Fluid therapy in farm animals

Fluid Therapy is the administration of fluids to a patient as a treatment or preventative measure. It can be administered via an intravenous, intraperitoneal, , subcutaneous and oral routes.

Fluid therapy in animals is often difficult because large volumes are needed some times, moreover, animals must be restrained, however proper therapy can be very time consuming, and monitoring is often difficult impossible.

For these reasons, fluid therapy is often avoided in most of times in farm animals however there are clinical situations where either oral or intravenous fluids are necessary and cannot be avoided.

Indications for fluid therapy

1- Fluid therapy is indicated either when there is a loss of fluid In cases of moderate to severe dehydration

2- Electrolytes abnormalities,

3-Hypotension

4-Hypovolemia

5-Decreased oxygen delivery

Route of admistration of fluid therapy…..

Oral rehydration therapy

Oral rehydration therapy (*ORT*) is a simple treatment for dehydration associatedwith diarrhea, particularly gastroenteritis/gastroenteropathy,for any causes.

ORT consists of a solution of salts and sugars which is taken by mouth. For most mild to moderate dehydration mostly in young animals the favorite treatment in an emergency department is ORT over intravenous replacement of fluid

Intravenous therapy

In severe dehydration, intravenous fluid replacement is preferred, and may be lifesaving. It is especially useful where there is depletion of fluid both in the intracellular space and the vascular spaces.

Fluid replacement is also indicated in fluid depletion due to hemorrhage, extensive burns and excessive sweating (as from a prolonged fever), and prolonged diarrhea .

In addition, during e.g. surgical procedures, fluid requirement increases by e.g. increased evaporation, fluid shifts and/or excessive urine production. Even a small surgery may cause a loss of approx. 4 ml/kg/hour, and a large surgery approximately 8 ml/kg/hour, in addition to the basal fluid requirement.

S/c therapy:

Intra peritoneal therapy:

Proctoclysis therapy:

an enema, is the administration of fluid into the rectum as a hydration therapy. It is sometimes used for very ill persons with cancer.[6]

Note : The speed of fluid replacement may differ between procedures and also depend on the type of the solutions

Terms used in body fluids ….

Total body water (TBW) – percentage of body composition consisting of water, approximately 60% of body weight

Intracellular fluid (ICF) volume – that part of the TBW contained within the cells, approximately 40% of body weight and 2/3rds of TBW.

It contain mainly

Na^{+}8 (mM)

K^{+} 139 (mM)

Cl^{-} 4 (mM)

Extracellular fluid (ECF) volume – that portion of the TBW outside the cells, approximately 20% of body weight and 1/3rd of TBW. include
interstitial fluid and blood plasma.

Interstitial fluid volume – that portion of the ECF outside the circulation and surrounding the cells

Intravascular fluid volume

- the total blood volume consisting of red and white cells and plasma. May be estimated at approximately 5-7% of the body weight.

It contain mainly

Na^{+} 150 (mM)

K^{+} 5 (mM)

Cl^{-} 110 (mM)

Types of Fluids

1. **Crystalloids** are fluids able to enter all body compartments. Those are aqueous solutions of mineral salts or other water-soluble molecules.
2. **Colloids** غرويةare fluids restricted to the plasma compartment contain larger insoluble molecules, such as gelatin such as Blood ,albumin and plasma. which do not pass out of normal blood vessels

Fluid Rate Calculations

When calculating the fluid requirements of a patient, there are 3 elements to consider :

1-Replacements are calculated based on the level of degree of dehydration.

2-Maintainance is the basic rate which a patient requires during a 24 hour period. It is commonly calculated as 50ml/kg/24hr, or 2ml/kg/hr.

3-Ongoing losses are calculated based on a expected fluid amount lost by a patient within a 24 hour period. Common losses include vomitting and diarrhoea.

Fluid rate calculations = *% Dehydration* x *Bodyweight (kg)* x 10

Rough field estimation of fluid in farm animals

Mild dehydration = 5-10 mL/ kgBw
Moderate dehydration 25-30 mL/ kgBw
Sever dehydration 100-150mL kgBw

Isotonic solution:

A solution that has the same salt concentration as cells and blood. Isotonic solutions are commonly used as intravenously infused fluids in hospitalized patients.

]. This type of solution is infused to replace fluid losses, usually extracellular losses, and to expand the intravascular volume. Most isotonic solutions do not provide calories or free water. Examples of isotonic solutions are 0.9% sodium chloride, commonly called normal saline (NS), and lactated Ringer's (LR).

Hypotonic solution:

A solution that contains less dissolved particles (such as salt and other electrolytes) than is found in normal cells and blood. Hypotonic solutions are commonly used to give fluids intravenously to hospitalized patients in order to treat or avoid dehydration.

They are commonly infused to dilute extracellular fluid and rehydrate the cells of patients who have hypertonic fluid imbalances and to treat gastric fluid loss and dehydration from excessive diuresis.

This type of solution provides free water, sodium, and chloride but does not provide calories or other electrolytes. An example of a hypotonic solution is 0.45% sodium chloride (0.45% NS), commonly called half normal saline.

Hypertonic solution:

A solution that contains more dissolved particles (such as salt and other electrolytes) than is found in normal cells and blood. For example, hypertonic solutions are used for soaking wounds.

The solutions are infused to treat patients who have severe hyponatremia. Depending on the type of hypertonic fluid infused, it can provide patients with

calories, free water, and some electrolytes. Examples of hypertonic solutions are dextrose 10% in water and dextrose 5% in 0.9% sodium chloride .

Type of fluid therapy in animals

1) Saline or Ringer's solution or *Ringer's lactate* or *Hartmann solution*

(isotonic or some times hypotonic)

a-In cases of severe dehydration, these isotonic, non-alkalinizing solutions are generally recommended for replacement of large fluid volumes in adult ruminants

b-. **Ringer's solution is a** composition of the blood serum and plasma.

c- **If mild to moderate** hypokalemia is present, potassium chloride can be added at a rate of 20 to 40 mEq/L during routine fluid administration (1 gram of KCl contains 14 mEq of K+)

d-If mild to moderate hypocalcemia is suspected, a 500 ml bottle of calcium gluconate can be added to 20 liters of fluids intended for intravenous administration.

Note: Don't give LR to patients with liver disease as it cant metabolize lactate.

2- **Dextrose** – (Isotonic or Hypertonic) Often indicated for cattle in early lactation with severe ketosis, hepatic lipidosis, or hypoglycemia.

Glucose as a 5% solution can be administered at a slow rate for several days, however this delivers free water and can cause dilution of serum electrolytes.

In general, it is preferable to add 2.5 to 5% glucose to a non-alkalinizing fluid type (ie. Ringer's) and administer a slightly hypertonic

solution than to administer isotonic dextrose by itself

Note: patients with intracranial pressure should not receive **Dextrose** because it increase cerebral edema

3- Sodium chloride(0.9%)Normal saline (Isotonic)

a-Used to maintain hydration or to rehydrate animals in many situations including the treatment of shock , decreased oral fluid intake, and to replace fluids lost due to an illness such as kidney disease and others .

b-This type of solution will pass freely out of the blood vessels and are capable of entering all body compartments

c-They are inexpensive and readily available with a wide range of uses, not just in emergency. In addition assuming renal function is adequate any excess fluid or solutes will be excreted in urine.

d- the Main problem in this solution may be short lived and there is a risk of interstitial oedema, dilution of RBCs and dilution of clotting factors.

e-It might use to treat low extracellular fluid, as in fluid volume deficit from- Hemorrhage - Severe vomiting or diarrhea - Heavy drainage fromGI suction, fistulas, or wounds,Shock, Mild hyponatremia, Metabolic acidosis

4-Mannitol I.V.

is indicated for the following purposes in adults and pediatric patients.

Therapeutic Use

1. Promotion of diuresis in the prevention or treatment of the oliguric phase of acute renal failure before irreversible renal failure becomes established.
2. Reduction of intracranial pressure and brain mass.

3. Reduction of high intraocular pressure when the pressure cannot be lowered by other means.
4. Promotion of urinary excretion of toxic materials.

5-Bicarbonate fluid therapy

a-Sodium bicarbonate is a systemic alkalinizing agent which, when given intravenously, will increase plasma bicarbonate, buffer excess hydrogen ion concentration, raise blood pH and reverse the clinical manifestations of acidosis

b-Sodium bicarbonate dissociates يفصل in water to provide sodium and bicarbonate ions (HCO3–). Sodium is the principal cation of the extracellular fluid and plays a large part in the therapy of fluid and electrolyte disturbances. Bicarbonate is a normal constituent of body fluids and the normal plasma level ranges from 24 to 31 mmol/L.

c- Sodium bicarbonate is used as an alkalinising agent in the treatment of metabolic acidosis which may occur in many conditions including diabetes, starvation, hepatitis, cardiac arrest, shock, severe dehydration, renal insufficiency, severe diarrhoea, or administration of acidifying salts (e.g. excessive sodium chloride, calcium chloride, ammonium chloride).

Sodium bicarbonate is also used to increase urinary pH in order to increase the solubility of certain weak acids (e.g. cystine, sulphonamides, uric acid) and in the treatment of certain intoxications (e.g. methanol, phenobarbitone, salicylates) to decrease renal absorption of the drug or to correct acidosis.

d- Sodium Bicarbonate is given as 8.4% Injection can be diluted with 0.9% sodium chloride injection.

e- Sodium bicarbonate is contraindicated in patients with renal failure, respiratory or metabolic alkalosis, hypoventilation, hypernatraemia, hypertension, oedema, congestive heart failure, eclampsia, potassium depletion or hypocalcaemia

6- Blood transfusion

Common IV solutions and names

	Isotonic	Hypotonic	Hypertonic
Dextrose in water	5% dextrose in water *also called:* D5W		10% dextrose in water *also called:* D10W
Saline	0.9% sodium chloride *also called:* 0.9% NaCl 0.9%NS (normal saline)	0.45% sodium chloride *also called:* 0.45% NaCl 0.45% NS (half normal saline) 0.33% sodium chloride *also called:* 0.33% NaCl 0.33% NS (one third normal saline)	3%-5% sodium chloride *also called:* 3%-5% NaCl 3%-5% NS
Dextrose in saline	5% dextrose in 0.225% sodium chloride *also called:* D5 one-quarter normal saline D5 0.225% NaCl D5 0.225% NS		5% dextrose in 0.9% sodium chloride *also called:* D5 normal saline D5 0.9% NaCl D5 0.9% NS 5% dextrose in 0.45% sodium chloride *also called:* D5 one half normal saline D5 0.45% NaCl D5 0.45% NS
Electrolyte solutions	Lactated Ringer's *also called:* LR		5% dextrose in lactated Ringer's *also called:* D5LR

Sings of response for fluid replacement

1- Urination
2- Rest
3- Comfort
4- Decrease PCV

5- Decrease dehydration sings
6- Body temperature back to normal
7- Increase muscles tone
8- Moisture of nose
9- Normal mucus membrane
10- Capillary Refill Time return to normal