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Microscopic Examination of Urine Sample

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Microscopic Examination of Urine Sample

It is of great clinical importance and should never been omitted. Important structure to be include casts, erythrocytes, leukocytes, epithelial cells, budding yeasts, protozoa and bacteria.

• **Casts:** Cylindrical bodies performed in distal collecting tubules from RBCs or WBCs or fatty compounds or waxes. Dignosis of cast type aid in diagnosis of the disease.

Types of casts:

Hyaline casts, density granulated casts, finely granulated casts, red cell casts (hematouria), and white cell casts (inflammation), wax casts, fat casts, and epithelial casts.

• **Erythrocytes:** and leukocytes present in urine in case of UTI, diseases, inflammation.

• **Epithelial cells:** presence normally due to sloughing the lining layer of urinary tubules, bladder and urethra or because of some renal diseases.

• **Budding yeasts:** Candida albicans, found in diabetes patients urine because of the low PH and the presence of sugar necessary for the growth.

• Protozoa: likeTrichomonasvaginalis that infect the vagina in women and urethra in men and cause trichomoniasis.

Chemical Examination of Urine:

-PH of urine

The normal hydrogen ion (pH) concentration, in the urine (5-8) depends on the type of diet. Vegetable diet, citrus fruits (also bacterial infections) produce alkaline urine, while high protein diet (also blood acidosis where PH<7.35, some microbial infections, ketones elevation due to diabetes or aspirin intake) produce acidic urine. PH measured by paper strip or pH meter.

-Proteins of urine: a little quantity, of protein are found normally in urine (150 mg/day) any access in protein called proteinuria which is an indication for many diseases like kidney diseases , fever and pregnancy.

Types of protein in urine:

1- **Albumine:** is the first protein appearing in urine due to its low molecular weight and size (albuminuria), this protein appears in Diabetes and hypertenation.
2- **Immunoglobulins:** appear in urine due to inflammations and microbial infections
3- **Hemoglobine:** found in urine due to blood hemolysis.

Test: (Robert's test)

Principle: Precipitation of protein by strong acid

A positive test is indicated by a white ring at the zone of concentration, which should be read against a dark back ground and reported as:

Negative - No ring at the zone of concentration

Note: In many clinical laboratories, Robert's test is routine method as it is simple, quick and easy to read even when only a small amount of protein presents.

-Glucose in urine:

No glucose is present in the urine normally which passes glomerular filter, because it is completely absorbed in the tubules. It present when the blood glucose level elevated to(180mg/ml) which is called renal threshold, when blood glucose elevated the glucose present in urine as in diabetes.

Glucose Test

Method: Qualitative method (Benedicts test)

Principle: Reducing sugars present in the urine react with the copper sulphate to reduce the copric ions to cuprous oxide giving a

Color change from blue (negative) to green, yellow and red depending on the amount of reducing substances present

-Acetone (Ketone body) (ketones):

The ketone bodies include acetone, acetoacetic acid (diacetic acid) and betahydroxybutric acid. A state in which these substances are present in increased amount in the blood and urine is called ketosis. Acetoacetic acid and beta hydroxyl butric acid from which acetone is derived is

normal intermediate product of fat metabolism. When greater amounts of fatty acids are utilized with the production of more acetoacetic acid and beta-hydroxybutric acid can be oxidized by the tissues. These bodies accumulate in the blood and are excreted in the urine (ketonuria).This bodies present in urine in starvation or low blood glucose levels.

Urine Culture:

Urine is the specimen most frequently submitted for culture. The most common sites of urinary tract infection (UTI) are the urinary bladder (cystitis) and the urethra. From these sites the infection may ascend into the ureters (ureteritis) and subsequently involve the kidney (pyelonephritis). Females are more prone to infection of the urinary tract than are males. In both males and females, UTI may be asymptomatic, acute, or chronic.

-Asymptomatic infection can be diagnosed by culture.

-Acute UTI is more frequently seen in females of all ages; these patients are usually treated on an outpatient basis and are rarely admitted to hospital.

-Chronic UTI in both males and females of all ages is usually associated with an underlying disease (e.g. pyelonephritis, prostatic disease, or congenital anomaly of the genitourinary tract) and these patients are most often hospitalized.

Since urine itself is a good culture medium, all specimens should be processed by the laboratory within 2 hours of collection, or be kept refrigerated at 4C until delivery to the laboratory and processed no longer than 18 hours after collection. The examination procedure includes the following steps:

1. Examination of a Gram-stained smear. (For the presence or absence of bacteria, polymorphonuclear leukocytes, and squamous epithelial cells). One or more bacterial cells per oil-immersion field usually implies that there are 105 or more bacteria per milliliter in the specimen. The presence of one or more leukocytes per oil-immersion field is a further indication of UTI.

2. A screening test for significant bacteriuria. The absence of leukocytes and bacteria in a Gram-stained smear of a clean catch

urine sample prepared as described above is good evidence that the urine is not infected. A urine specimen that is “negative” on careful examination of the Gram-stained smear does not need to be cultured.

An alternative simple and effective screening test is the test strip for leukocyte esterase/nitrate reduction. The strip is dipped into the urine specimen as instructed in the package literature. Any pink colour is a positive reaction indicating the presence of leukocyte esterase and/or bacteria in excess of 105 per ml. Urine samples that are positive in the screening test should be cultured as soon as possible to prevent possible overgrowth by no significant bacteria. If the strip does not develop a pink colour it is interpreted as a negative screening test, is so reported, and no culture is indicated. The test strip may not be sensitive enough to detect bacterial counts of less than 105 per ml of urine.

3. A definitive culture for urine specimens found to be positive in the screening

test, and for all specimens obtained by cystoscopy, suprapubic bladder puncture (SBP), or catheterization.

4. Susceptibility tests on clinically significant bacterial isolates should only be performed on well-isolated colonies of similar appearance. Susceptibility tests are generally more importanton cultures obtained from patients who are hospitalized or have a history of recurring UTI.