Unit V – Problem 8 – Biochemistry: Urinalysis

- **Urinalysis**: it is a test which evaluates a sample or urine. It is used to detect and assess a wide range of disorders (e.g. urinary tract infection, kidney disease and diabetes).
- **Urinalysis involves the examination of the following:**
  - Appearance.
  - Concentration.
  - Urine content.
- **Purposes for urinalysis:**
  - Assessing overall health: requested in routine medical exam, pregnancy follow-up, pre-surgery preparation.
  - Diagnosis of urinary problems.
  - Monitoring and follow up: or renal disease or urinary tract infection (UTI).
  - Screening.
  - Specific tests: such as pregnancy testing and drug screenings.
- **Patient's rights regarding the lab test:**
  - To know risks of the test.
  - How the test will be done.
  - What do results mean.
- **Prerequisites and preparations:**
  - Only urinalysis: patient can eat and drink normally before the test.
  - Do not eat food that can color the urine such as blackberries, beets and rhubarb.
  - Do not exercise strenuously.
  - If patient is menstruating or close, postponed the test.
  - Certain medicines, vitamins and supplements that color the urine (e.g. rifampin, vitamin B and phenytoin) can be stopped as they can affect results.
  - Diuretics can also affect test results.
- **Urine collection:**
  - Collected in the morning because urine will be more concentrated and results more obvious.
  - **Sample must be collected midstream using a clean-catch method:**
    - ✓ Patient must wash hands, cleanse urinary opening using towelettes or swabs.
    - ✓ Urine container inside must not be touched by fingers.
    - ✓ Urinate into the toilet for several seconds.
    - ✓ Pass collection container into your urine stream.
    - ✓ Urinate 30-60 ml without stopping urine flow.
    - ✓ Finish urinating into the toilet.
    - ✓ Do not touch the rim of the cup by genital organs.
    - ✓ Avoid toilet paper, pubic hair, stool and menstrual blood in urine.
    - ✓ Deliver urine to lab in 30-60 minutes otherwise refrigerate it.
    - ✓ A catheter may be use to collect urine sample.
    - ✓ Collection of urine from small child is done by a special plastic bag with tape around its opening. The bag is placed around child's genitals until he urinates, then carefully removed.
    - ✓ Collection of urine from a very sick baby, a catheter through the urethra or a needle through the baby's belly directly into the bladder (suprapubic tap) is used.
  - **Special types for urine collection:**
    - ✓ Double-voided urine sample collection:
      - ❖ Patient is asked to urinate into the toilet, but this urine will not be collected.
      - ❖ Patient is then asked to drink a large glass of water and to wait for 30-40 minutes. Then, urine sample is collected.

- ✓ 24-hour urine collection:
  - ❖ Collection period starts in the morning. First urine is excluded. 2nd urination marks the beginning of the 24-hour urine collection.
  - ❖ Urination has to be into small clean container, drained into a large container (1 gal = 4 Liters!).
  - ❖ The large container must be kept in refrigerator during collection.
- ✓ Bence-Jones protein:
  - ❖ Abnormal protein found in the urine of 50% of people with multiple myeloma.

- **Results:**
  - **Visual exam:**
    - ✓ Color: factors which affect the color of the urine were mentioned previously.
    - ✓ Clarity: normally, urine is clear. Bacteria, blood, sperm, crystals or mucus can make urine look cloudy.
    - ✓ Odor: normally, urine has a slightly "nutty" odor. Infection with E.coli can cause a bad odor while diabetes or starvation can cause a sweet, fruity odor.
  - **Chemical examination:**
    - ✓ pH: normally it is between 4.6-8
    - ✓ Specific gravity: it shows concentration of particles in urine. Higher than normal concentration often is a result of dehydration.
    - ✓ Protein: normally not present in urine.
    - ✓ Sugar: normally not present in urine. It is high in uncontrolled diabetes.
    - ✓ Ketones: detected in diabetes, starvation or severe vomiting.
    - ✓ Bilirubin: indicating liver disease if detected in urine.
    - ✓ Urobilinogen: a sign of liver disease or biliary obstruction.
    - ✓ Evidence of infection: leukocyte esterase (product of WBCs).
    - ✓ Blood: a sign or renal disease, stones, bladder cancer or blood disorders.
  - **Microscopic examination:**
    - ✓ WBCs: may be a sign of infection.
    - ✓ RBCs: mentioned above.
    - ✓ Epithelial (squamous cells): may be a sign of tumor but mostly it indicates that the sample is contaminated.
    - ✓ Casts: the type of cast indicates the type of kidney disease.
    - ✓ Crystals: large number indicates kidney stones.
- **Normal urine composition:**

Test	Reference Range
Color	Straw - Dark yellow
Appearance	Clear - Hazy
Specific Gravity	1.003-1.029
pH	4.5-7.8
Protein	Negative
Glucose	Negative
Ketones	Negative
Bilirubin	Negative
Occult blood	Negative
Leukocyte Esterase	Negative
Nitrite	Negative
Urobilinogen	0.1-1.0 EU/dL
WBCs	0-4/hpf
RBCs	male: 0-3/hpf female: 0-5/hpf
Casts	0-4/lpf
Bacteria	Negative

EU = Ehrlich Units (ca. 1 mg) *hpf = High Power Field (400x)*
lpf = Low Power Field (100X)