

CLINICAL PATHOLOGY

– INTRODUCTION

PRESENTED BY

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CLINICAL PATHOLOGY

What is clinical pathology?

- Clinical pathology is a laboratory that is concerned with the diagnosis of disease based on the laboratory analysis of bodily fluids, such as blood, urine, and tissue homogenates or extracts.
- Clinical – clinical samples (blood, urine, stool, body fluids, etc....)
- Pathology – study about disease.
- The science and practice of medical diagnosis by laboratory examination and analysis of tissue specimens (Biopsies), body fluids and other samples.
- Clinical pathology is subdivided into
 - Virology,
 - Bacteriology,
 - clinical
 - chemistry,
 - Serology and
 - pathological Histology.

The background of the slide is a light gray gradient. In the top-left and bottom-right corners, there are several realistic-looking water droplets or bubbles of various sizes, some with highlights and shadows, giving a clean, clinical feel.

BLOOD SAMPLE COLLECTION

SAMPLE COLLECTION

BLOOD collection method

- Blood collection, or the collection of blood, usually involves the removal of blood and it comes in many different forms. It's also a common term in blood sampling for laboratory analysis.
- Three popular methods of blood collection are:

1. Arterial Sampling
2. Venipuncture Sampling
3. Fingerstick Sampling



1. ARTERIAL SAMPLING

- This form of blood collection most commonly takes place within a hospital environment.
- It is used in the identification of metabolic, respiratory, and mixed acid-base disorders, where CO₂ levels require understanding or monitoring.
- While generally safe, the procedure can be upsetting and painful for the patient.
- There are also several **potential contradictions** that can affect the site of the collection, such as an abnormal modified Allen test or local infection.
- There is also an increased risk of bleeding complications in patients with coagulopathy.



2. VEINPUNCTURE SAMPLING

- Venipuncture is the most common way to collect blood from adult patients.
- Collection takes place from a superficial vein in the upper limb, generally the median cubital vein; this vein is close to the skin and doesn't have many large nerves positioned close by.
- This reduces pain and discomfort for the patient.
- Clean the site with spirit allow to dry. Readily attached syringe and needle is introduced to the vein with the level facing upward at an angle of 30 – 40 ° to the skin.
- Entrance into the vein is denoted by appearance of blood into the hub of the needle.
- Release the tourniquet and withdraw the needle . The blood is transferred into the appropriate containers.



3. FINGERSTICK SAMPLING

- Fingerstick or finger prick sampling involves taking a very small amount of blood from the patient, usually from the end of a finger.
- It is also known as Capillary blood collection.
- It is over quickly and requires very little in the way of preparation; therefore, reducing concern and anxiety in patients, particularly in children and nervous adults.
- Clean the finger with alcohol swab and allow to dry.
- Hold the ball finger and make a quick puncture about $\frac{1}{2}$ cm from the end using a sterile lancet, wipe the first drop as it may contains tissue fluids.
- The blood should flow freely, without applying pressure collect the succeeding drop for investigation.
- It is mainly used for doing differential count, cell count, Hb estimation , etc...



LABELLING

- Before or after the sample collection the tube should be labelled immediately.
- Requiring patients to state their full name and birth date, and to spell their first name and last name;
- Requiring outpatients to show a form of identification when an ID band is not in use, typically a driver's license or insurance card;
- Labeling specimen tubes in the presence of the patient after the draw;
- Visually comparing tube labels with the ID band or requiring the patient to confirm samples are properly labeled.
- It should be help avoid errors.



TYPES OF BLOOD COLLECTION TUBES

Red :

- No anticoagulant or additives.
- Collection of serum for chemical or serological and bacteriologic studies.
- May be used for any procedure requiring serum except HLA antibody tests.

Lavender :

- Contains EDTA (Ethylene Diamine Tetra Acetate) as the anticoagulant.
- Mix well Primarily for collection of hematology studies, blood bank procedures and certain chemistries.

Blue :

- Contains sodium citrate (0.109M, 3.2%) solution as the anticoagulant.
- Primarily for collection of coagulation studies.

Gray :

- Contains potassium oxalate and sodium fluoride as the anticoagulant.
- Mix well For the collection of glucose and lactate samples.
- Not suitable for enzymes or electrolytes.

Green :

- Contains lithium heparin as the anticoagulant.
- Mix well For collection of other miscellaneous studies.
- Electrolytes, glucose, BUN can be performed more quickly than from a red top.

Special green :

- Sterile, contains sodium heparin as the anticoagulant.
- For collection of flow cytometry specimens.

Yellow :

- contains ACD (Acid Citrate Dextrose) as the anticoagulant.
- For determination of HLA-ABC antigens, HLA-B27, HLA Molecular Typing, G6PD levels and acid phosphatase levels.

Pink :

- Does not contain any anticoagulant, serum separator, or silicone coating.
- For detection of HLA antibodies in serum (CYTS).



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**URINE SAMPLE
COLLECTION**

URINE SAMPLE COLLECTION METHOD

What is urine ?

- Urine is an ultrafiltrate of the blood plasma and fluid created in the kidney and stored in the urinary bladder.
- It is a waste product and it can give us a wealth of information! Many metabolic diseases can be detected and monitored via the urine.
- Urine is mostly water with dissolved metabolites.

Urine Specimen Types Include:

First Morning Urine:

- very first urine voided when waking up after sleep, since it has been retained and incubating in the bladder for 6-8 hours and is the most concentrated specimen
 - ideal for testing for protein or to confirm postural or orthostatic proteinuria
 - ideal for testing for nitrites
 - red blood cells, white blood cells, and casts that may be present will be more stable.
 - The urine is slightly more acidic and has high osmolality
- during the night before, the individual should void right before going to bed



Random Urine Specimen:

- This type of urine specimen can be collected at any time, whether day or night
- No prior patient preparation
- Easy and convenient
- Good for routine screening
- Good for cytology studies
- Good for fluid deprivation studies
- "Random clean catch" type of specimens can also be performed after good hydration and are perfect for cytology studies
- Individual will consume 24-32 oz of water each hour for 2 hours prior to urine collection may require collection daily for 3-5 consecutive days
- Enhanced by patient exercise for 5 minutes prior to specimen collection (jumping, skipping, running in place)

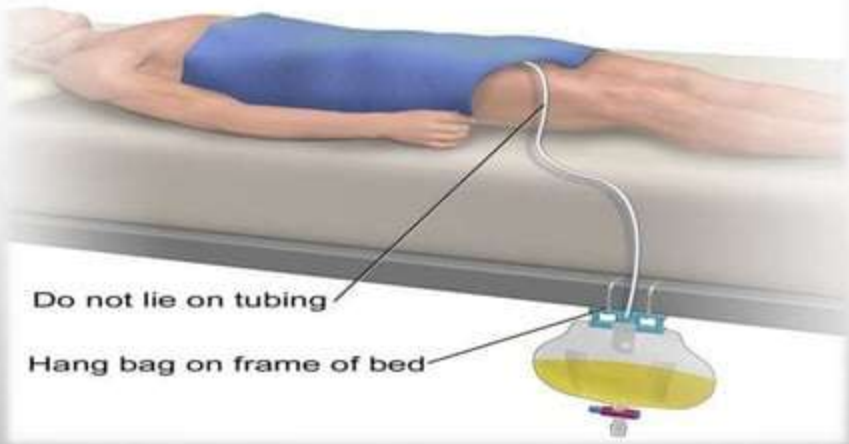
Timed Collection:

- This specimen is collected throughout a very specific time interval (ex: 2 hours, 12 hours, 24 hours, over a weekend, etc...)
- Avoid at the beginning of the collection then discard it
- Collect all subsequent urines
- Include the last void in the urine

Catheterized Urine:

- Obtained using a sterile, flexible tube catheter, which is inserted into the urethra and into the bladder
- Urine flows into the bladder by gravity and is collected in a plastic reservoir bag
- Requires healthcare personnel to perform
- UTIs are common in catheterized patients, so these are often sent for bacterial culture

Closed Urinary Drainage



Catheterized Urine sample collection

Routine Void:

- Does not require patient preparation
- Simple urination into a specimen collection container

Midstream "Clean Catch:

- Urine is collected after thorough cleansing of the urethral opening with antiseptic wipes
- The individual must pass the first portion of the urine in the toilet, stop the stream, then collect the mid portion of the urine into the specimen container, followed by passing remaining urine into the toilet
- Ideal for the routine urinalysis and urine culture free from contamination

Suprapubic Aspiration:

- A rare technique used to collect urine directly from the bladder via the puncturing of the abdominal wall and distended bladder following the use of a sterile needle and syringe
- This technique is used to obtain sterile urine for bacterial cultures from infants or adults, is aspirated into the syringe, capped and sent for analysis

Pediatric Collections:

- Sterile, plastic urine collection bags with a hypoallergenic skin adhesive are used for collection after the perineal area is cleansed and dried prior to placement of the specimen bag onto the skin
- The patient is checked every 15 minutes to see if enough specimen has been collected

URINE SAMPLE COLLECTION

- The urine specimen containers for collection should be clean, dry, sterile, made of clear translucent, disposable plastic or glass.
- It should be stable and able to stand upright, with a rim of 4-5 cm.
- It should be able to hold as much as 50-100 mL of urine.
- It should also come with the lid tightly screwed on and should be a leakproof seal or covered to prevent leaks or spills.
- Always wear gloves and proper PPE when working with urine.

LABELLING

- Before the sample collection the container should be labelled immediately.
- Requiring patients to state their full name and birth date, and to spell their first name and last name.
- It should be help avoid errors.
- The labels should contain adhesive that resists moisture and will stick during refrigeration.
- It should contain the
 - Patient's full name
 - A unique ID number
 - The date and time of collection
 - An ID or information about the room number or clinic name of collection
 - The type of preservative used and date/time.



Urine Storage and Handling :

- Ideally, once collected, urine specimens should be sent immediately to the laboratory.
- Time of arrival to the laboratory should be documented.
- If this is not possible, the specimen should be preserved or refrigerated.
- Transportation to the laboratory or some type of preservation must occur within 2 hours of collection, otherwise the specimen will be no good and will need to be rejected.
- Urine is sensitive to light, temperature, moisture, and microbes in the environment.

Urine preservation method

- Urine preservative is basically either a chemical substance or a process or technique used to prevent changes in the composition of the urine until it can be tested, or to prevent deterioration of any formed elements.
- The most common form of urine preservation is *refrigeration*, though there are chemical means to preserve urine for a couple of hours at room temperature as well.

- First morning urine specimens have high osmolality, and are therefore prone to salts crystallizing upon cooling to room temperature, which are known as amorphous urates, which can interfere with some cytological studies.
- Random urine specimens may be preferred for this type of testing.
- Specimens need to be preserved within 2 hours of collection if not analyzed immediately.
- Changes in unpreserved urine may be
 - A) Physical - Color, Clarity , Odour
 - B) Chemical - Ph, Glucose, Ketones, Bilirubin, Urobilinogen , Etc.....
 - C) Microscopic – Casts, Bacteria, Etc....
- The easiest and most common type of preservation is *refrigeration* of the urine specimen at 4-6 degrees Celsius within 2 hours of collection if the specimen is not able to be tested right away.

➤ Timed urine collections may require the use of a chemical preservative.

- Boric acid
- Thymol
- Formalin
- Glacial acetic acid
- Sodium carbonate

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STOOL SAMPLE COLLECTION

STOOL SAMPLE COLLECTION

You will be collecting a sample for one or more tests, depending on your health care provider's order.

You may use the same bowel movement for more than one test. For each test:

- Unscrew the lid from the specimen container. Set aside.
- Prepare the collection container (clean shallow pan, plastic bag or clear plastic wrap) in which you will collect your sample.
- Collect the sample. Do not collect stool that has been mixed with water or urine.
- Using the plastic spoon attached to the lid, scoop out samples from bloody, slimy or watery areas of the stool (if present). If the stool is hard, select areas from each end and the middle of the stool.
- Transfer enough of the selected stool to the orange- and green-cap specimen containers to raise the level of liquid to the "fill to here" line. Do not overfill.
- Screw the lid back on the container. Make sure it is closed tightly. Shake to mix.
- Place the specimen container in a zip-close bag and seal it.

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SAMPLE REJECTION

Sample rejection criteria for clinical samples

- Improper test requests (incomplete, duplicate, errors in test input, inconsistent information)
- Inappropriate transport (transport temperature, light exposure, delayed transport time)
- Specimens without barcodes or unsuitable barcodes
- Misidentification (unlabeled, mislabeled or mismatched samples)
- Improper container or tube (including precious samples such as cerebrospinal fluid)
- Insufficient specimen volume (inappropriate blood/anticoagulant ratio)
- Incorrect preservation, storage
- Lipemic specimen
- Hemolyzed specimen
- Clotted samples with fibrin .



- Specimens which are improperly labeled.
- Specimens in which the quantity is not sufficient for proper processing.
- Specimens in which there has been a significant time delay between specimen collection and specimen receipt (more than 24 hours), for which a transport tube/medium was not used and/or specimen results would be compromised. Specimens and requisitions which are incompatible (i.e. urine specimen with requisition checked off for sputum).
- Specimens received with no requisition.
- Liquid specimens which are not sent in sterile, dry, leakproof containers.
- Requisitions which have been contaminated with a liquid specimen.
- **SPECIMENS IN SYRINGE WITH NEEDLE ATTACHED.** Physician and/or office staff will be contacted to remove needle before specimen will be processed.

