

# Genito-Urinary System

## *Laboratory Practical 1*

# Laboratory No. 1

## Urinalysis and Urine Culture

1. Describe methods of urine collection.
2. Examine the following characteristics of urine:
  - a) Physical
  - b) Chemical
  - c) Microscopic
3. Demonstrate the laboratory diagnosis of UTI.

# What is urine analysis?

\* simple  
\* cheap  
\* important

مجموعة من الـ test

- Commonly order panel of test on a urine sample which can evaluate:

① – Kidney failure

② – UTI

③ – Stone

④ – GU malignancy (hematuria)

⑤ – Volume state (if the pt hydrated or dehydrated → حسب لون الـ urine)

⑥ – Acid base balance

# 1. Methods of urine collection

## Random Specimen *(first type of sample)*

- most commonly
  - it is the easiest to obtain and is readily available.
  - urinalysis and microscopic analysis, although it is not the specimen of choice. *\* متى أفضل نوعي*
- Sometimes gives an inaccurate view as specimen is too diluted and analyte values are artificially lowered.



## First Morning Specimen

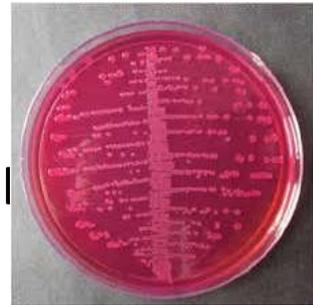
(also called an 8-hour specimen).

- This is the specimen of choice for urinalysis and microscopic analysis,
- since the urine is generally more concentrated (due to the length of time the urine is allowed to remain in the bladder) and, therefore, contains relatively higher levels of cellular elements and analytes such as protein, if present.

# Midstream Clean Catch Specimen

- This is the preferred type of specimen for culture and sensitivity testing
  - reduced incidence of cellular and microbial contamination.

- (1) • Patients are required to first cleanse the urethral area with a castile soap towelette.
- (2) • The patient should then void the first portion of the urine stream into the toilet, urine midstream is then collected into a clean container.

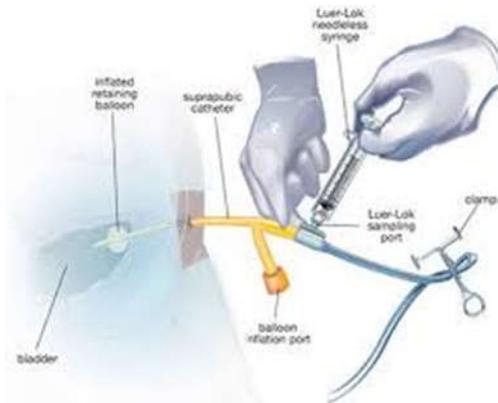


## Timed Collection Specimen

- Among the most commonly performed tests requiring timed specimens (usually 8 or 24 hours).
- measuring creatinine, urine urea nitrogen, glucose, sodium, potassium, or analytes such as catecholamines and 17-hydroxy-steroids that are affected by diurnal variations.

# Catheter Collection Specimen

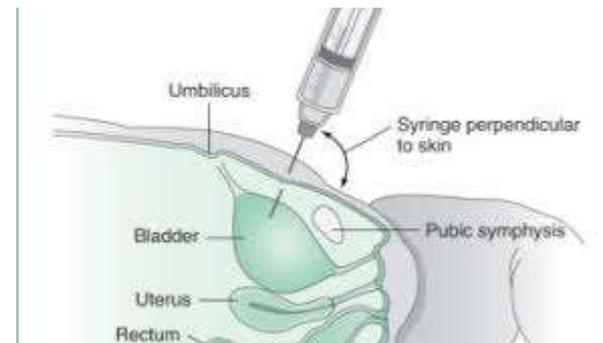
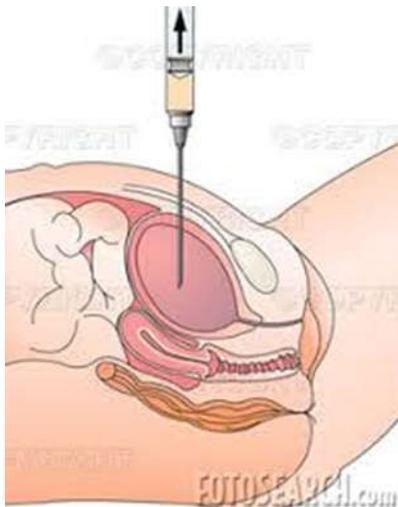
- This assisted procedure is conducted when a patient is **bedridden** or cannot urinate independently.
- Specimens may be collected directly from a Foley into an evacuated tube or transferred from a syringe into a tube or cup.



# Suprapubic Aspiration Specimen

- This method is used when a bedridden patient cannot be catheterized or a sterile specimen is required. The urine specimen is collected by needle aspiration through the abdominal wall into the bladder.

*if the pt had prostatic hypertrophy*



# Pediatric Specimen

- For infants and small children, a special urine collection bag is adhered to the skin surrounding the urethral area.
- Urine collected from a diaper is not recommended for laboratory testing since contamination from the diaper material may affect test results.





# Cross inspection

- ① • Unusual coloration
  - Clear- indicates over-hydration (urine like water)
  - Orange urine, from certain medications such as rifampin
  - Bloody urine (hematuria), potentially a sign of a bladder infection. *dark red.*
  - Consumption of (beets) can cause urine to have a pinkish tint. شمندر
  - Green UTI: P.aeruginosa







- Dark orange to brown urine can be a symptom of jaundice or Gilbert's syndrome
- Dark yellow urine is usually indicative of dehydration

ليس معروف  
change in urine color may indicate  
something wrong.



↳ UTI, *P. aeruginosa*

## ② • Odor

Usually odorless, urine can be pungent after the consumption of certain foods. Eating asparagus is known to produce a strong odour in human urine.

## ③ • Turbidity

Turbid urine may be a symptom of a bacterial infection, but can also be due to crystallization of salts such as calcium phosphate.

نبات الهليون



# Chemical analysis (Dipstick)

- Series of pads embedded one reagent strip that provide quick semi quantitative assessment of various potential content of urine.



## Chemical analysis (Dipstick)

- The pH of urine is close to neutral (7) but can normally vary (4.5 and 8).
    - Strongly acidic or alkaline urine may be symptomatic of disease. acidemia, RTA, alkalemia, UTI proteus, diet  
*Renal tubular acidosis*
  - Normal urine density or specific gravity values vary between 1.003-1.035 (g.cm<sup>-3</sup>).
    - sg= Density of urine/density of water  
*مِسْ مَلْهُوبِ حَقْلَه*
- indicate the hydration state of the pt*

- **Glucose:** hyperglycemia
- **Heme:** UTI, stone, malignancy, rhabdomyolysis
- **Protein:** glomerular disease
- **Leukocyte esterase and nitrites:** UTI

	<b>LE</b> (usually graded 1 – 4+)	<b>Nitrites</b> (usually graded "positive" vs. "negative")
Urinary tract infection	X	X
Indwelling urinary catheter	X	X
Recent instrumentation of the GU tract	X	
Urologic malignancy	X	
Chronic interstitial nephritis	X	
Interstitial cystitis	X	
Intra-abdominal inflammatory process adjacent to the GU tract	X	



## ■ **Microscopic examination**

- A urine sample may contain cells that originated in the blood, the kidney, or the lower urinary tract.

# RBCs

میں مٹاویں حفظہم

## ↑ RBCs

● RBCs are quantified as # of cells / "high powered field".

●  $\geq 3$  RBCs/HPF should be considered abnormal.

● Presence of dysmorphic RBCs is strongly suggestive of glomerular disease.

- UTI
- Renal stone
- GU malignancy
- Recent instrumentation (including Foley placement)
- Coagulopathy
- Glomerulonephritis
- Sickle cell anemia
- Renal tuberculosis
- Vigorous exercise
- Contamination with menstrual

# WBCs

مس حفظ ...

- WBCs are quantified as # of cells / "high powered field".
- >5 is generally considered to be abnormal. 5 → normal



## ↑ WBCs

- Urinary tract infection
- Indwelling urinary catheter
- Recent instrumentation of the GU tract
- Urologic malignancy
- Chronic interstitial nephritis
- Interstitial cystitis
- Intra-abdominal inflammatory process adjacent to the GU tract
- Contamination with vaginal secretions

# Bacteria

## Use of the UA to Diagnose a UTI

- Although UAs are frequently used to assist in the diagnosis of a UTI, there are no standardized approaches on how to do this.
- The presence of nitrites is the most specific finding, and has the highest positive predictive value.
- However, leukocyte esterase, WBCs, and even bacteria on microscopic exam are not specific, and their presence does not necessarily indicate infection.
- Diagnosis of a UTI also needs to consider the presence of symptoms and a positive urine culture (if one is done, which is probably not necessary in young, otherwise healthy women with typical symptoms).

# Crystals

- Crystals are highly organized, **microscopic** solids usually composed of a small number of different ions and/or molecules.
- Formation of crystals is most dependent upon:
  - 1 ■ Concentration of ions and molecules
  - 2 ■ Urine pH
- Small amounts of most types of crystals are not necessarily pathologic



# Crystals



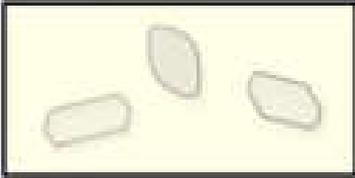
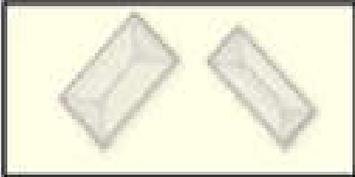
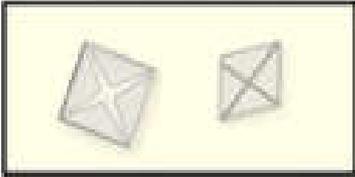
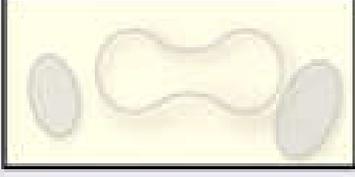
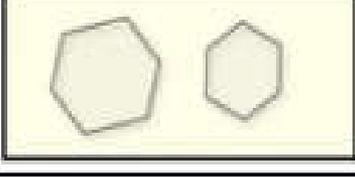
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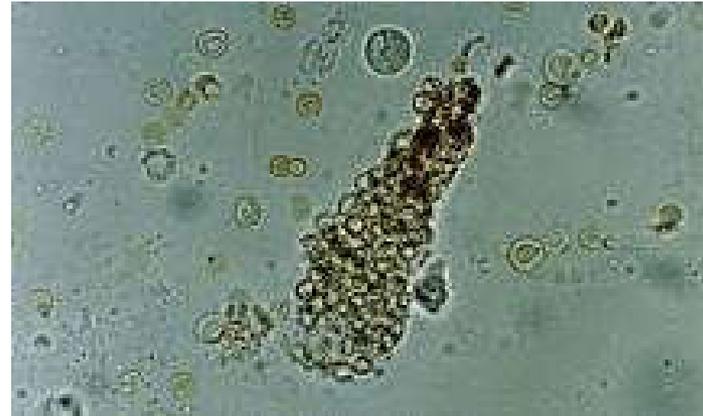
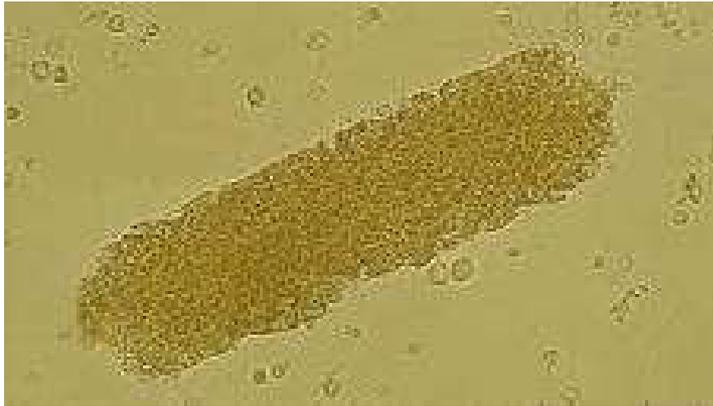
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Crystals	Characteristics of Formation	Appearance	Diagnostic Utility
<p>حقیق تال</p> <p><b>Uric acid</b></p>	<p>Formation promoted by <u>acidic urine</u></p>		<p>Seen in tumor lysis syndrome</p>
<p>Calcium phosphate</p>	<p>Formation promoted by alkaline urine</p>	<p>الشکل فقط القطوب</p> 	<p>Not suggestive of any specific systemic disease</p>
<p><b>Magnesium ammonium phosphate</b> (k.a. struvite or "triple phosphate")</p>	<p>Formation promoted by <u>alkaline urine</u></p> <p>حقیق قطب</p>		<p>Seen in UTIs by urease-producing organisms (e.g. <i>Proteus</i>, <i>Klebsiella</i>)</p>
<p>Calcium oxalate dihydrate</p>	<p>Formation is largely independent of urine pH</p>		<p>Not suggestive of any specific systemic disease</p>
<p>Calcium oxalate monohydrate</p>	<p>Formation is largely independent of urine pH</p>	<p>حقیق فقط القطوب</p> 	<p>Seen in ethylene glycol ingestion</p>
<p>Cystine</p>	<p>Formation promoted by acidic urine</p>		<p>Diagnostic of cystinuria</p>

- **Urinary casts** are microscopic cylindrical structures produced by the kidney and present in the urine in certain disease states



- The presence of cellular casts (casts containing RBCs, WBCs, or epithelial cells) identifies the kidneys, rather than the lower urinary tract.

- **Normal Results**

- Normal urine is clear straw-colored, but may also be slightly hazy. It has a slight odor.
- It may contain some normal crystals as well as squamous or transitional epithelial cells from bladder, lower urinary tract, or vagina.
- Normal urine contains a small amount of urobilinogen, and may contain a few RBCs and WBCs.



- **Normal values used in many laboratories:**
- **Glucose**: negative (quantitative less than 130 mg/day or 30 mg/dL).
- **Bilirubin**: negative (quantitative less than 0.02 mg/dL).
- **Ketones**: negative (quantitative 0.5–3.0 mg/dL).
- **pH**: 5.0–8.0. *(around 7)*
- **Protein**: negative (quantitative 15–150 mg/day, less than 10 mg/dL).

- **Blood**: negative.
- **Nitrite**: negative.
- **Specific gravity**: 1.003-1.035.
- **Leukocyte esterase**: negative.
- **Red blood cells**: 0–2 per high power field.
- **White blood cells**: 0–5 per high power field.

# Genito-Urinary System

## *Laboratory Practical 2*

Specimen collection methods used  
in sexually transmitted diseases

- **Principles followed in collecting samples:**

1. Communication with laboratory staff to discuss collection, transport and testing.
2. wearing appropriate protective gear.
3. Avoid contamination
4. Adequate volumes
5. Labeled correctly (*time, date, name of pt*)
6. Optimal transport conditions

- **The common lab. diagnostic procedures:**

1. Dark-field microscopy-Syphilis
2. Gram staining for gonorrhea, non-gonococcal urethritis, chancroid, bacterial vaginosis
3. Tzanck smear for Herpes genitalis,
4. Wet mount for trichomoniasis
5. KOH wet mount for candidiasis

# Specimen collection methods used in sexually transmitted diseases:

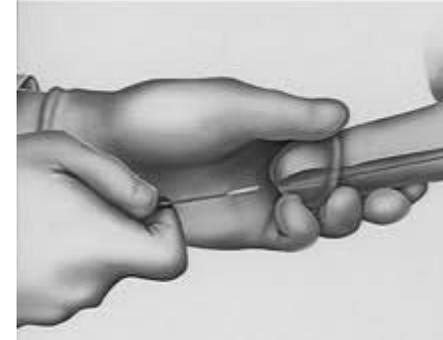
## (A) Gonorrhoea

- *In men* :

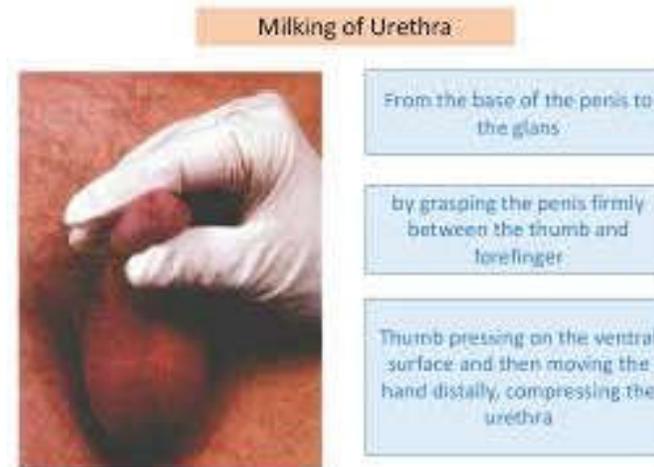
- a) Urethral swab

- Collect specimen at least **2 hours after urination** as voiding decreases the amount of exudates.

- 1) • Retract the prepuce, clean the tip of the meatus with normal saline and collect the pus directly onto a glass slide or sterile swab in case of frank urethral discharge.



- 2) • If no urethral discharge is seen, milk / strip the urethra from the root of the penis to the glans and collect the discharge as above.
- 3) • If no discharge is obtained, insert a sterile cotton tipped swab with a flexible wire shaft or a bacteriological loop 2-3 cm into the urethra and rotate for 5-10 seconds.



4) If there is no evidence of urethritis on examination, but there is a history of contact, ask the patient to hold the urine overnight and then milk / strip the urethra and collect the discharge if any. If no discharge is obtained, insert a swab and collect specimen.

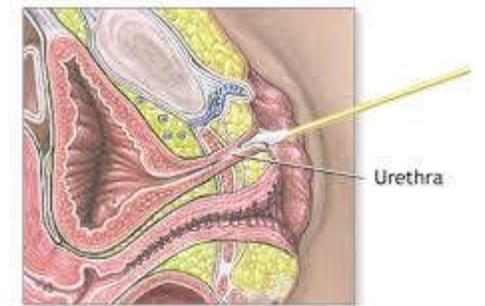
- *In women :*

### **a) Endocervical swab**

- No antiseptics, analgesics or lubricants should be applied.
- A sterile vaginal speculum moistened with warm water is inserted in the vagina and the ectocervix is visualized.

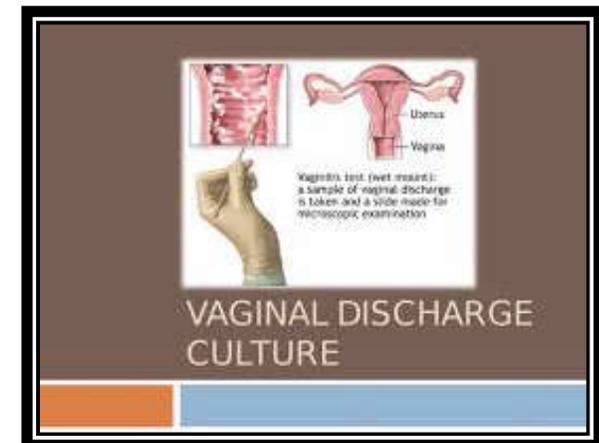
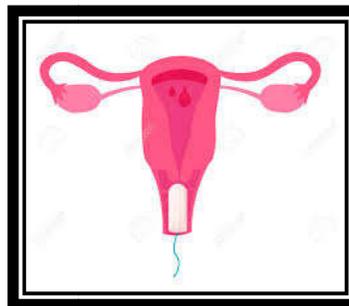


- After cleaning the ectocervix using forceps with a sterile cotton swab, insert a sterile swab 2-3 cm into the endocervical canal, rotate and move from side to side for 5-10 seconds and withdraw.
- **b) Urethral swab**  
Same method as for men, except that the urethra is massaged against the pubic symphysis from its proximal end towards the meatus if no pus is visible.



Urethral discharge is collected on a cotton swab

- **c) Vaginal swab**
- Vaginal swab or vaginal tampon may be used to obtain the specimen.
- Using a speculum, swab the posterior fornix with a sterile swab in women.

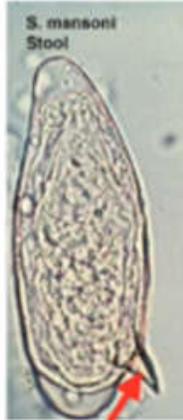


# Schistosomiasis

(مقاله)  
هدی، جای یا امتحان

## Diagnostic Stage by Morphology

*mansoni*



-Lateral spine

*haematobium*



-Central spine

*japonicum*



بالامتحان جای.

# T. vaginalis

