



GENITOURINARY SYSTEM

SUBJECT :

Micro lab 1 

LEC NO. :

DONE BY :

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وَقُلْ رَبِّ زِدْنِي عِلْمًا

Genito-Urinary System

Laboratory Practical 1

اللهم احفظ أهل غزة وكن لهم عوناً ونصيراً، اللهم ارحم شهداءهم، واشف جرحاهم، ونجي أطفالهم من الموت وارحم نساءهم من الفقد وأشدد على رجالهم بالقوة والصبر.

اللهم اجعل أطفال غزة آمنين مطمئنين، اللهم احفظهم بعينك التي لا تنام واجعل منهم عباداً أقوياء أشداء يجاهدون في سبيلك فينصرون على عدوهم.

سبحان الله

الحمد لله

لا إله إلا الله

الله أكبر

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 (cells)
3. Demonstrate the laboratory diagnosis of UTI.

غالباً اغلب الحالات للمرضى بنطلب بالبدايه اهم test و اللي هو ال CBC و كمان ال
urinalysis ايضاً test مهم وال kidney and liver function test

What is urine analysis?

ال urin analysis يعتبر simple test و ما بدو جهد و لا وقت كثير

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

- Kidney failure
- UTI
- Stone
- GU malignancy
- Volume state
- Acid base balance

يعني كيف وضع ال hydration عندو و هاد mainly in children
لنشوف اذا عندهم dehydration or good hydration

1. Methods of urine collection

① Random Specimen

اسمها random لانو المريض بيحيني بأي ساعه خلال اليوم بغض النظر عن الوقت و عمر المريض و بعطيه ال urine cup و بخليه يجييلي عينة ال urine تاعنو

- most commonly
- it is the easiest to obtain and is readily available.
- urinalysis and microscopic analysis, although it is not the specimen of choice.

No need for preparation

- Sometimes gives an inaccurate view as specimen is too diluted and analyte values are artificially lowered.

يعني

specimen may have been diluted by excessive fluid intake (water, coffee, soda, etc.) prior to the test



هون العينه بناخذها بالصبح بحيث يحكو للمريض يجي عندهم الصبح و ما يعمل urination الا لما يوصل العياده عندهم بحيث بيعطوه ال urine cup و بياخدو عينة ال urine منو طيب ليه الصبح ؟ لانو عينة ال urine بكون كلشي فيها more concentrated فحتعطي best results

② First Morning Specimen

(also called an 8-hour specimen).

- This is the specimen of choice for urinalysis and microscopic analysis, ال chemicals
- 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. ال cells

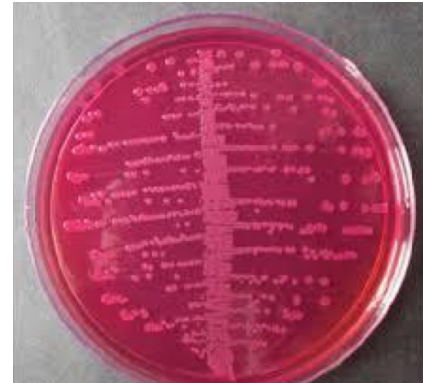
We call it midstream because you don't collect the first or last part of urine that comes out
And clean catch because we clean before urination

3

Midstream Clean Catch Specimen

- This is the preferred type of specimen for culture and sensitivity testing
 - reduced incidence of cellular and microbial contamination.
- Patients are required to first cleanse the urethral area with a castile soap towelette.
- The patient should then void the first portion of the urine stream into the toilet, urine midstream is then collected into a clean container.

هاد ال test بعملو لو
بدي اعمل culture
بالتالي بحتاج عينة
ال urine ما تكون
contaminated



و بطلب من قبل ما يبيلش يغسل ايديه و castile soap towelette و اللي هما gentle cleansing wipes بالبداية بعطي للمريض بعدها بيوقف و urine in the toilet من ال part لأول void بعدها يعمل urethral area و بمسح فيهم ال wipes بعدها ياخذ ال cup و بكل cup واحد ما نملي نص العلبه بعدها بنسكر ال inside the urine cup لتاني جزء void و بعمل urine cup بياخذ ال قدر الامكان contamination او غطايته من الداخل لحتى نبعد عن ال cup عادي و نتأكد انو ما نلمس ال urination

مش common كثير



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.

ما حسيت
الدكتور ركز
عليهم 😊

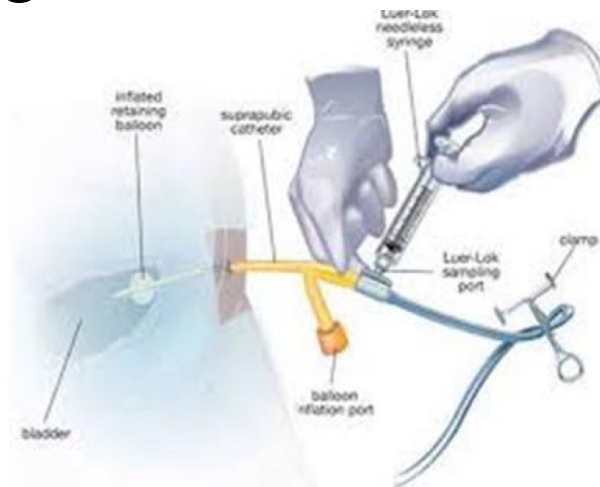
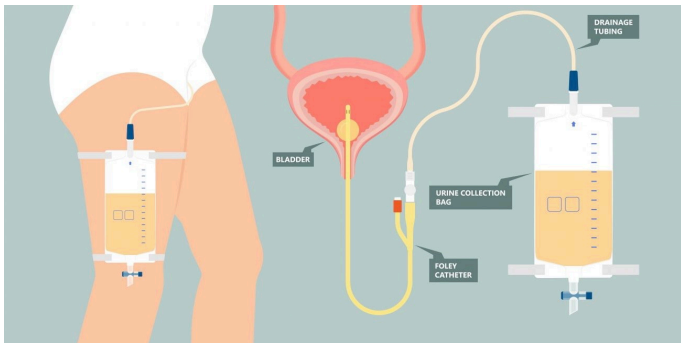
هون بنجمع كل عينات ال urine على مدار ال 8-24
ساعه to measure the concentration of
specific substance over the last 8-24 h

بعض الاشخاص يكونوا bedridden و ما بقدر و يقوموا يعطوا عينة urine
او عندهم امراض معينه ما بقدر و يعملو urination مثلاً
obstruction , tumor فبنلاقية مركيبيلو catheter يعني عندو urine bag
فخلص بناخد العينه من ال catheter

5 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.

هون صوره خارجيه لتوضيح ال Foley catheter

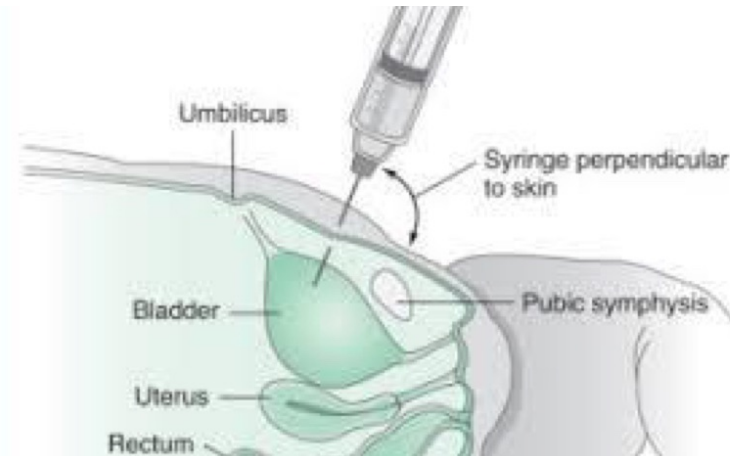
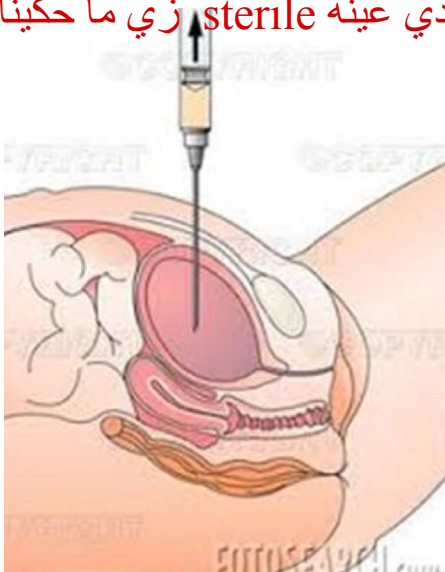


⑥ Suprapubic Aspiration Specimen

- 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.

❗ برضو لو هاد المريض ال bedridden بحتاج اخذ منو عينة urine تكون sterile و مش contaminated لاعمل culture فهون حتى لو المريض حاط catheter ما باخد منها لانو بدى عينه sterile زي ما حكينا ف بنلجأ لهاي الطريقه

❗ نفس الفكره اللي قبل المريض bedridden لكن هون بحالته ما بقدر يركب catheter بالتالي بدخل على ال bladder ب needle aspiration و ممكن استخدم CT scan. ك guidance لاحدد مكان ال bladder او من ال palpation بحدد مكانها





طبعاً اكد في طريقه خاصه لاخذ
عينة ال urine للاطفال لانهم
معروف بغلبوا و بجننوا الواحد 😊
فهون بنستعملهم urine bag و
هيك بنحطها عليهم

7 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 ^{حفاضات البببي} is not recommended for laboratory testing since contamination from the diaper material may affect test results.

بنستنتج انو حسب حالة و وضع المريض و
شو بحتاج بنختار احدى هاي الطرق لاخذ العينه



هون بدنا نبش نشرح شو الاشياء و المعلومات اللي عينة ال urine بتعطيني اياها

What is urine analysis?

طبعاً ال urine ال characteristic معينه بحيث اي مرض ممكن
يغير باحدى هاي ال characteristics و يخليه abnormal

■ **Physical** (Gross inspection): color, turbidity

■ **Chemical** (Dipstick): Sg, pH, glucose,
hem, protein, Leukocyte esterase, Nitrites,
ketone, bilirubin

We're searching for cells

■ **Microscopy**: WBCs, RBCs, Bacteria,
crystals, Casts

extra

Urinary casts may be made up of white blood cells, red blood cells, kidney cells, or substances such as protein or fat.

طبعاً بنش فيهم بالترتيب من
فوق لتحت و اذا لسا بدنا بنعمل
gram stain and culture

طبعاً اذا الشخص dehydrated مثلاً صاييم او مابشرب مي فهون لون ال urine يكون yellow اما اذا كان بشرب مي كثير و very hydrated فاللون يكون clear (watery)

① Cross inspection

A- Unusual coloration

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

هاد بعني انو ال infections can change the color of urine

مهم بس نشوف لون ال urine متغير ناخذ history من المريض لنتأكد اذا فعلاً مريض او ما عندو اشي بس مجرد انو صاييم او بياخذ دواء معين







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

↳ hemolytic anemia

هلاء الدكتور حكي ما بدو كل اشبي و شو بعطي
لون بس بدو الفكره من الموضوع

بس نصيحه مني اعرفوا كل واحد شو بعطي لون
بلاش تنفلموا بالامتحان 🧐



B- ■ Odor

ازا صار عنا infection or WBCs or pus
هون ال smell بتصير تختلف عن الطبيعي

→ Strong smell

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

C- ■ Turbidity مهمه

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

بالطبيعي لازم يكون clear

نبات الهليون



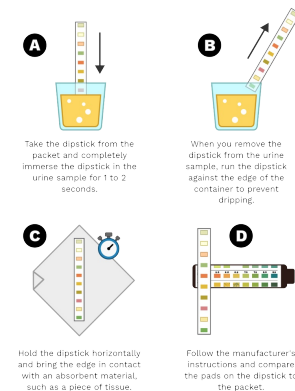
② Chemical analysis (Dipstick)

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

The dipstick is a thin plastic strip with pads or squares containing different chemicals that change colour in the presence of certain substances so These chemicals react with substances in the urine, which causes the color of the pads to change and then the final color of the pads can tell you the levels of different substances in the urine Often the more intense the colour change, the more of the substance there is in the urine.



هاد زياده بس
لفهم الفكره



extra slide :-

str,p

color-code



مثلاً كحوااااا test
تابعاً لطلع ⊖ لا ماو

زي ما شايفين ال strip بعد ما طلعتنا
من عينة ال urine كل مربع صار
الو لون معين ف بناخد ال strip و
بنصير نقارنه بالجدول اللي فيه ال
color code لكل test بحيث كل
مربع يمثل نتيجة test معين مثلاً
جلوكوز فبروح ع الجدول عند
الجلوكوز حلاقي اكثر من shade الو
فبصير اكارن لون المربع تاغي لأي
shade تابع و هيك بعرف شو نتيجت
ال test تاغي

Chemical analysis (Dipstick)

- The pH of urine is close to neutral (7) but can normally vary (4.5 and 8). حسب وضع الشخص اذا مثلاً hydrated or not و عوامل تانيه بتأثر فيه
 - 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⁻³). الرقم مش حفظ

Specific gravity

– sg= Density of urine/density of water

مقارنه مع ال plasma هل هو concentrated or not

اكسترا للفهم Sg is a measure of the concentration of solutes in the urine. It measures the ratio of urine density compared with water density and provides information on the kidney's ability to concentrate urine.

Glucose is not normally found in urine but its presence in excess is an indicator of DM

■ Glucose: hyperglycemia

RBCs in urine

■ Heme: UTI, stone, malignancy, rhabdomyolysis

■ Protein: glomerular disease (Nephrotic syndrome)

■ Leukocyte esterase and nitrites: UTI

هي ماده تفرز من ال WBCs بالتالي اي اشي ممكن يزيد ال WBCs حيزيد هاي الماده بال urine

	LE (usually graded 1 - 4+)	Nitrites (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	

الدكتور حكى ما
بدو نحفظ الجدول

خاص بال
infection
غالباً نوع
من
البكتيريا
بعمل زياده
بال
nitrites
اللي بطلع
بال urine



3 Microscopic examination

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

بندور ع cells:

RBCs

wBCs

Bacteria

Crystals

Casts

حنبش فيهم وحده وحده للاسف 🦴🔥

(A) RBCs

- RBCs are quantified as # of cells / "high powered field". وحدة القياس
- ≥ 3 RBCs/HPF should be considered abnormal.
- Presence of dysmorphic RBCs is strongly suggestive of glomerular disease.

↑ RBCs

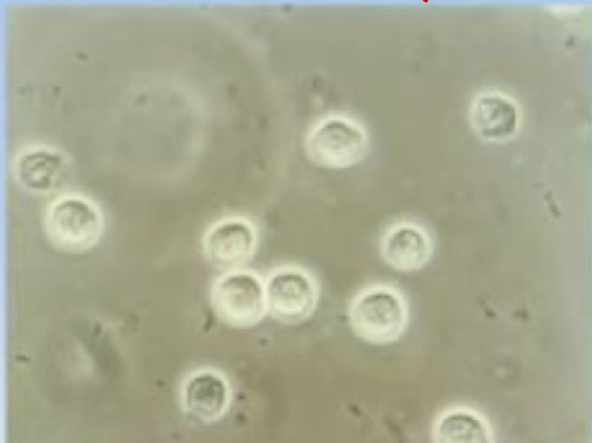
- UTI
 - Renal stone
 - GU malignancy
 - Recent instrumentation (including Foley placement)
 - Coagulopathy
 - Glomerulonephritis
 - Sickle cell anemia
 - Renal tuberculosis
 - Vigorous exercise
 - Contamination with menstrual
- مش حفظ
الاسباب
هاي

Ⓑ

WBCs

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

غالباً عندي inflammation



↑ WBCs

برضو مش حفظ
الاسباب

- 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

Urine analysis

- 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 necessary 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).

يعني لازم عشان نتأكد فعلاً انو UTI بنحتاج نعمل culture and gram stain كمان

ⓓ Crystals

- Crystals are highly organized, microscopic solids usually composed of a small number of different ions and/or molecules.

عباره عن ions
يرتبطوا مع بعضهم و
يعملو هاي ال crystals

ما قرأه الدكتور

- Formation of crystals is most dependent upon:

- Concentration of ions and molecules
- Urine pH

Extra:





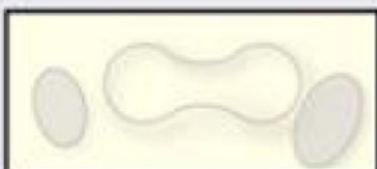
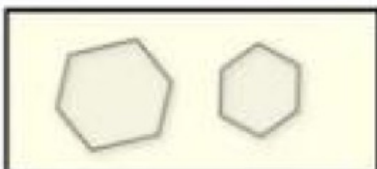
An alkaline pH favors the crystallization of calcium- and phosphate-containing stones, whereas and acidic urine pH promotes uric acid or cystine stones.

- Small amounts of most types of crystals are not necessarily pathologic



crystals

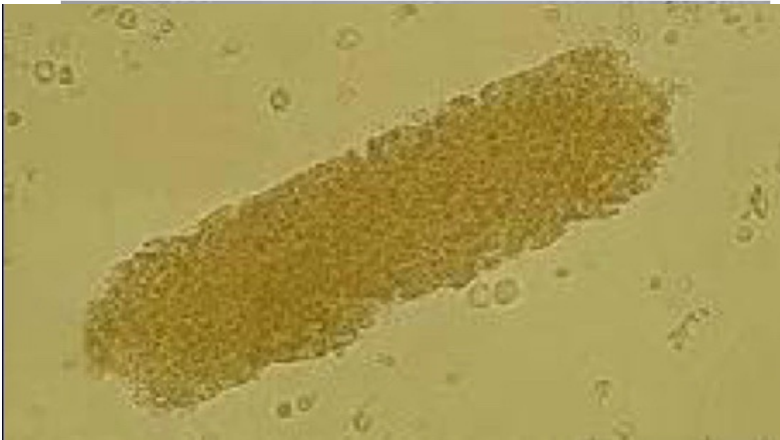


Crystals	Characteristics of Formation	Appearance	Diagnostic Utility
Uric Acid	Formation promoted by acidic urine		Seen in tumor <u>lysis syndrome</u>
Calcium phosphate	Formation promoted by alkaline urine		Not suggestive of any specific systemic disease
Magnesium ammonium phosphate (a.k.a. <u>struvite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

مهم
الاصح

بس احفظو اللي عليهم دوائر و محدد
+ حسيت الدكتور ركز عليهم و خصوصاً ع شكل ال crystals ف احفظوهم منيح 🔥

⑤ 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.

بالتالي بفيدينا لنعمل assessment لل kidney

■ Normal Results

- Normal urine is clear straw-colored, but may also be slightly hazy. It has a slight odor.
light yellow in color
↪ Cloudy
- 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.
↪ Extra : colorless pigment produced in the gut from the metabolism of bilirubin



هيك شكل ال
urine الطبيعي

كلهم لازم negative

■ 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.
- **Protein:** negative (quantitative 15–150 mg/day, less than 10 mg/dL).

الصراحة الارقام
ما بعرف ازا
حفظ بس الدكتور
ما قرأ الا اللي
مخطط تحتيه

- 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.

هدول
مطلوبين

UTI

■ Labs: Analyzing urine sample

– ⊕ leukocyte esterase (dipstick test)

– ⊕ nitrites لانو certain type of microorganism مثل ال proteus و
ال e coli بتزيد وجود ال nitrites بال urine

■ More likely gram-negative rods

– ⊕ WBCs

– ⊕ RBCs

هلاء اذا شفت كل الامور اللي بتحكيلى انو هاد UTI هون
لازم اعمل gram stain and culture لانو هما ال
UTI definitive diagnosis لل

UTI

- **Gram stain** of urine: identify by shape and characteristic (gram positive or negative); obtain by clean catch urine or catheterization
- **Urine culture** yielding greater than 100,000 colony-forming units (10^5 CFU) per ml = significant bacteriuria.

لو طلع الرقم اقل من هيك بنرجع
نعيد ال culture لنتأكد

تفسير المعلومات التي بتطلع بال culture for UTI

Culture: interpretation

- ✓ $>10^5$ cfu/ml of a single species strongly suggests a UTI
- ✓ 10^4 - 10^5 /ml of a single species is equivocal – needs repeat specimen for testing
- ✓ $<10^4$ /ml is regarded as no significant growth
- ✓ >1 species in any numbers suggests contamination

يعني لو طلع معنا e coli و pseudomonas فهون ع الغالب في contamination لل culture لازم اعيده لانو نادر ما يكون تنين مع بعض عاملين ال UTI

اللهم يا فارح الكربات
ويا ناصر المستضعفين
يامن لايهزم جنده
ولا يخلف وعده عجل
بفرج أهل غزه اللهم
احفظهم وارحمهم
وكن معهم

♥ هيك بكون خلص اللاب

بتمنى اكون افدتكم و ما تنسوننا من دعائكم