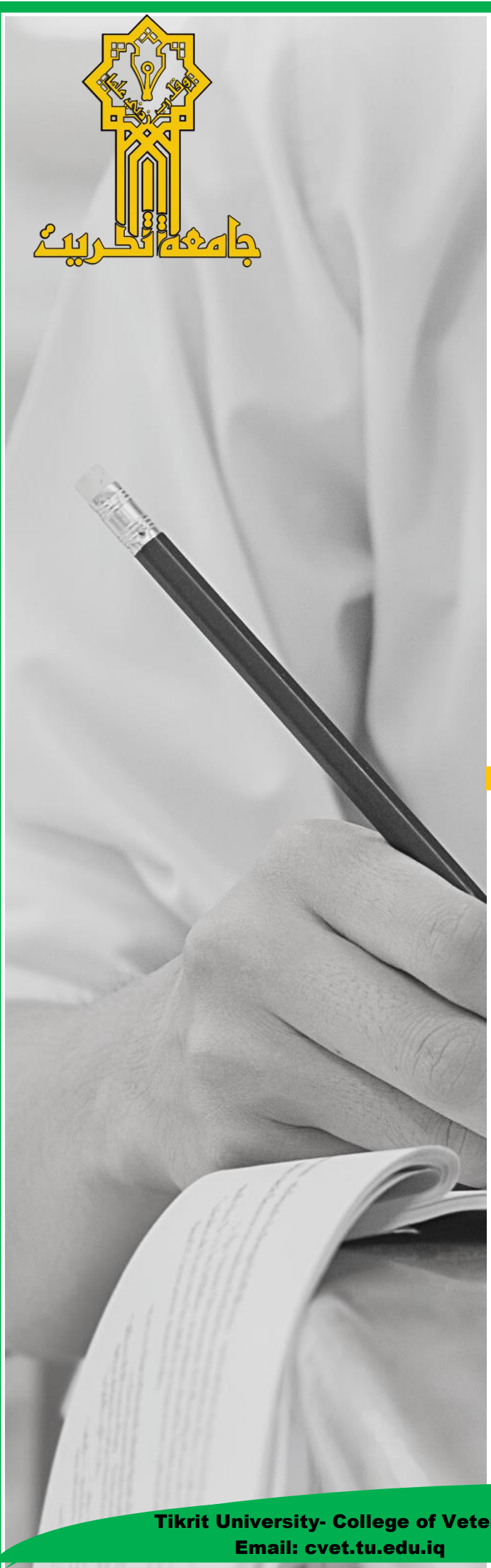

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Disease of the Urinary system

Introduction

* The kidneys excrete the end products of tissue metabolism (except CO2), and maintain fluid, electrolyte and acid-base balance by varying the volume of water and the concentration of solutes in the urine.

* the kidney as composed of many similar nephrons, which are the basic functional units of the kidney. Each nephron is composed of blood vessels, the glomerulus, and a tubular system that consists of the proximal tubule, the loop of Henle, the distal tubule, and the collecting duct.

* Glomerular filtrate is derived from plasma by simple passive filtration driven by arterial blood pressure depends on the hydrostatic pressure and the plasma oncotic pressure in the glomerular capillaries and on the proportion of glomeruli,

*A partial loss of function is described as renal insufficiency. When the kidneys can no longer regulate body fluid and solute composition, renal failure occurs.

Clinical Features(principles manifestations) of Urinary Tract Disease

The major clinical manifestations of urinary tract disease are

1- **Abnormal constituents of urine**:

such as specific gravity and osmolality, enzymuria, and quantitative proteinuria and glycosuria.

2-Variations in daily urine flow:

* urine production is highly variable in large animals and is dependent to a large extent on diet, watering systems, and the palatability of the water.

•••Polyuria: Polyuria occurs when there is an increase in the volume of urine produced over a 24-hour period.

••• Oliguria and Anuria

* Reduction in the daily output of urine (**oliguria**) and complete absence of urine (**anuria**) occur under the same conditions and vary only in degree.

* In dehydrated animals, urine flow naturally decreases in an effort to conserve water as plasma osmolality increases.

* Congestive heart failure and peripheral circulatory failure may cause a reduction in renal blood flow that oliguria follows.

•••Pollakiuria

* This is an increase in the daily number of postures for urination and is usually accompanied by a decreased volume of urine**.**

* **Dribbling** is a steady, intermittent passage of small volumes of urine.

3-Abdominal pain and painful and difficult urination (dysuria and stranguria)

* Abdominal pain and painful urination (**dysuria**) and difficult and slow urination (**stranguria**) are manifestations of discomfort caused by disease of the urinary tract.

* During these acute attacks of pain, the cow may exhibit downward arching of the back, paddling with the hind feet, rolling, and bellowing.

4- Morphologic abnormalities of kidneys and ureters

*Enlarged or decreased size of kidneys may be palpable on rectal examination or detected by ultrasonography.

* In cattle, gross enlargement of the posterior aspect of the left kidney may be palpable in the right upper flank.

5-Palpable abnormalities of the bladder and urethra

Abnormalities of the bladder that may be palpable by rectal examination include gross enlargement of the bladder, rupture of the bladder, a shrunken bladder following rupture.

6-Uremia

*Uremia is the systemic state that occurs in the terminal stages of renal insufficiency.

* Anuria or oliguria may occur with uremia. Oliguria is more common unless there is complete obstruction of the urinary tract.

*The uremic animal is depressed and anorexic with muscular weakness and tremor.

*In chronic uremia, the body condition is poor, probably as a result of continued loss of protein in the urine, dehydration, and anorexia.

*The heart rate is markedly increased because of terminal dehydration,

*Uremic encephalopathy is associated with seizures, tremors, abnormal behavior, and muscle weakness, and histologic evidence of myelin vacuolation may be present.

*The animal becomes recumbent and comatose in the terminal stages of uremia. The temperature falls to below normal and death occurs quietly.

* There is a progressive increase in serum urea concentration and serum creatinine concentration

Special Examination of the Urinary System

*Lack of accessibility limits the value of physical examination of the urinary tract in farm animals.

* Palpation per rectum can be performed on horses and cattle.

* In small ruminants and calves the urinary system is largely inaccessible to physical examination

* Urinalysis and determination of the serum or plasma concentration of urea nitrogen or creatinine is a required component of any examination of the urinary system.

Tests of urine samples

***** Urinalysis is an essential component of the examination of the urinary system.

* The urine sample should be centrifuged; the supernatant used for laboratory analysis and the sediment for routine urine analysis.

1- **Specific Gravity:** Specific gravity of urine is the simplest test to measure the capacity of renal tubules to conserve fluid and excrete solute. For most species, the normal specific gravity range is 1.015 to 1.035.

* In chronic renal disease the urine specific gravity decreases to 1.008 to 1.012.

2- **pH:** The pH of urine can be measured using pH papers calibrated in 0.2 to 0.3 pH units or urine dipstick point-of-care tests that are calibrated in 0.5 pH units.

* The physiologic range of urine pH is 4.5 to 9.0, with herbivore urine typically being between 7.0 and 8.5.

3- **Net Acid Excretion:** The kidney plays a central role in acid-bas homeostasis by adjusting urine electrolyte excretion to maintain constant blood pH.

4- **Hematuria:**

* Hematuria can be from

prerenal causes when vascular damage occurs, such as trauma to the kidney, septicemia, and purpura hemorrhagica.

***Renal** causes include acute glomerulonephritis, renal infarction, embolism of the renal artery, tubular damage from toxic insult, and pyelonephritis.

* **Postrenal** hematuria occurs particularly in urolithiasis and cystitis.

5-Hemoglobinuria

True hemoglobinuria causes a deep red to brown coloration of urine and there is no erythrocyte debris in sediment.

6-Myoglobinuria

The presence of myoglobin (myohemoglobin) in the urine is evidence of severe muscle damage.The only notable occurrence in animals is azoturia of horses. Myoglobinuria

7-**Ketonuria**

is seen in starvation; acetonemia of lactating dairy cattle; and pregnancy toxemia of ewes, does, and beef cattle.

8-Glucosuria

Glucosuria occurs in acute tubular nephrosis as a result of failure of tubular resorption.

9-Proteinuria

Proteinuria can be prerenal, renal, or Postrenal in origin, and it is clinically helpful to identify the anatomic source of protein loss.

10-Casts

Casts are present as an indication of inflammatory or degenerative changes in the kidney, where they form by agglomeration of desquamated cells .

11-Bacteriuria

Diagnosis of a urinary tract infection is based on finding a clinically relevant bacteriuria in urine collected by free catch (midstream ncollection into a sterile container),catheterization, or cystocentesis.

12-Crystalluria

Calcium carbonate and triple phosphate crystals are common in normal urine.

13-Enzymuria

A clinically useful index of proximal tubular injury is determining the γ -glutamyl transferase (GGT) activity in urine.

the presence of high molecular weight enzymes in urine such as GGT (molecular weight 330,000 g) is called **parenchymatous enzymuria**.

13-Serum Urea Nitrogen and Creatinine Concentration

These serum indices of function are simple estimates of glomerular filtration because urea and creatinine are freely filtered by the glomerulus.

do not rise appreciably above the normal range until 60% to 75% of nephrons are destroyed.

14-Ultrasonography

Transcutaneous and transrectal ultrasonography is commonly used to detect and characterize anatomic abnormalities of the kidneys, ureters, bladder, and urethra in horses, cattle, and small ruminants.

Ultrasonography is an effective screening test for diagnosing obstructive conditions of the urinary tract, including hydronephrosis, hydroureter, and bladder distension and can be used to visualize the kidney and guide the biopsy needle during renal biopsy

In cattle, the right kidney is easily accessible to ultrasonography from the body surface. Generally, a 5- to 10-MHz linear probe is used transrectally and a 2.5- to 3.5-MHz sector transducer used transcutaneously

15-Endoscopy

Transurethral endoscopy can be easily performed in mares, stallions, geldings, and cows to examine the urethra and bladder and flow of urine from both ureters.

16-Renal Biopsy

Percutaneous renal biopsy can be performed in sedated and adequately restrained cows and horses.

17-**Radiography**

Radiographic examination has limited value for the diagnosis of urinary tract disease in farm animals with the potential exception of radiolucent particles in the bladder of ruminants with urolithiasis.

Principles of Treatment of Urinary Tract Disease

•Fluid and Electrolytes

•Balanced electrolyte solutions or isotonic (0.9% NaCl) saline supplemented with potassium (if hyperkalemia is not present) and calcium (if hypercalcemia is not present) can be used to correct fluid and electrolyte deficits.

•If the patient has anuria or oliguria after the fluid volume deficit is corrected, a diuretic should be administered to help restore urine flow.

•Furosemide (1–2 mg/kg BW IV or IM every 2–6 hours) or mannitol (0.25–2.0 g/kg BW in a 20% solution administered IV over 15–20 minutes) may be used.

•.Animals nonresponsive to fluid loading and diuretics could be administered low dose (“renal dose”) dopamine as a continuous IV infusion (3–5 μg/kg BW/min) with dopamine diluted in 0.9% NaCl

•Dopamineis theoretically the preferred pharmacologic agent to selectively increase renal blood flow and therefore glomerular filtration rate in animals with renal failure.

Antimicrobial Agents

•Selection of antimicrobial agents for the treatment of urinary tract infections should be based on quantitative urine culture of a catheterized urine sample.

•A clinically relevant bacterial concentration indicative of cystitis or pyelonephritis is 1000 cfu/mL or 30,000 cfu/mL of urine from a catheterized or midstream free-catch sample, respectively.

•The ideal antimicrobial for treatment of urinary tract infections should meet several criteria. It should

1 Be active against the causal bacteria

2 Be excreted and concentrated in the kidney and urine

3 Be active at the pH of urine

4 Have low toxicity, particularly nephrotoxicity

5 Be easily administered

6 Be low in cost

7 Have no harmful interactions with other concurrently administered drugs

•Appropriate first-line antimicrobials include

penicillin, ampicillin, amoxicillin, ceftiofur, and cefquinome in ruminants and trimethoprim-sulfonamides and ceftiofur in horses.

•Antimicrobial therapy for lower urinary tract infections should continue for at least 7 days; for upper urinary tract infections 2 to 4 weeks of treatment is often necessary.

•Success of therapy can be evaluated by repeating the urine culture 7 to 10 days after the last treatment.