Falsely low Calcium and ALP results
- A repeat sample must be taken



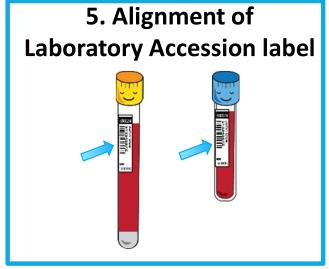
Points to Note for Good Sample Results









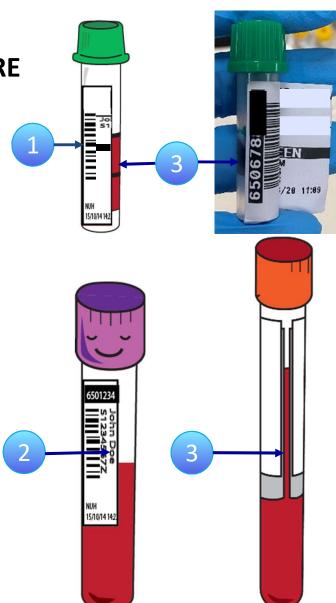




5. Labelling Sample Tubes Correctly

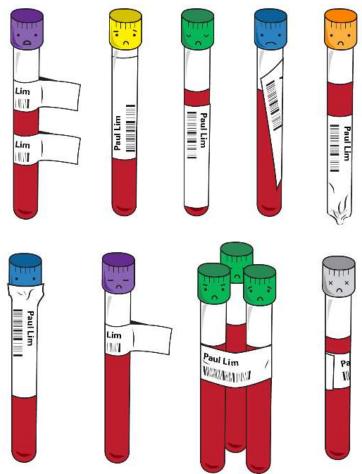
When sticking labels on sample tubes, MAKE SURE

- 1 Barcode is aligned straight for analyser barcode readers to read
- 2 Unique Identifiers are visible
 - ✓ Patient Name
 - ✓ Patient I/C Number
- 3 Leave a visible window to allow laboratory personnel to check





5. Labelling Sample Tubes Correctly



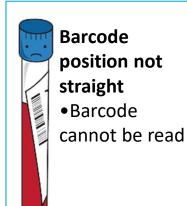
UNACCEPTABLE EXAMPLES OF SPECIMEN LABELLINGS

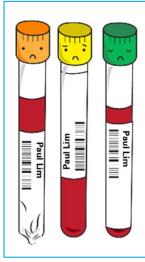
These types of specimen labelling are not accepted by our Laboratory Automation System

- •Manual intervention is required to reprint the appropriate labels
- Causes increased result turnaround time
- •Results in a longer waiting time for the patient = Unhappy experience for patient



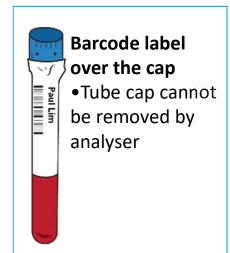
5. Labelling Sample Tubes Correctly

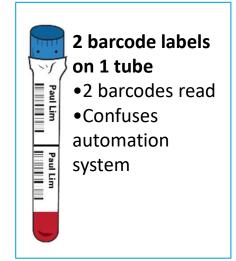


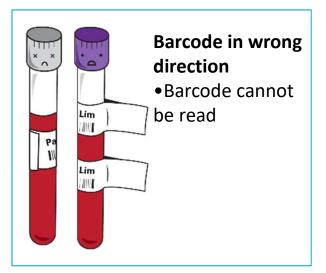


Barcode position too low

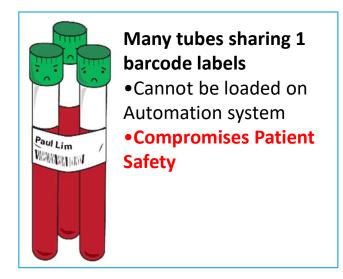
- •Barcode cannot be read
- •Wrinkled label at the bottom of tube may cause mechanical error













Group and Crossmatch Tube

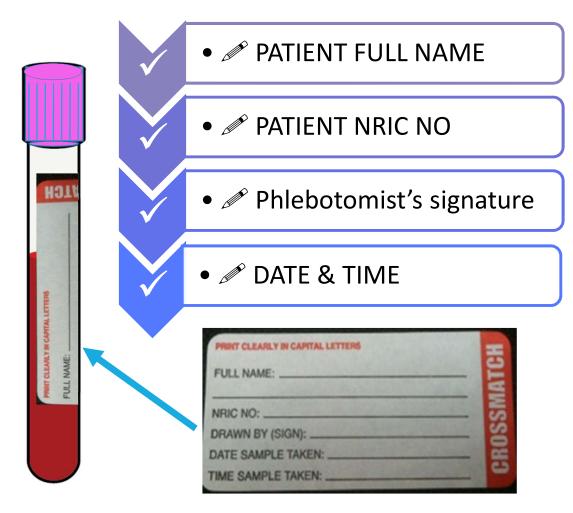
ALWAYS check the identity of the patient and labels must be hand-written



Samples collection MUST be a continuous process

To prevent transcription errors

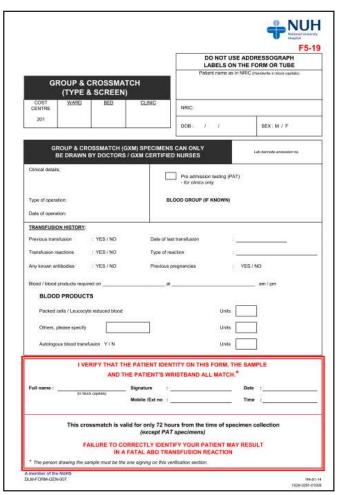
A leading cause of fatal transfusion reactions



Please refer to Lab Medicine > Test Catalogue > Test Collection Information > Blood Transfusion Services Collection Information



Group and Crossmatch Form



			Lab	Acon No:	
T	University Hospital			e: DFR 1099 Test li :: G6549672R	
BTS			Male	Malay	Filipino
Clinic: Medicine	CLD		DOE	: 17-Apr-1965	Age: 45Y 0M
Requestor: A VA	THSALA	MCR NO: 027478	Gase Case	No: 1510100752F	
Consultant: A VA	THSALA	MCR NO: 02747E	3	1510100	7525
Specialty: Anaes	thesia				
NONEMERGI	ENCY For or	peration at specified time	•	Date/Time: 30-Apr-	2010 10:00
atest Hb: 0.0 g	/dL Late	est PLT: 0 10^9/L	Latest PT: 0.0	Sec Latest	PTT: 0.0 Sec
Previously Trans	fused: N	Transfusion Re	eaction:	Previous	Pregnancies:
Cnown Antibodie	a. M	Danete	ol Blood Bowirome	ent Indicator: N	
Known Antibodie	15. IN	Specia	al piood requireme		
Specify Antibodic Clinical Diagnosi	es:	Specia Releva	al Blood Requireme ant History / Finding	ent:	
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- PATIENT NAME
- PATIENT NRIC
- DATE OF BIRTH



Give history



Dated & signed by phlebotomist

Paper Form

Aurora Form



Toxicology Forms

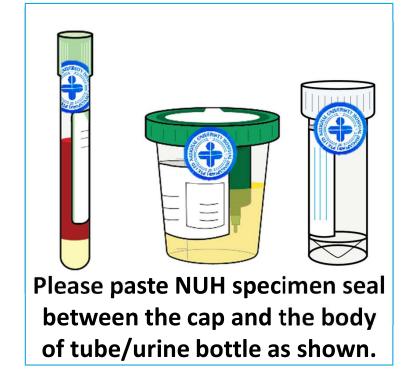
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REQUE	ST FOR TOXICO		PATIENT'S P.		
UNIT	WARD	BED	SEX/BIRTH	DATE / RACE:	
			OLICE CASE		FOR TOXICOLOGY LAB USE: Received by: Date:
	INCES ERLY BEHAVIOUR: TED POISONING	S ROAD T ☐ OTH	RAFFIC ACCIDE		Jate.
SPECIMEN S	SUBMITTED			LUDINE TI eto	A GOSS
SPECIMEN S BLOOD (TEST REQUI	SUBMITTED (Heparinised, Time	Taken:] URINE STO	MACH ASPIRATE OTHERS
SPECIMENS BLOOD (TEST REQUI TEQUIRES 2 ml	SUBMITTED (Heparinised, Time ESTED (Please tick of specimen)	Taken :t. Please note tha) [URINE STO	MACH ASPIRATE OTHERS
SPECIMEN S BLOOD TEST REQUI requires 2 ml ALCOHOI TOLUENE	GUBMITTED (Heparinised, Time ESTED (Please tick of specimen)	Taken : t. Please note that de alcohols & other ROAD TRAFFIC) [the each test requirement volatiles*) CASE	URINE STO Tes at least 1 ml of si METFORMIN SULFONYLU OTHERS (as	MACH ASPIRATE OTHERS
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Alcohol must not be used either in swabbing the area to be punctured or for sterilising the hypodermic needle

* Please refer to page 2 for list of analytes

You can obtain the form at Labmed resources > eForms > General Lab Forms > Toxicological Investigation





SEND COMPLETED FORM AND SAMPLES WITH NUH SPECIMEN LABELS TO THE LAB.



Timed Urine



24-hour Urine Collection Patient Instructions

Your doctor has ordered a urine test that requires you to collect all urine that you pass for the next 24 hours. For accurate results, it is important to collect all your urine for exactly 24 hours.

Please read and follow the instructions carefully. Make sure you are prepared before starting the collection.

Contents of the kit:

One 24-hour Urine Collection Patient Instructions Sheet

One large orange container

One small green-capped container

One biohazard ziplock bag (for returning urine container)

Preparation:

- P1 Some tests require dietary and drug restrictions. Please check with your doctor before beginning specimen collection. It is important to check with your doctor before stopping or resuming any medications.
- P2 You may drink as much fluid as you normally would during the 24-hour collection period.
- P3 Plan your collection for an off day or over a weekend. If you plan to go out, bring the large orange container with you. If, for any reason, the urine collection must be terminated before the 24-hour period is up, empty the urine and start again on another day.
- P4 If you need to pass motion, empty the bladder first to avoid faecal contamination of the urine

Collection Procedure:

- C1 Start the 24-hour urine test by emptying your bladder. Do not collect this urine.
- C2 After this, write the date and time on the "Start date" & "Start Time" fields on the label of the green-capped container. For the next 24 hours, pass all urine into the orange container for collection
- ^{C3} Keep the orange container in a cool place, closed and protected from light at all times.
- C4 Exactly 24 hours after you started the test, pass urine one last time into the orange container. This is the end of your collection period.
- C5 Write the date and time on the "End date" and "End Time" fields on the label of the green-capped container.

Getting your specimen ready for your clinic visit:

- T1 Look at the markings at the bottom of the orange container and record the volume of urine on the "Total Urine Volume" field on the label of the green-capped container e.g. 1500 mL etc.
- T2 Mix the urine thoroughly by inverting (turning upside down) the orange container.
- T3 Pour urine into the green-capped container up to 80 mL mark and tighten the cap. Empty the remaining urine from the orange container into the toilet bowl and discard the empty orange container.
- T4 Place the green-capped container (containing the urine) into the biohazard ziplock bag provided and bring them to the clinic as soon as possible, taking note of clinic opening hours.



If you have questions about the procedure or require this information in another language, please ask your nurse or doctor. If needed, please call the laboratory at 67724346.

Clinical Chemistry, Department of Laboratory Medicine Updated: July 2013



For Outpatients

- → Measure and record total urine volume on small container
- → Transfer 100ml urine to small container
- → Bring small container back to NUH

Patient convenience!



Dispensation of CORE Lab-Issued Items



staff nurse or book a porter, indicate test name and item(s) to be collected.



at Department of Laboratory
Medicine, Reception, Main Building,
Level 3.

- Royal Blue (Plain)
- - Copper, Aluminium, Zinc, Selenium
- Royal Blue (EDTA)
 - Arsenic, Cadmium, Lead, Manganese, Mercury
- TB Spot Tube
- Plasma EDTA Meta
 - Catecholamine Fractionation, Free, Plasma
- UTM Swab
 - Measles Virus RNA Amplification (PCR)
 - Mycoplasma Pneumonia DNA Amplification (PCR)
- Cortisol, Saliva Collection Kit
- i-STAT Cartridges
 - *G3+, CG4+, EG7+*
- i-STAT 9V Batteries and Thermal paper

- Filter Paper Blood Spot Card
 - National Newborn Screening (NENS)



- Self-sealing Capillary Tubes
 - Bilirubin, Paediatrics



ABG Multicap Capillary Tubes



24 Hour Urine Bottle



It is not necessary to call the lab to reserve these items as the lab is open 24/7

For other items, please refer to test catalogue



Dispensation of Haematology Lab-Issued Item

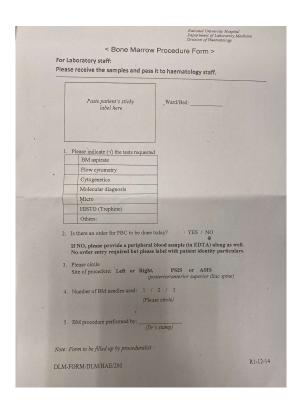


staff nurse or book a porter, indicate test name and item(s) to be collected.



at Department of Laboratory
Medicine, Reception, Main Building,
Level 3.

- Bone Marrow Biopsy Needle
 - Bone Marrow Aspiration Kit





Please call x25354 for appointment before collecting kit.

Send completed form, labelled sample tubes and kit back to Haematology Lab, preferably before 4pm.

^{*}For other items and more information, please refer to test catalogue or call x25354.



Dispensation of Microbiology Lab-Issued Items



staff nurse or book a porter, indicate test name and item(s) to be collected.



at Microbiology Reception, Main Building, Level 3.





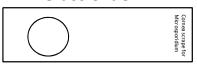
Chocolate Plate



- CDC ANA Blood Plate
- Fungus Culture



- Sabouraud's plate with chloramphenicol
- Microsporidium Microscopy
 - Glass Slide





- Respiratory IF
- Influenza A, B, RSV PCR
- Herpes Simplex Virus (HSV) IF
- Varicella-Zoster Virus (VZV) IF
 - UTM and Flocked Swab

 Boric Acid Urine container (Paeds)



- Acanthamoeba culture
 - Page's Saline



^{*}For other items, please refer to test catalogue or call x24343.



Dispensation of Molecular Diagnosis Centre-Issued Items



staff nurse or book a porter, indicate test name and item(s) to be collected.



at Molecular Diagnosis Centre, Main Building, Level 3.

- Cervical sampler
 - A cervical brush and a tube containing specimen transport medium for HPV testing



- cobas PCR media (Swab)
 - Transport medium for endocervical and urethral swab specimens for Chlamydia trachomatis and/or Neisseria gonorrhoeae PCR testing

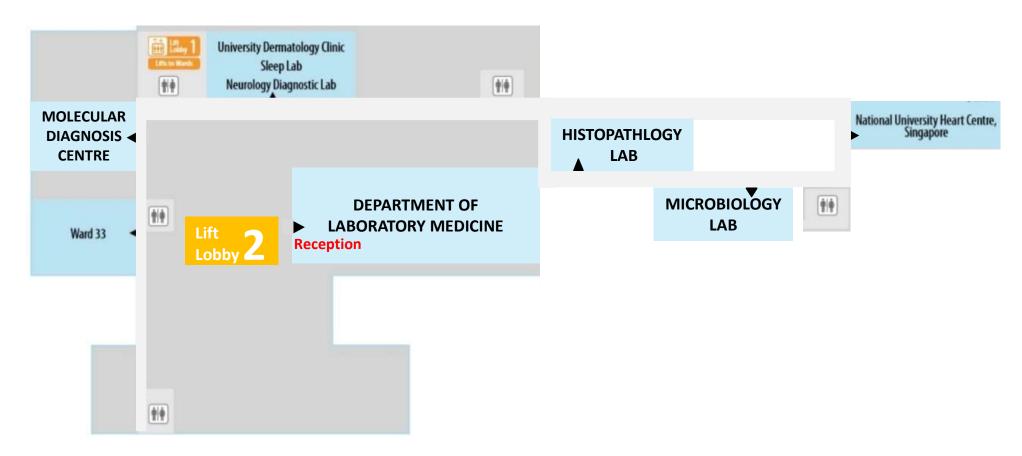
^{*}For other items, please refer to test catalogue or call x24384.



Main Building, Level 3 Map



PLEASE DIRECT PORTERS TO THE CORRECT LOCATION TO COLLECT LAB-ISSUED ITEMS





Sendout Testing Services

Tests not performed in DLM...What can lab do?

Send to local or overseas laboratories.

What?

Common referred tests

- Order & collect in CCOE/Aurora
- Specimen handling instructions are available

What?

Tests with special requirements

 For enquiries, contact Clinical Chemistry @ x24346 for specimen collection, handling instructions & billing issues

When...?

- Mondays to Fridays
- Send specimen before 3 pm

Why?

- Complex
- Need to comply with referred lab requirements











...TO NUH LABORATORY

Let us work together!

Quality Sample in



Quality Result out