



**PBL** 😊

Sheet

Slide

Handout

Number

1

Subject

Urinary Analysis

Done By

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Corrected by

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Doctor

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Price:



## Urinary Analysis

### ❖ Two main tests of Urinary Analysis:

Dipstick & Microscopy



### ■ Dipstick test:

- Dipstick is either visual or automated.
- It shows the content of the urine.
- reaction between the urine and the stick occurs, and certain colors appear.
- depending on color depth +1 +2 compared to key on bottle



### ■ Normal Urine must have:

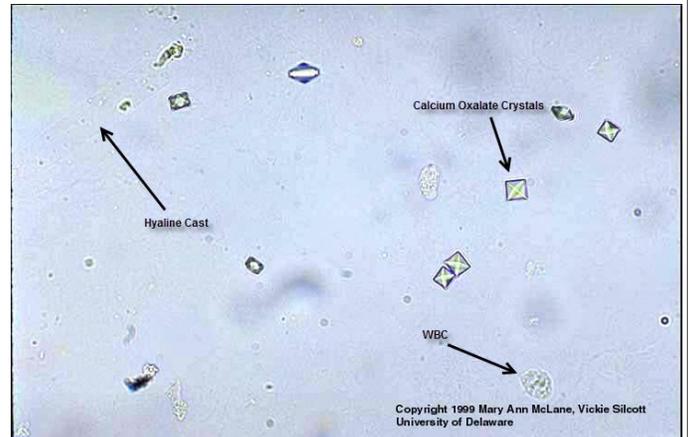
- no blood
- no ketone
- no proteins (or trace amounts)
- pH from 5-8

|                     |  |        |           |          |           |          |                      |                        |
|---------------------|--|--------|-----------|----------|-----------|----------|----------------------|------------------------|
|                     | Specific Gravity<br>Densidad<br>Densidade<br>60 sec/seg.     | 1.000  | 1.005     | 1.010    | 1.015     | 1.020    | 1.025                | 1.030                  |
|                     | pH<br>60 sec/seg.  | 5.0    | 6.0       | 6.5      | 7.0       | 8.0      | 9.0                  |                        |
|                     | Leucocytes<br>Leucocitos<br>60-120 sec/seg.                  | neg.   | ca. 15    | ca. 75   | ca. 125   | ca. 500  | Leuko/ $\mu$ L       |                        |
|                     | Blood/Hemoglobin/<br>Sang(re)(ue)/Hemoglobina<br>60 sec/seg. | neg.   | ca. 5-10  | ca. 10   | ca. 25    | ca. 25   | ca. 50               | ca. 50<br>Ery/ $\mu$ L |
|                     | Nitrite/Nitrito/Nitritos<br>60 sec/seg.                      | neg.   | +         | ++       |           |          |                      |                        |
|                     | Ketones/<br>C.Cetónicos<br>60 sec/seg.                       | neg.   | 5 (0.5)   | 15 (1.5) | 50 (5)    | 150 (15) | mg/dL (mmol/L)       |                        |
|                     | Bilirubin/Bilirrubina/<br>60 sec/seg.                        | neg.   | +         | ++       | +++       |          |                      |                        |
|                     | Urobilinogen(o)/<br>Urobilinogênio<br>60 sec/seg.            | normal | 1 (17)    | 4 (70)   | 8 (140)   | 12 (200) | mg/dL ( $\mu$ mol/L) |                        |
| 2011-02<br>23054941 | Protein/Proteínas/<br>Proteínas<br>60 sec/seg.               | neg.   | 15 (0.15) | 30 (0.3) | 100 (1)   | 300 (3)  | 1000 (10)            | mg/dL (g/L)            |
|                     | Glucose/Glucosa/<br>Glucose<br>60 sec/seg.                   | normal | 100 (5.5) | 300 (17) | 1000 (55) |          | mg/dL (mmol/L)       |                        |

“Anything abnormal found in the urine indicates that we have an abnormal urine and further tests must be taken”

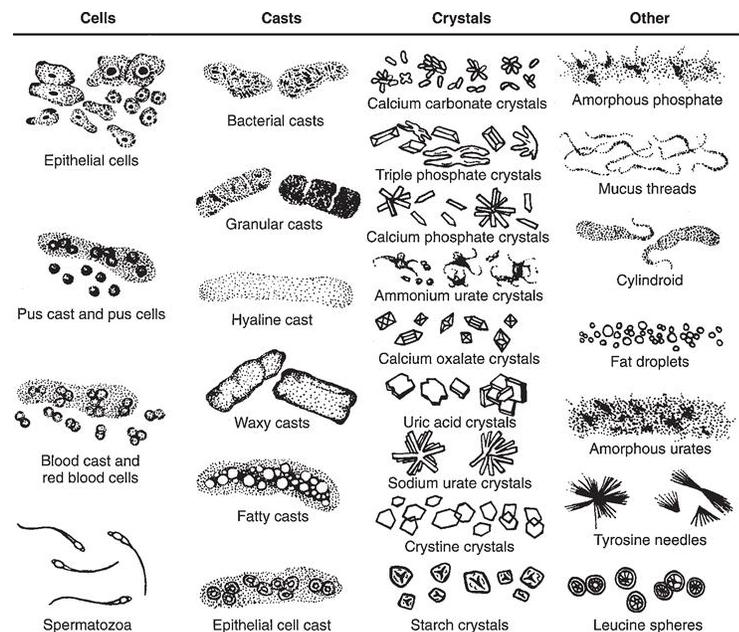
## Microscopy test:

- we normally see squamous cells (little amounts) and sometimes hyaline casts and crystals
- we do centrifugation to concentrate the cells to see
- if RBCs are rounded then it's origin is not from the glomerulus.
- if it was dysmorphic then it is coming from the glomerulus and it may form a cast (glomerulonephritis).
- we may see budding yeast in the normal urine due to contamination! (happens more in females, due to short urethra) "contamination without true UTI"
- Or it could be true UTI secondary to yeast infection, happens in immunocompromised patients, most commonly diabetic patients.
- diabetic patients are relatively immunocompromised (we think about them before the chemotherapy and AIDs patients)
- So, in suspicion of UTI we do microscopy not dipstick



- squamous cells are mainly from the urethra (bladder and ureter are transitional cells not squamous)
- we normally see 1-2 squamous cells in the slide, but if there was an increase in number that may be an indication of **SCC** "squamous cell carcinoma"

❖ mucus can be seen in urine normally, also transitional cells and sperms in males (little amounts)

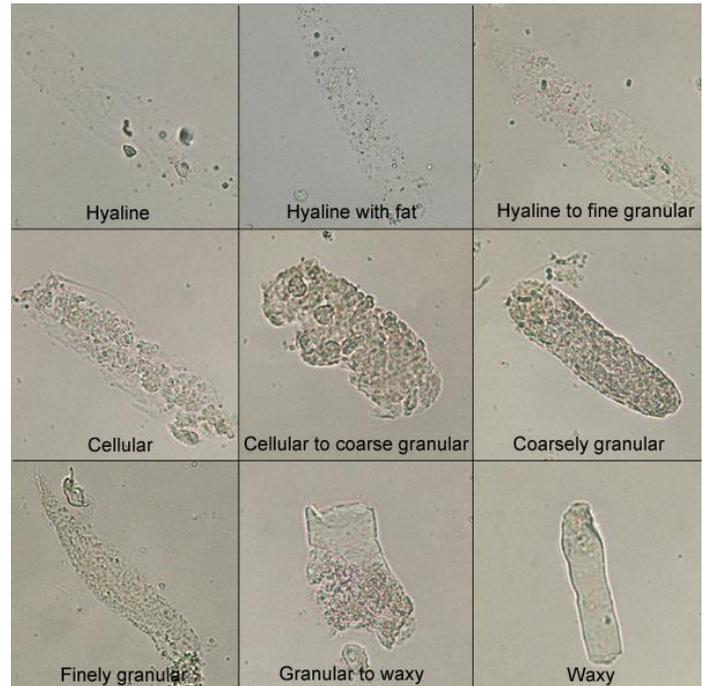


Source: McAninch JW, Lue TF: *Smith & Tanagho's General Urology*, 18th Edition: www.accessmedicine.com

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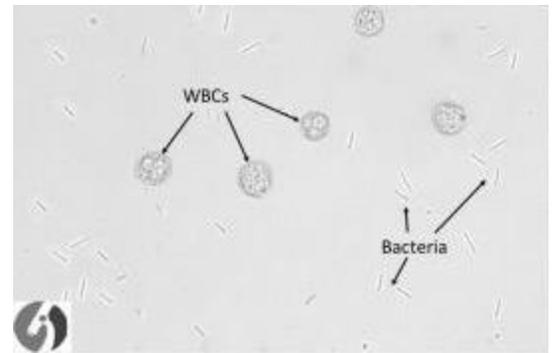
## ❖ Urinary Casts:

- Urinary casts are an aggregation of a substance around a matrix
- **Hyaline Casts:**
  - tubular cells normally secrete **tamm-Horsfall** protein (THP), it is the most abundant protein in normal human urine
  - if an obstruction or decrease in the urinary flow occurred, this protein will aggregate on itself and form Hyaline cast
  - it is a benign case and may occur in normal people with no specificity
  - but it is actually the basic cast of the other types casts (substances may aggregate inside or around it)
- If RBCs aggregated in it is then it's called **RBC cast**
  - occurs in proliferative type of glomerular nephritis (GN),
- if WBC aggregated → **WBC cast**
  - occurs when there's infection, most commonly **pyelonephritis**
  - sometimes may occur due to an allergic reaction at the level of the interstitium of the kidney or granulomatous GN (sarcoidosis or TB at the level of the kidney)
- if debris aggregated → **granular cast**
  - granular → no type of cell can be identified, indicates a presence of pathology but with no specificity
- **heme (brown) granular cast** → associated mostly with ischemic ATN (acute tubular necrosis), secondary to low perfusion
- **Waxy Cast:**
  - found in advanced chronic kidney disease (i.e. prolonged obstruction of flow)
- **Acellular cast**
  - containing lip droplets or oval fat body
  - occurs in nephrotic syndrome due **hyperlipidemia**

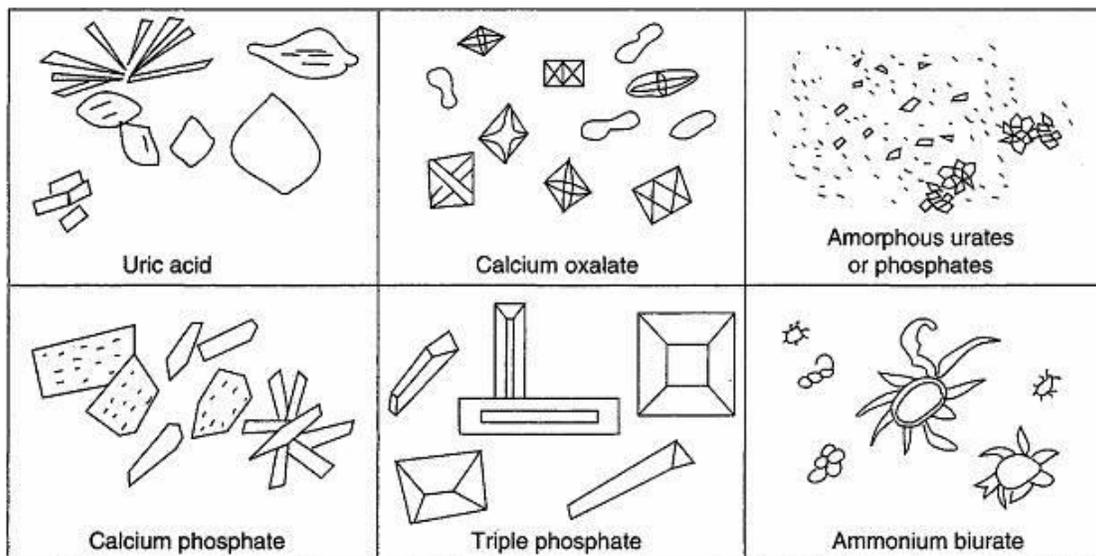


## ❖ Bacteria in urine:

- we may see bacteria in the microscopy of the urine, it is usually considered normal and we should do a culture for the bacteria if we suspect a UTI



## ❖ Crystals in urine:



- Crystals might be seen, and crystals will indicate the type of stone that might be formed
  - calcium oxalate, envelope shaped crystals
    - they are the **most common** crystals seen in the urine analysis, why?
    - because our food is very rich in calcium and oxalate
    - increased level of calcium oxalate indicates the formation of stones or ethylene glycol intoxication
    - ethylene glycol is commonly known as the **Anti-freeze**
  - other crystals: uric crystal, triple phosphate (coffin) crystals, cysteine crystals

## ❖ Urinary analysis findings & Clinical Cases:

- urine analysis and findings are useful when the urine is abnormal, as these tests will help in knowing the cause of this abnormality
- also, it may help in the case of acute kidney injury

🔗 here are 2 cases that we can make use of urine analysis in:

### ✓ Case 1

- 22 years old female found to have **+2 blood** on a routine urine analysis (it must be 0), no proteinuria and she's not menstruating, blood pressure and serum creatinine are normal

\*(menstruation may give false hematuria)

- we repeat the urine analysis 3 times in separate occasions for confirmation
- this information indicates a simple hematuria
- the next step is assessment by doing microscopy urine analysis
- two scenarios are given:
  1. Microscopy shows dysmorphic RBC & RBC Cast → **GN** and then differential diagnosis is taken according to its condition and history and biopsy
  2. Microscopy shows RBCs without dysmorphism or cast → the pathology most likely to be in this case is **Renal Stones** → further imaging is needed for conformation, and less likely it might be **PKD**

### ✓ Case 2

- 64 years old man, smoker with **+2 blood** on routine urine analysis, he had normal urine 1 year earlier, currently taking ACE inhibitors for HTN
- ACR (albumin to creatinine ratio) is 30mg/ml which is **slightly high** → proteinuria
- GFR is low
  - So, this patient has hematuria & proteinuria → chronic kidney disease

- microscopy will either show dysmorphic RBC, or normal shaped RBC
  - 1. if RBCs were **normal shaped**, imaging is required +/- cystoscopy, because this means that the source of blood is not the glomeruli, and also he's a smoker we should think about **cancer** first (RCC or transitional cell carcinoma)
  - 2. if RBC were **dysmorphic** → GN according to age and presentation, if we ruled out GN then we send the patient for Autoimmune tests, and if we didn't get to a diagnosis then we take kidney biopsy as we do in all cases if no hint was found
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# Le Fin.

*This is the last lecture of the last system of our basic years  
Good luck & Be proud!*

Done by: *Omar Saffar*