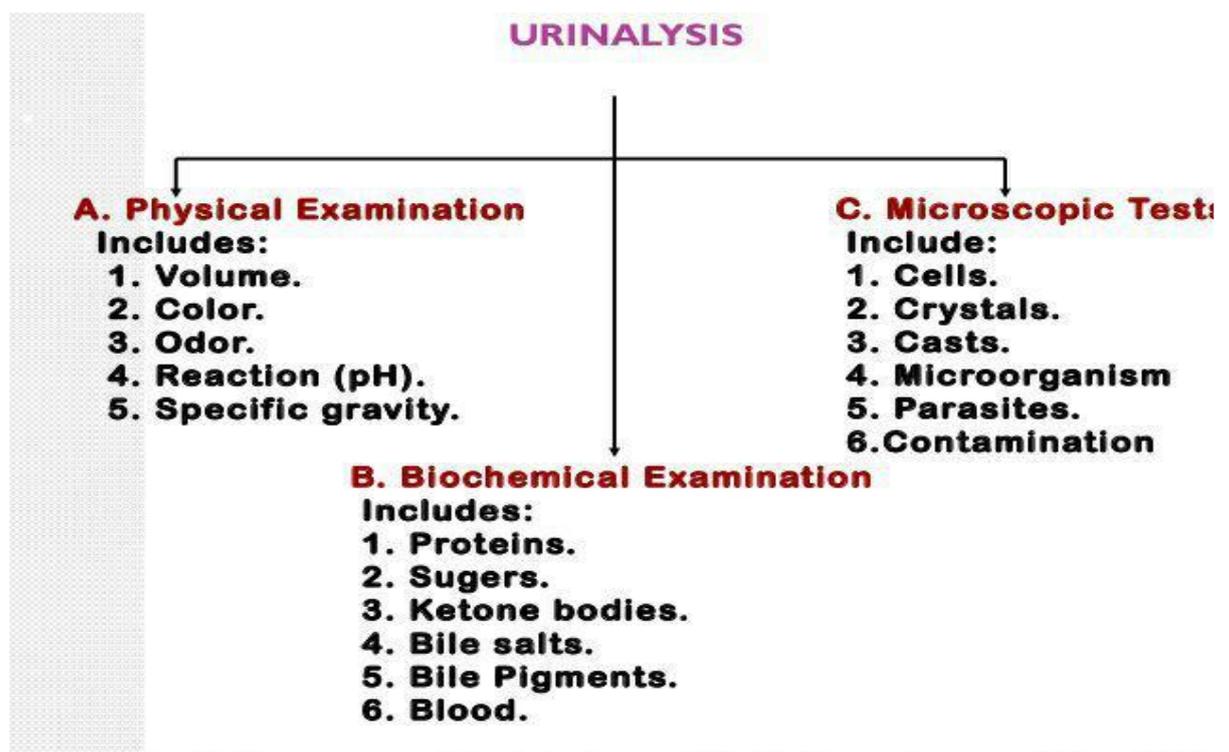


**I- Urine****A. URINALYSIS (General urine examination: GUE)**

Acceptable method of urine collection for analysis?

- ❖ adult male: MSU (with retracted foreskin)
- ❖ adult female: MSU (with separated labia) , if infection suspected, need Clean intermittent catheterization (CIC) sample
- ❖ Children: depending on age, CIC or Suprapubic aspiration

Complete urinalysis includes physical, chemical, and microscopic analyses.

**Physical: color, pH, & Specific Gravity**

1. **Color** : yellowish
2. **Turbidity** :phosphaturia , Pyuria
3. **Specific Gravity**: Specific Gravity usually varies from 1.003 to 1.030.
4. **Osmolality** is a measure of the amount of material dissolved in the urine and usually varies between 50 and 1200 mOsm/L.
5. **pH** the average pH varies between 5.5 and 6.5.

## Common causes of abnormality urine colour :

### 1) **Clear:**

- Overhydration
- very dilute urine

### 2) **Cloudy/milky**

- phosphaturia (most common) which clears in acidic urine
- pyuria
- chyluria

### 3) **Red**

- hematuria
- hemoglobinuria/myoglobinuria
- beets & blackberries (anthrocyanin)
- rifampin

### 4) **Orange**

- dehydration
- phenoazopyridine (Pyridium)
- sulfasalazine

### 5) **Yellow } normal**

### 6) **Green-blue**

- indigo carmine
- methylene blue

### 7) **Brown or black**

- urobilinogen
- chloroquine and primaquine
- Flagel, Nitrofurantoin
- hemorrhage

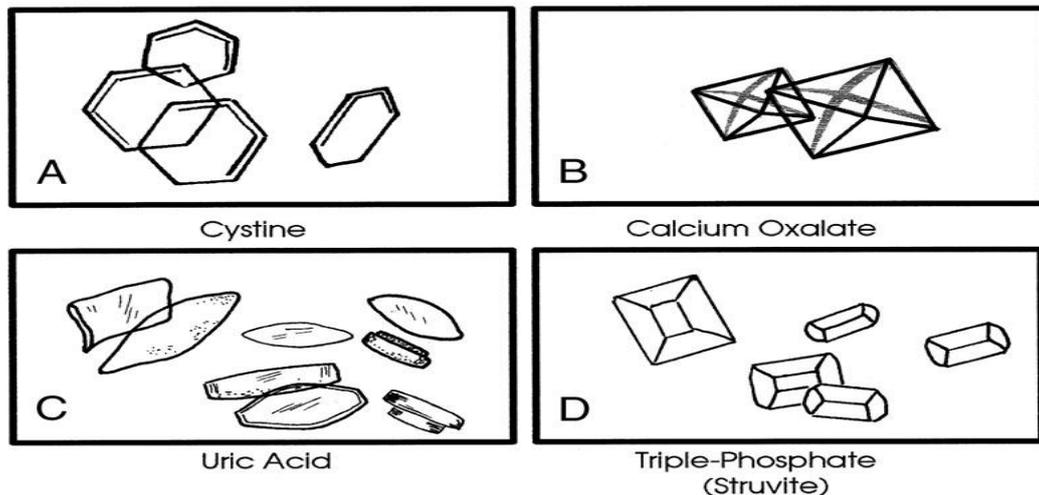
## Biochemical Examination of Urine

- The abnormal substances commonly tested for with a dipstick include
  1. Hemoglobin.
  2. Protein
  3. Glucose.
  4. Ketones.
  5. Electrolytes.
  6. Myoglobin.
  7. Urobilinogen and bilirubin.

## Microscopic analyses

1. **Cells:** (RBC, Leukocytes, Epithelial cells, Renal tubular cells)
2. **Casts:** cast is a protein coagulum that is formed in the renal tubule (The presence of protein casts suggests disease affecting the renal parenchyma)
3. **Crystal**

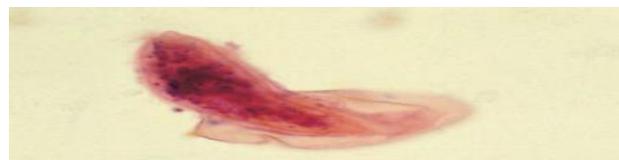
### Crystals



## Bacteria

- Five bacteria/HPF reflects colony counts of about 100,000 bacteria/mL
- The finding of any bacteria in a properly collected midstream specimen from a male should be further evaluated with a urine culture Mid-stream urine for culture & sensitivity (C&S).
- Early morning sample for AFB

## Yeast



## Parasites: Schistosoma ovum

### B. Bacteriological culture

- Culture & sensitivity (C&S) of a clean-catch midstream specimen
- If there are pus cells in the urine but there is no growth on the routine culture media (sterile pyuria), it is worth testing for more fastidious organisms.
- The presumptive diagnosis of bacterial infection based on microscopic examination of the urinary sediment should be confirmed by culture.

- Cultures can be used to:
  1. Estimate the number of bacteria in the urine (quantitative cultures).
  2. Identify the exact organism present.
  3. Predict which drugs will be effective in treating the infection.
  
- Cultures are particularly important and Identifying the drugs to which the bacteria are sensitive IS important to determine the antibiotic sensitivity of the organism and the drug concentration necessary for efficacious treatment in patients with :
  1. Septicemia.
  2. Renal insufficiency.
  3. Diabetes mellitus,
  4. Suspected enterococcal.
  5. Infections *with Proteus*, or *Pseudomonas*
  6. Recurrent or persistent infections.
  7. Drug allergies.
  
- The number of bacteria present in the urine (colony count) is influenced by:
  1. method used to collect the urine specimen.
  2. patient's hydration status.
  3. whether the patient has been taking antimicrobial drugs.
  
- The concept that urinary tract infection is present only when the urine specimen contains 10<sup>5</sup> or more bacteria per milliliter is not an absolute rule; a lower count does not exclude the possibility of an infection, particularly in a symptomatic patient.
  
- Cultures with growth of multiple organisms usually signify contamination.

### **C. Analysis of a 24-hour specimen of urine**

- Quantify the rate of loss, and is especially useful in the investigation of calculus disease caused by abnormal excretion of calcium, oxalate, uric acid and other products of metabolism.
- Patients with recurrent urolithiasis may have an underlying abnormality of excretion of calcium, uric acid, oxalate, magnesium, or citrate. Samples of 24-hour urine collections can be tested to determine abnormally high levels of each.

## Urothelial Cancer Tests (Urine cytology):

- The evaluation of voided or bladder wash urine for bladder urothelial cancer cells has been quite successful for high-grade tumors and carcinoma in situ with sensitivity ranging from 38% to 51% and specificity between 81% and 100%.
- Lower grade tumors less commonly shed abnormal cells and cytology is relatively insensitive in this setting.
- Urinary cytology is fairly interpreter dependent and detection of cancer can be improved by collection of fresh urine samples that are not given in the early morning, barbotage samples, and collection of multiple samples (at least three consecutive specimens).
- Cystoscopy remains the standard diagnostic test for initial diagnosis and surveillance of bladder cancer.

## D. Hormonal Studies

- Tests for abnormalities in adrenal hormone secretion are important in the workup of patients with suspected adrenal tumors.
- **Pheochromocytoma and neuroblastoma** can be detected by measuring the excretion of vanillylmandelic acid. However, serum and urinary levels of metanephrine, epinephrine, and norepinephrine are more sensitive indicators, particularly in cases of pheochromocytoma.

## II- Renal function tests:

- More than 70% of kidney function must be lost before renal failure becomes evident (Because of large renal reserve, considerable structural damage can occur before functional damage become apparent).

### 1. Serum Creatinine

- **Creatinine:** the end product of the metabolism of creatine in skeletal muscle, is normally excreted by the kidneys.
- Because individual daily creatinine production is constant, the serum level is a direct reflection of renal function.
- Serum creatinine levels remain within the normal range (0.8–1.2 mg/dL in adults; 0.4–0.8 mg/dL in young children) until approximately 50% of renal function has been lost.
- Unlike most other excretory products, the serum creatinine level generally is not influenced by dietary intake or hydration status.

## 2. Blood urea (Blood Urea Nitrogen):

- Urea is the primary metabolite of protein catabolism and is excreted entirely by the kidneys.
- The blood urea nitrogen (BUN) level is therefore related to the glomerular filtration rate.
- However, unlike creatinine, BUN is influenced by dietary protein intake, hydration status, and gastrointestinal bleeding.
- Approximately two-thirds of renal function must be lost before a significant rise in BUN level becomes evident. For these reasons, an elevated BUN level is less specific for renal insufficiency than an elevated serum creatinine level.
- BUN–creatinine (BUN–Cr) ratio can provide specific diagnostic information. It is normally 10:1; in dehydrated patients and those with bilateral urinary obstruction or urinary extravasation, the ratio may range from 20:1 to 40:1.
- In patients with renal insufficiency, extremely high BUN levels may develop that can be partially controlled by a decrease in dietary protein.
- normally (15-40 mg/dl) (2.5-6.5 mmol/l)
- It increases in dehydration, fasting, fever & after protein meal. Also in renal failure.

## 3- Creatinine clearance: (85-120 ml/min)

- Creatinine clearance test will give an approximate value for glomerular filtration rate.
- Needs 24h urine collection and a sample of blood.

**III- Tubular function tests:** Specific gravity: (1.003-1.030).

## IV. EXAMINATION OF URETHRAL DISCHARGE AND VAGINAL EXUDATE

### Urethral Discharge:

- Examination of urethral discharge in males can be particularly helpful in establishing a diagnosis.
- If the patient presents with the thick yellowish discharge typical of *Neisseria gonorrhoeae* infection, the discharge should be stained with Gram's stain and examined for gram negative intracellular diplococci.
- If the patient presents with clear or whitish urethral discharge, a smear of the discharge obtained by milking the urethra indicates The presence of trichomonads, yeast cells, or bacteria.

- In cases of acute epididymitis, urinalysis and urine culture are often helpful in establishing the cause. Epididymitis is most commonly caused by *Chlamydia* species in young men and by *E. coli* in men older than 35 years.
- Culturing chlamydia is time consuming and expensive.

### Vaginal Exudate:

- The underlying cause of vaginitis is often a viral, yeast, or protozoal infection or the presence of a foreign body (eg, retained tampon), and a simple physical examination may be all that is required for diagnosis.
- Vaginal secretions obtained by use of a swab can be examined either stained or unstained.
- Examination under a low- or high-power lens may reveal yeast cells or trichomonads, thus suggesting appropriate therapy.
- Since bacteria are always present in the vagina, they generally are not significant findings in a wet smear.

## V. EXAMINATION OF BLOOD, SERUM, AND PLASMA

### Complete Blood Count

- Normochromic normocytic anemia is often seen with chronic renal insufficiency.
- The leukocyte count is usually nonspecific, although marked elevations may indicate an underlying leukemia that may be the cause of urologic symptoms.

### Blood Clotting Studies

- Clotting studies are generally not necessary unless an insidious disorder such as von Willebrand disease, hepatic disease, or sensitivity to ingested salicylates is suspected in a patient with unexplained hematuria.
- The determination of prothrombin time and bleeding time (and perhaps partial thromboplastin time) is usually sufficient.
- A platelet count is important in patients receiving chemotherapy and those who have received extensive radiation therapy.

### Electrolyte Studies

- **Serum sodium and potassium** determinations may be indicated in patients taking diuretics or digitalis preparations and in patients who have just undergone transurethral prostatectomy.
- **Serum calcium** determinations are useful in patients with calcium urolithiasis. Elevated calcium levels are occasionally indicative of a paraneoplastic syndrome in patients with renal cell cancer.
- **Serum albumin** levels should be measured simultaneously with calcium levels to adequately assess the significance of the latter.

## Prostate Cancer Markers

- **PSA** is an important, if controversial, prostate cancer marker.
- PSA is prostate specific but not cancer specific.
- Levels vary with prostate volume, inflammation, and amount of cancer within the gland.
- The percentage of free PSA (ratio of unbound to total PSA) in the serum is useful for increasing the specificity of PSA for diagnosing prostate cancer.

## Hormonal Studies

1. **Serum parathyroid hormone** studies are useful in determining the presence of a parathyroid adenoma in patients with urolithiasis and an elevated serum calcium level. Measurement of parathyroid hormone is not reliable, however, as a sole screening test for parathyroid adenoma and should not be used routinely in all patients with urolithiasis.
2. **Serum renin levels** may be elevated in patients with renal hypertension,
3. Studies of adrenal steroid hormones (eg, aldosterone, cortisol, epinephrine, and norepinephrine) are useful in determining adrenal function or the presence of adrenal tumors.
4. Determinations of serum levels of the beta-subunit of human chorionic gonadotrophin (**hCG**) and of alpha-fetoprotein are indispensable in staging and in treatment follow-up for testicular tumors.
5. **Serum testosterone** studies can help to establish the cause of impotence or infertility.

## Other Studies

1. The finding of elevated **fasting plasma glucose** levels in patients with urologic disease can establish the diagnosis of diabetes mellitus and, thus, indicate a possible cause of renal insufficiency, bladder dysfunction, impotence, or recurrent urinary tract infection.
2. **Serum uric acid** levels are often elevated in patients with uric acid stones.
3. Elevated **serum complement** levels may be diagnostic of underlying glomerulopathies.

## LABORATORY VALUES IN ELDERLY PATIENTS

- Clearly, some laboratory values change as patients age, others stay the same, and the effects of aging on some are as yet unknown.
- Laboratory values that do not change with increasing age include complete blood count, serum electrolytes, and hepatic function tests others.

THANK YOU

2021-2022