



Fluid Therapy

WRNC Training

Basic Wildlife Rehabilitation Course Hydration



Fluid Therapy

Hydration

Is it always appropriate to administer fluids?

What type of fluids? What temperature should it be?

What is the appropriate route of fluid administration?

What is the appropriate volume of fluids needed?

How rapidly should fluids be given?

How frequently should fluids be administered?

How to monitor the effects and + or - physiological responses?

When should fluid therapy be discontinued?



Fluid Therapy

Skin Turgor - Mammals

Well-hydrated: Lifting skin from the dorsal surface of the back & releasing it results in skin snapping back immediately. Check abdomen for “wrinkles”.



Obese animals have fast skin turgor response even if dehydrated.



Fluid Therapy

Skin Turgor - Mammals

% of Dehydration

< 5

5% - 6%

6% - 8%

Clinical Signs

- Not detectable
- Subtle loss of skin elasticity
- Dry oral mucous membranes (mouth, vulva or rectal mucosa)
- Definite delay in return of skin to normal
- Discolored, dark urine (rabbits can be brown)
- Slight prolongation of capillary refill time
- Eyes possibly sunken in orbits



Fluid Therapy

Skin Turgor - Mammals

% of Dehydration

10% - 12%

12% - 15%

Clinical Signs

- Tented skin stands in place-wrinkled abdomen, sunken eyes
- Definite prolongation of capillary refill time
- Dry oral mucous membranes, no urine
- Possible signs of shock: rapid & weak pulse, cool extremities
- Definite signs of shock
- Death imminent



Fluid Therapy

Skin Turgor-Birds/Reptiles

Avian - examine skin turgor on top of feet or legs, upper eyelid, especially abdomen for “wrinkles” & leathery feel in baby birds.

Reptiles - examine on back or abdomen for “wrinkles”, check eye-lids.





Fluid Therapy

Skin Turgor – Birds/Reptiles

% of Dehydration

< 5

5% - 6%

7% - 10%

Clinical Signs

- Not detectable
- Subtle loss of skin elasticity
- Tenting of skin
- Loss of brightness around eyes
- Slow upper eye-lid turgor
- Dry, ropy mucous membranes
- Thick, pasty urates



Fluid Therapy

Skin Turgor – Birds/Reptiles

% of Dehydration

10% - 12%

Clinical Signs

- Tented skin stands in place
- Muddy color to scales of feet, cool extremities
- Dry mucous membranes
- Rapid heart rate
- Depressed
- No urates at all

12% - 15%

- Definite signs of shock, extreme depression
- Near death



Fluid Therapy

Fluid Therapy- How does it work?

The cell membrane regulates the water molecules and concentration of solutes (salts, electrolytes) moving into and out of each cell. This is called **Osmosis**.

Tonicity – tension of fluids within & outside cell membranes.

Isotonic – will not draw fluid out of cells by osmosis.

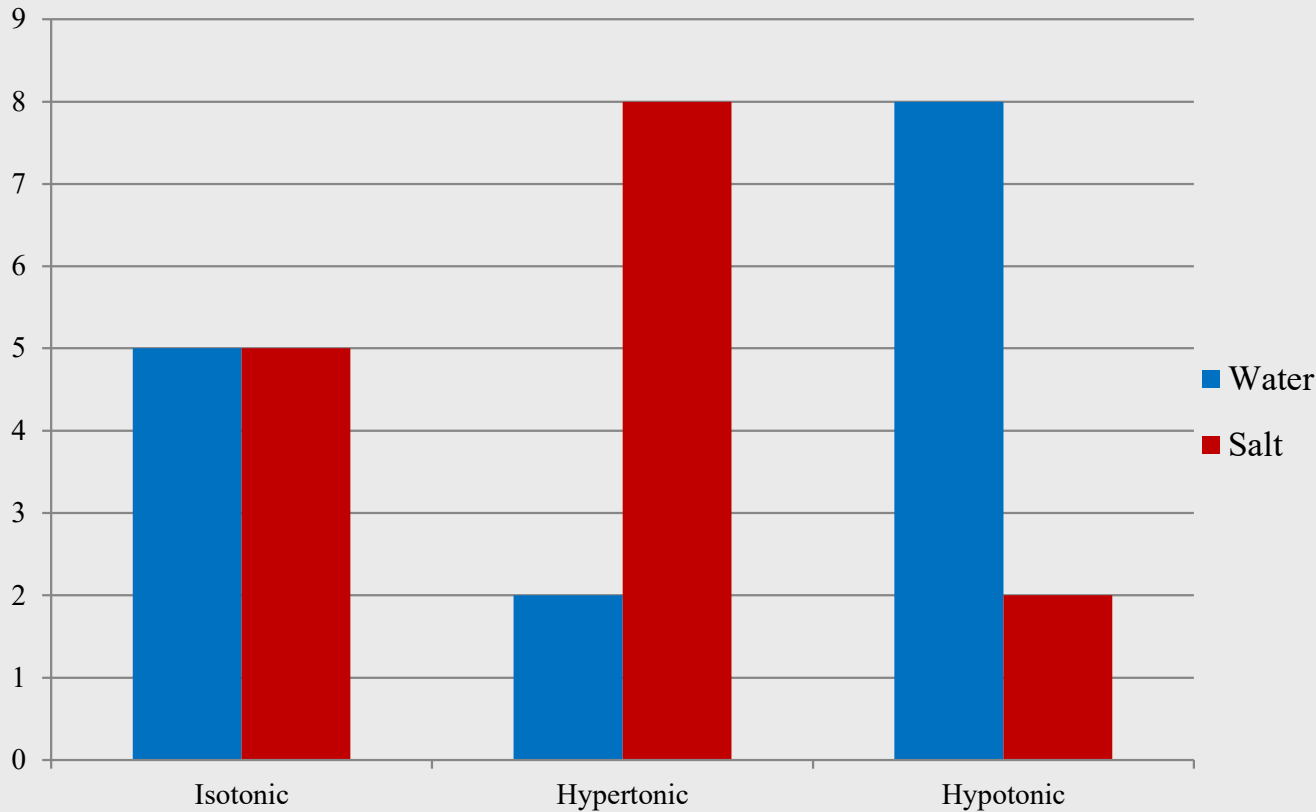
Hypertonic – can draw fluids out of the cells resulting in increased levels of dehydration.

Hypotonic – can force fluid into cells, maybe too much (edema).



Fluid Therapy

Basic Types of Solutions



Isotonic

Equal parts salt and water

Hypertonic

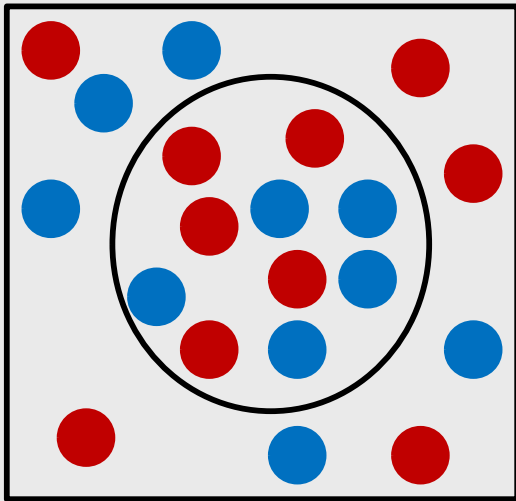
More salt, less water

Hypotonic

More water, less salt

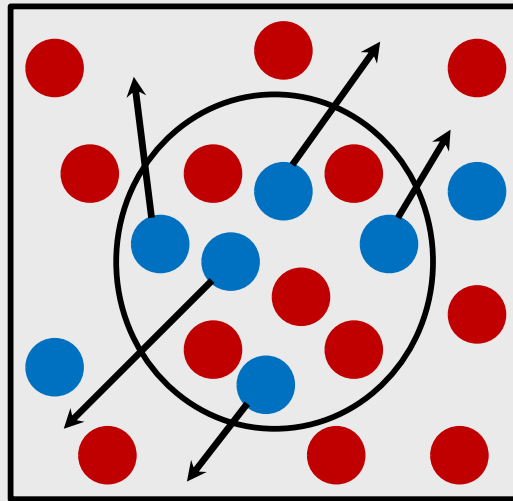


Fluid Therapy



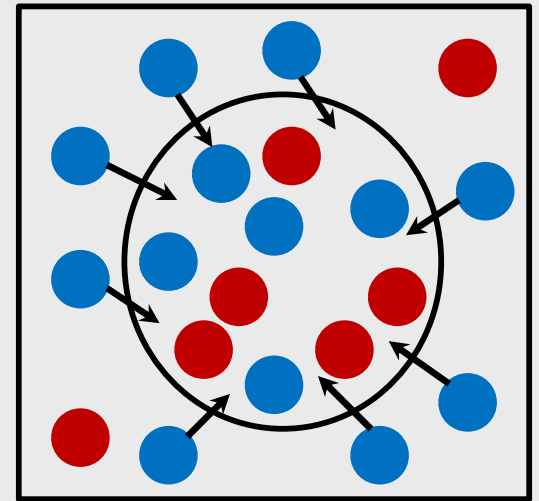
Isotonic

Introduced fluids
Same outside cell
Same inside cell
No water movement



Hypertonic

Less water outside cell
More salt outside cell
Water inside leaves cell
to dilute salt outside



Hypotonic

More water outside cell
Less salt outside cell
Water enters cell to
dilute salt inside



Fluid Therapy

Fluid Therapy- Purpose

Two categories of fluid therapy:

Replacement and Maintenance

- *Replace current fluid deficits (dehydration)
- *Replace ongoing losses (vomiting, diarrhea, bleeding)
- *Supply daily fluid needs (maintenance)

Most importantly,

Aids in recovery from shock

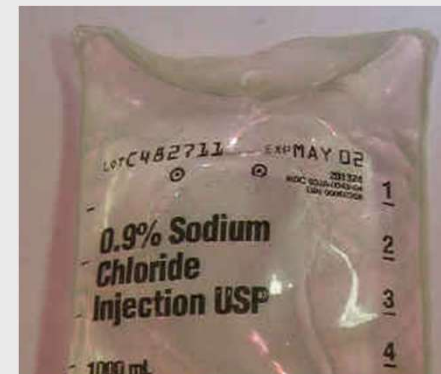
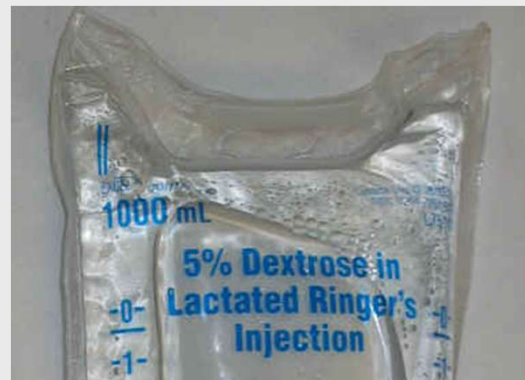


Fluid Therapy

Fluid Therapy- Types of Solutions

Summary of Fluids

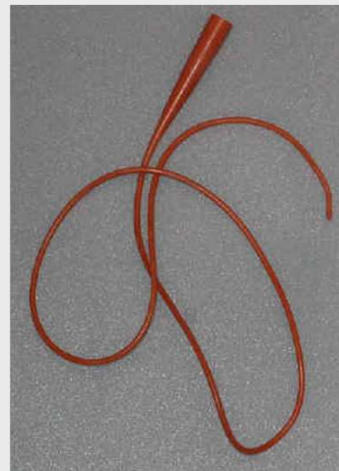
<u>Product</u>	<u>Tonicity</u>	<u>Calories</u>	<u>Route(s)</u>
Lactated Ringers	Isotonic	9/L	Oral, SQ, IV, IP
Dextrose 5% (D5W)	Isotonic	170/L	Oral, IV, IP
Normal Saline (0.9%)	Isotonic	0/L	Oral, SQ, IV, IP
Normosol-R	Isotonic	18/L	Oral, SQ, IV, IP
Pedialyte	Isotonic	100/L	Oral only
Lactated Ringers & 5% Dextrose	Hypertonic	179/L	Oral, IV - only





Fluid Therapy

Fluid Therapy- Route of Administration



Oral - Fluids through the mouth (PO). Use with alert patients with no clinical signs of gastrointestinal stasis, vomiting or diarrhea, or not severely dehydrated.



Fluid Therapy

Oral Fluid Therapy in mammals



Encouraging them to drink on their own is a goal for older mammals. Good tasting fluids are easier to get babies to accept and not spit out or fight drinking.



Fluid Therapy

Oral Fluid Therapy in Birds



Appropriate size tubing is required to match the size of bird and size of throat.



Fluid Therapy

Subcutaneous (SQ) - mammals



Subcutaneous (SQ) - Fluids are delivered under the skin. Can be delivered intra-scapular, at the flank or abdominal flank. Do not give to hypothermic animals. Fluids must be warm, but not too hot. Do not overfill and make skin extremely taut



Fluid Therapy

Subcutaneous (SQ) - birds



Subcutaneous (SQ) - Fluids are delivered intra-scapular, same as for mammals. There is a bare spot without feathers on either side of the spine.



Fluid Therapy

Fluid Therapy- Route of Administration

Intravenous (IV)-Into the vein-Beyond the scope of this lesson.*

Intraosseous (IO)-Into the bone-Beyond the scope of this lesson.*

Intraperitoneal (IP)-Into the abdomen-used on reptiles. Beyond the scope of this lesson.*

***Discuss with your veterinarian. Receive hands-on inservice.**



Fluid Therapy

Fluid Therapy- Route of Administration

Route Advantages

- Oral**
- Rapid administration
 - Minimal side effects
 - Economical
 - Caloric needs may be met
- SQ**
- Convenient
 - Rapid
 - Solutions higher in potassium content may be given
 - Best for species with loosely attached skin
 - Can be used with most species

Disadvantages/Limitations

- May be contraindicated because of gastrointestinal disease.
- Slower than some other routes
- Selective administration of fluid may be more difficult
- Limited to isotonic solutions
- Absorption may not be efficient
- Solutions irritating to tissues cannot be given
- Not suitable for large animals



Fluid Therapy

Fluid Therapy- Route of Administration

Route Advantages

- IV**
- Rapid dispersion within body
 - Precise dosage possible

- IP**
- Rapid absorption
 - Used for reptiles & rodents

- IO**
- Rapid absorption

Disadvantages/Limitations

- Greater chance of side effects
- Limited number of sites available

- Potential for injury to organs
- Limited to isotonic solutions

- High risk of infection
- Uncomfortable procedure

**All of these are beyond scope of this class. Discuss with your veterinarian.
Receive hands-on inservice.**



Fluid Therapy

Fluid Therapy- Rate of Delivery

Fluid deficits are estimated based on hydration determined from physical exam findings.

Percent of dehydration is multiplied by the animal's weight in Kg. and this equals the volume of replacement fluid in ml's or cc's.

Maintenance fluids are the volume of fluids which are required during a 24 hour period by a healthy animal.

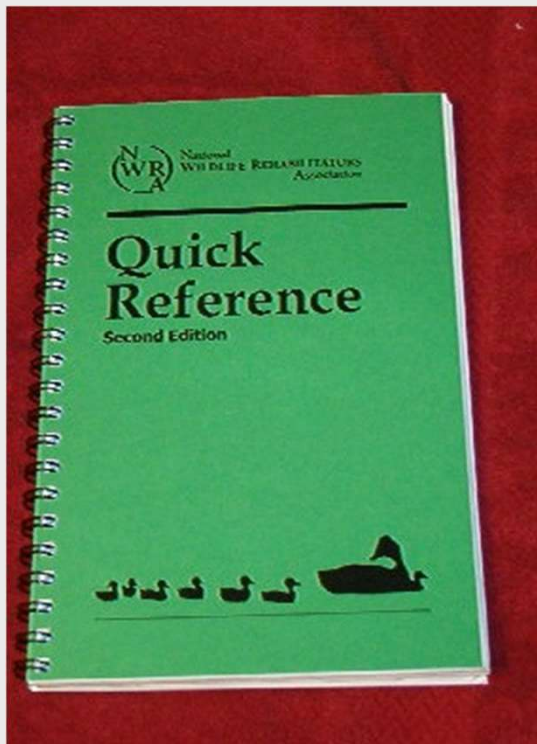
<u>Species</u>	<u>Maintenance Fluids</u>
Avian	50-60 ml/kg/day
Canids	45ml/kg/day
Felids	50ml/kg/day
Rabbit	50-100 ml/kg/day
Rodent	50-100 ml/kg/day
Reptile	10-15 ml/kg/day
In shock	90 ml/kg/day



Fluid Therapy

Fluid Therapy- Rate of Delivery

Use NWRA/IWRC Fluid Charts

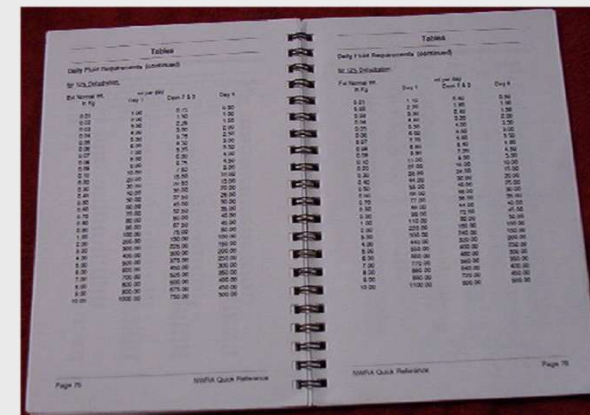
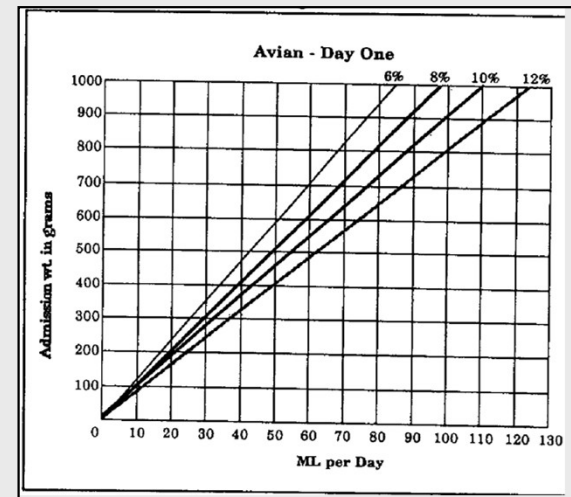


Tables

Daily Fluid Requirements (cont'd.)
for 12% Dehydration:

Est. Normal Weight in Kg	Day 1	ml per day Days 2 & 3	Day 4
0.01	1.10	0.80	0.50
0.02	2.20	1.60	1.00
0.03	3.30	2.40	1.50
0.04	4.40	3.20	2.00
0.05	5.50	4.00	2.50
0.06	6.60	4.80	3.00
0.07	7.70	5.60	3.50
0.08	8.80	6.40	4.00
0.09	9.90	7.20	4.50
0.10	11.00	8.00	5.00
0.20	22.00	16.00	10.00
0.30	33.00	24.00	15.00
0.40	44.00	32.00	20.00
0.50	55.00	40.00	25.00
0.60	66.00	48.00	30.00
0.70	77.00	56.00	35.00
0.80	88.00	64.00	40.00
0.90	99.00	72.00	45.00
1.00	110.00	80.00	50.00
2.00	220.00	160.00	100.00
3.00	330.00	240.00	150.00
4.00	440.00	320.00	200.00
5.00	550.00	400.00	250.00
6.00	660.00	480.00	300.00
7.00	770.00	560.00	350.00
8.00	880.00	640.00	400.00
9.00	990.00	720.00	450.00
10.00	1100.00	800.00	500.00

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Fluid Therapy

- Assume 10% dehydrated to start and replace over 24-48 hours (or 5% in 12 hours)
- *reptiles: over 72 hours
- Assume rate of 50 ml/kg or 50 ml/1000 gms which is 5/100 or 5% for maintenance
- Add 5% and 5% and get 10% - for 12 hours
SO
- Take 10% of weight in grams and divide by 3



“Down and Dirty”

Fluid Therapy

Practice: You get in an opossum that weighs 302 grams and is slightly lethargic.

302 divided by 10 is 30.2

30.2 divided by 3 is 10

So give 10 cc of LRS



Fluid Therapy

Monitoring Response to Fluid Administration

Complete Physical Exam to determine extent of hydration status.

Monitor bladder – check for abdominal swelling, pear shape, or visible bladder.

For partial hind-end paralysis, may have to evacuate manually.

Monitor urine color and frequency – check bedding for color and dampness.

Check mutes (in birds) for consistency of urates.

Check mucous membranes in mouth, an skin color, and refill time.

Skin turgor and abdomen “wrinkling” should improve.



Fluid Therapy

The goal is to be able to slowly wean off the replacement fluid therapy once you have “refilled” the deficit level you started with.

The patient is rehydrated when it is capable of ingesting maintenance volume of fluids on its own, usually through eating and drinking.



Fluid Therapy

Monitoring Response to Fluid Administration

Patient attitude & activity level should increase.

Improved heart rate, pulse rate, and pulse quality.

Do not discontinue fluid therapy abruptly-reduce by 25%-50% per day slowly.

Take into account normal food intake increasing when decreasing fluids.

It is possible to overhydrate with resulting accumulation of fluids in the lungs or development of respiratory disease.



Fluid Therapy



Signs of overhydration:

- dripping clear fluid from nose
- crackles in lungs-can hear when they bring in/out
- edema in limbs
- swelling of eyelids/chemosis
- coughing



Fluid Therapy

Fluid Therapy-Summary

- Fluid therapy is vitally important! May mean life or death.
- Fluid therapy is challenging & rewarding.
- Learn the basics, understand the theories & ***KEEP IT SIMPLE.***
- Good technique is acquired with practice.
- Some techniques can be practiced on carcasses.
- Work with an experienced co-worker to practice on live animals, and to ask for help.
- Take advantage of lab time with experienced professionals.



Fluid Therapy

If you can get them to cooperate,
that's the easiest way of all!

