Principles of Fluid Therapy for Wildlife

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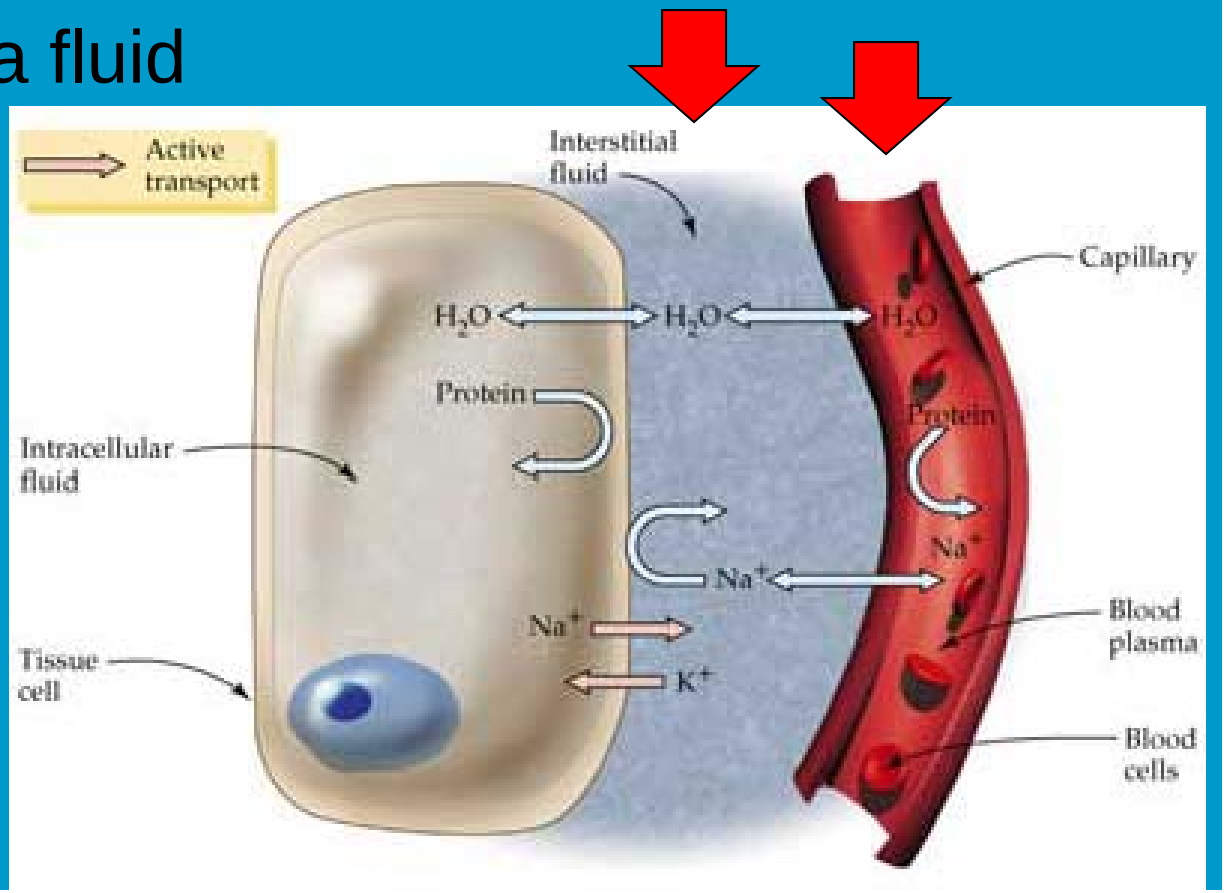
Basic Physiology

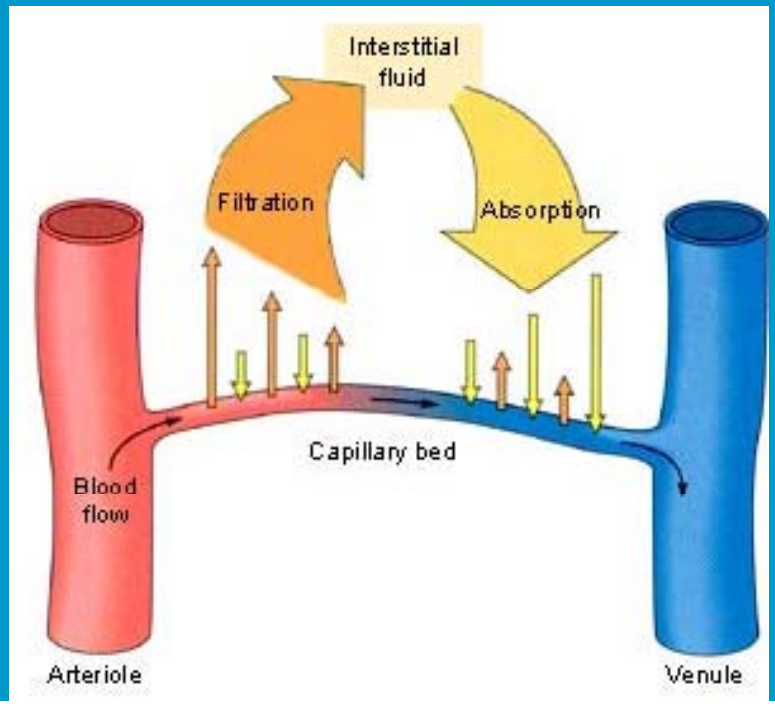
- Total body water divided into:
  - Intracellular fluid compartment (50%)
  - Extracellular fluid compartment (50%)
    - Interstitial fluid
    - Plasma fluid



Major forces responsible for water movement between compartments

1. Hydrostatic force (heart)
2. Osmotic force (proteins)

The distribution of extracellular fluid between plasma and interstitium is determined by the balance between two opposing forces: hydrostatic pressure and osmotic pressure



Plasma osmolality

measure of the concentration of substances such as sodium, chloride, potassium, urea, glucose, and other ions in blood.

- Osmolality of blood increases with dehydration and decreases with overhydration.
- Plasma osmolality of mammals 275-299 mOsm/L
- Some reptiles may be lower < 260 mOsm/L);
  - Consequently, solutions osmotically balanced for mammals (eg, 0.9% NaCL) are likely to be mildly hypertonic for such animals

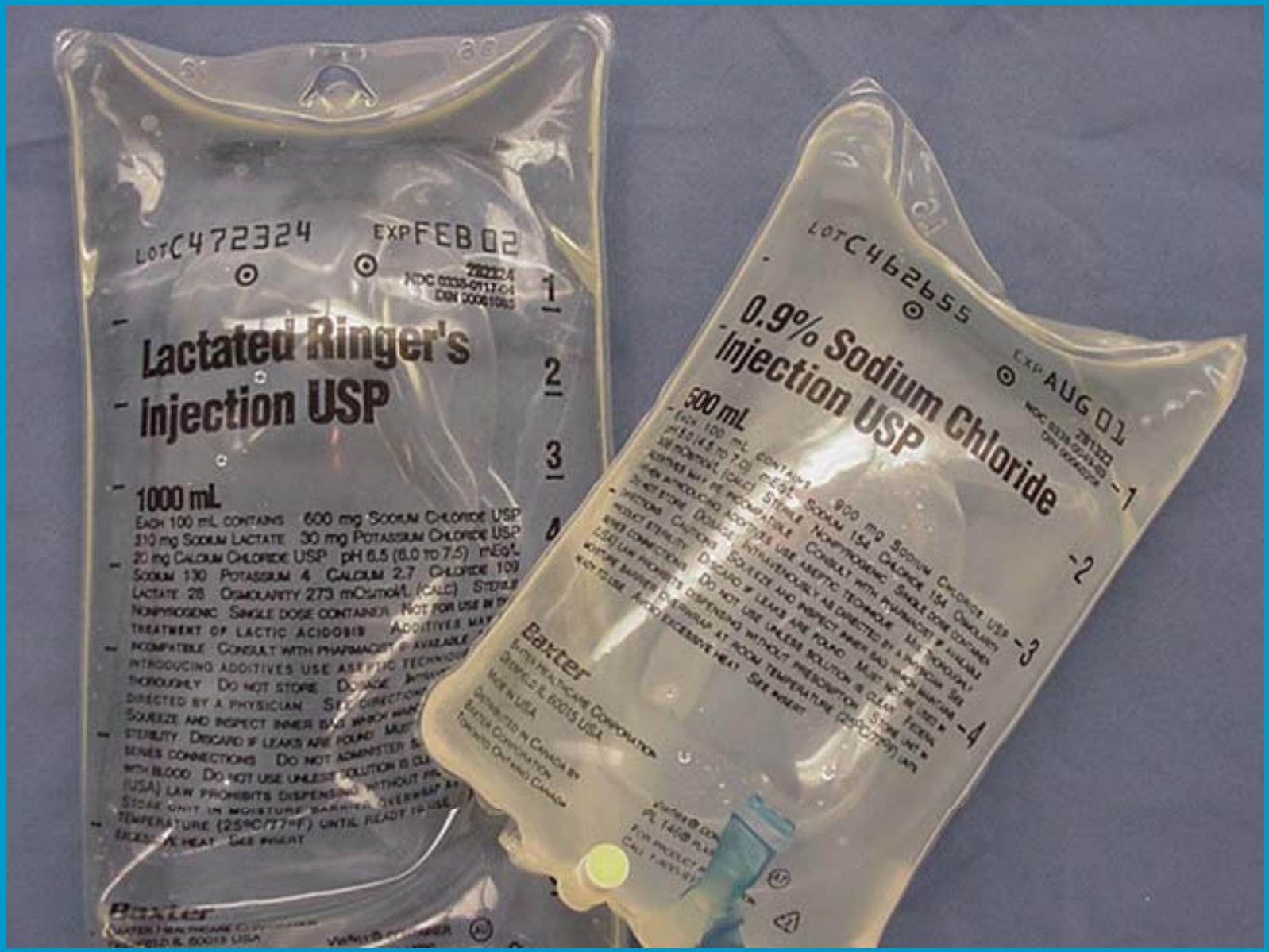
TYPES OF FLUIDS

Crystalloids

- LRS-isotonic (272)
- Saline (0.9%)-isotonic (308)
- $NaCl/D_{2.5}W$ (280)
- $LRS/D_{2.5}W$ (263)
- Dextrose solutions 5% (527)
  - hypertonic; pull fluid into the vascular space
- 0.45% NaCl (154)
  - hypotonic; move fluid into intracellular space

- Isotonic=same osmolality as plasma
- Hypotonic=lower
- Hypertonic=higher

CRYSTALLOIDS



Alterations of Fluid Status

Fluid deficit----dehydration, blood loss...

Fluid excess----heart, renal, hepatic disease

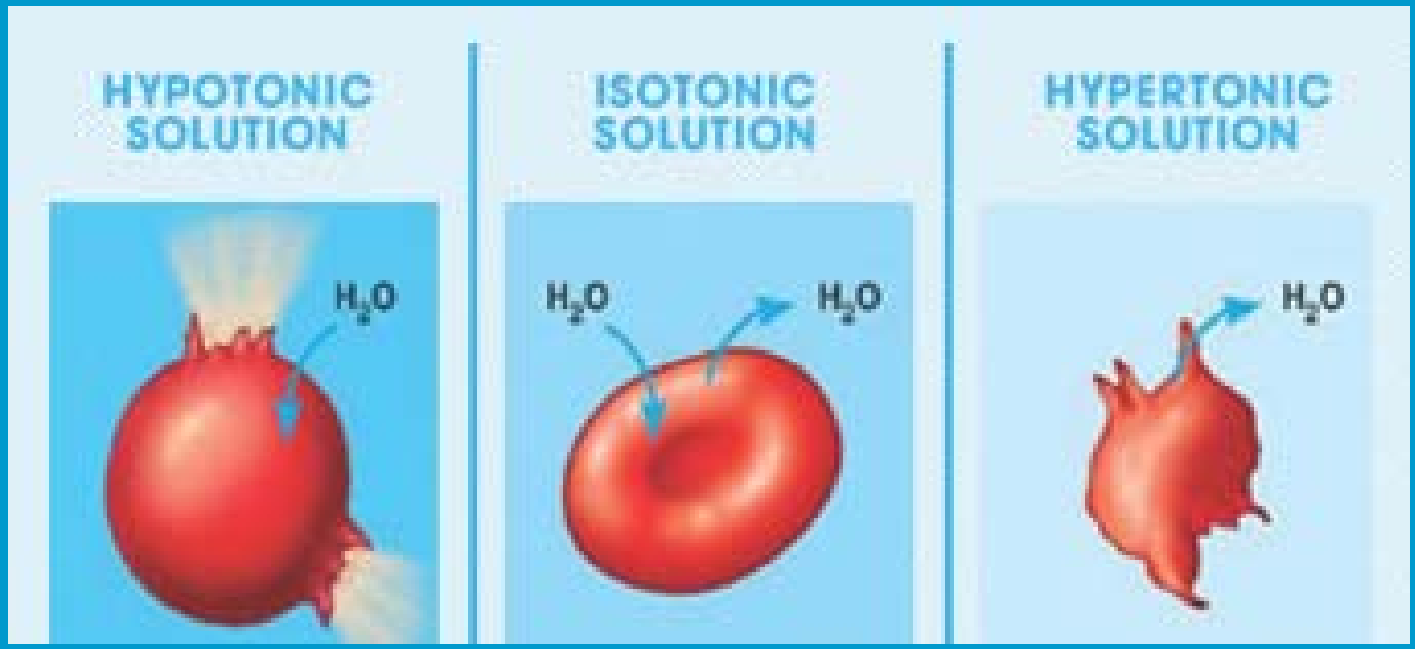
What type of dehydration is it?

Isotonic dehydration (lack of water intake, vomiting, diarrhea)

Hypotonic dehydration(excess loss of sodium, potassium in diarrhea, vomiting, overuse of diuretics, renal disease, third space)

Hypertonic dehydration (fever)

The majority of wildlife cases are isotonic dehydration

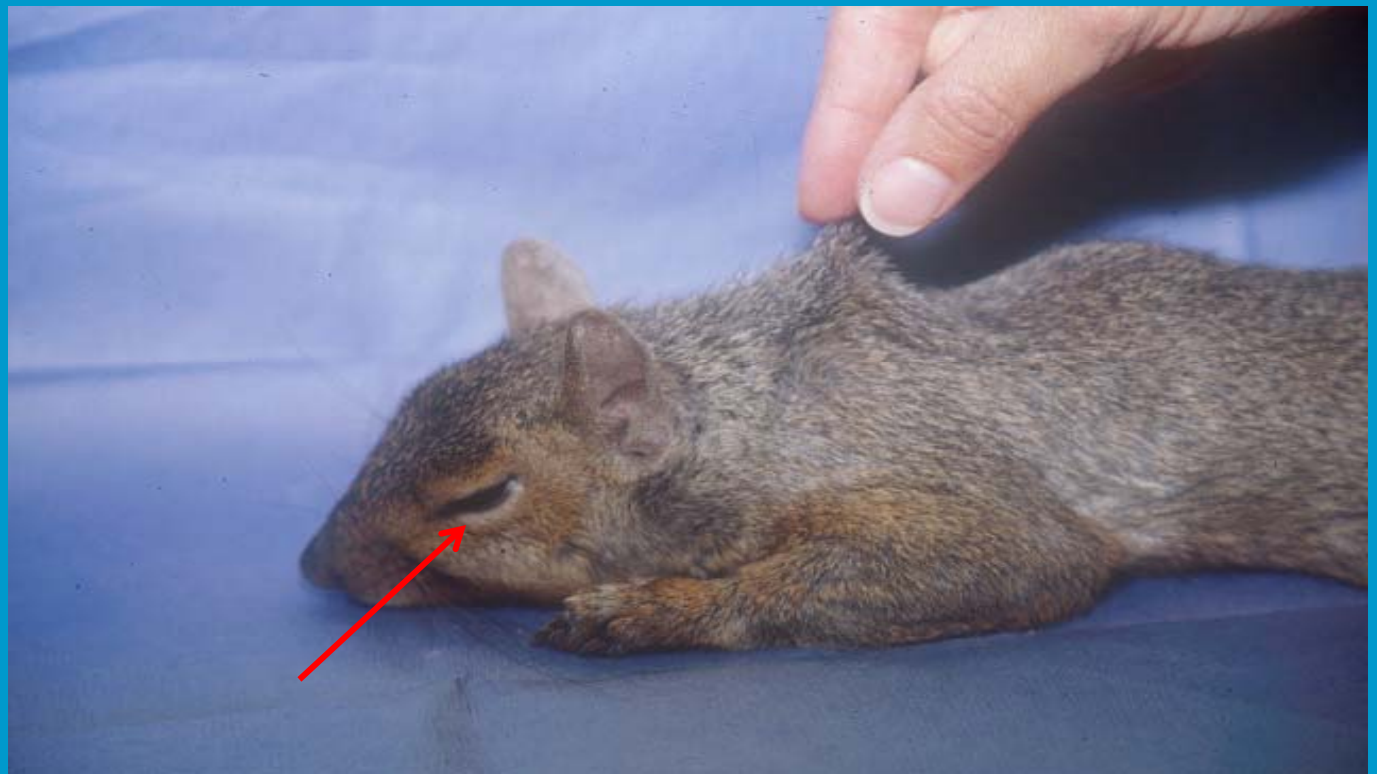


Causes for Fluid Therapy

Shock

- Dehydration

Blood loss



Shock –(a state of acute, severe circulatory failure)

"*Inadequate circulation is the most common physiologic abnormality in most forms of shock*."

Shock----->hypothalamus---->sympathetic nervous system----> adrenal gland & pituitary gland----> catecholamines & other stress hormones

Consequence:

-mobilize energy reserves

-support blood pressure

-conserve salt and water

Blood flood and pressure

- needed to bring O2, nutrients to tissues AND pick up CO2 and metabolic byproducts

Assessment of Hydration

Body weight. (1 kg = 1L)

-Skin turgor

-Mucous Membranes

-Eye position

-Laboratory tests

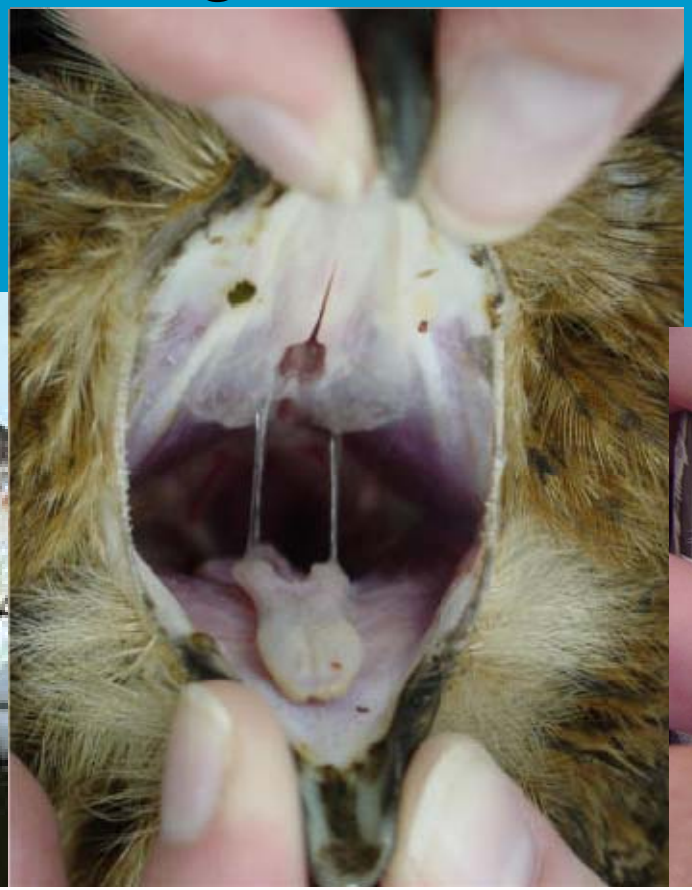
(PCV, TP, BUN, urine SG, electrolytes)

-Central venous pressure

Reptiles

Birds

Asses hydration three ways: position and sheen of eye, consistency of saliva and skin tenting



Birds

Subjective blood pressure assessment

ASSESSING HYDRATION

Laboratory Parameters

-Osmolality

-T plasma proteins

-BUN, Creat

-Uric acid

-PCV

Clinical Classification of Dehydration

1-4%-undetectable

5-7%-mild dehydration

7-9%-moderate dehydration

9-12%-severe dehydration

Blood Loss

Cannot replace blood cells unless administering whole blood

If blood loss < 25%, replace with 3X crystalloid fluids

If blood loss > 25%, transfuse

-Goal: Improve circulation

-Potential problem: hemodilution

Fluid Therapy Requirements

1. Deficit
2. Maintenance
   - dependent on metabolism
     - Mammals- 30-40 ml/kg/day hr(adults), 40-60 ml/kg/day (young)
     - Birds- 50-90 ml/kg/day
     - Reptiles-10-25 ml/kg/day
3. Ongoing losses**

ONGOING LOSSES

Ex: diarrhea, polyuria, vomiting, burns, **wounds**, increased respiratory rate, fever, discharges

-4X4 gauze =15 ml of blood

-vol. of urine in ml= 0.84 X radius^2 of spot of urine

-vol. of diarrhea in ml= 0.52 X radius^2 of spot of diarrhea

DEFICIT

% dehydration X body weight (kg)= L needed to replace deficit

(in most cases, should not be replaced faster than in a 24 hr period)

ADD:

DEFICIT

+ MAINTENANCE

+ ONGOING LOSS

ML OF FLUIDS GIVEN/DAY

Specifically for Wildlife

Take this total and divide it into the # of times you foresee safely handling the animal…….the most important part is figuring out how much of the deficit you need to give now...

Example

100 g adult bird, 10% dehydrated, presents at 8 am with lead-toxicity-associated diarrhea

DEFICIT= *100 g X 0.10 = 10 ml (this is TOTAL deficit)*

MAINTENANCE= *0.100 Kg X 60 ml = 6 ml/24 hr*

6.0 ml

ONGOING LOSS= *you estimate that this bird will defecate/urinate at least 10X in a 24 hr period; you estimate each defecation is 0.5 inch in diameter; thus it is losing: 0.52 ml X 0.25^2 = 0.3 ml*

NOTE: in practicality, this calculation is often omitted and estimated.

OTHER REASONS FOR FLUID TREATMENT

Diuresis

Toxicity

Hypothermia

Anesthesia

(10 ml/kg/hr,

4-5 ml/kg/hr)

Routes of Administration

1. Oral adv.-inexpensive, easy, large amounts. disadv. -slow absorption, regurgitation and aspiration. NEVER give oral fluids to an animal that is displaying central neurologic signs, or is mentally obtunded.

2. Subcutaneous adv.-easy, inexpensive, large amounts, hard to overload, min. handling. disadv.—slow absorption, hypothermia, pain,sterile abscess

SUBCUTANEOUS

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Routes of Administration

3. Intravenous adv.-best for acute shock, extreme dehydration. disadv.-more equipment, more expertise, more restraint at beginning, poss. of infection.

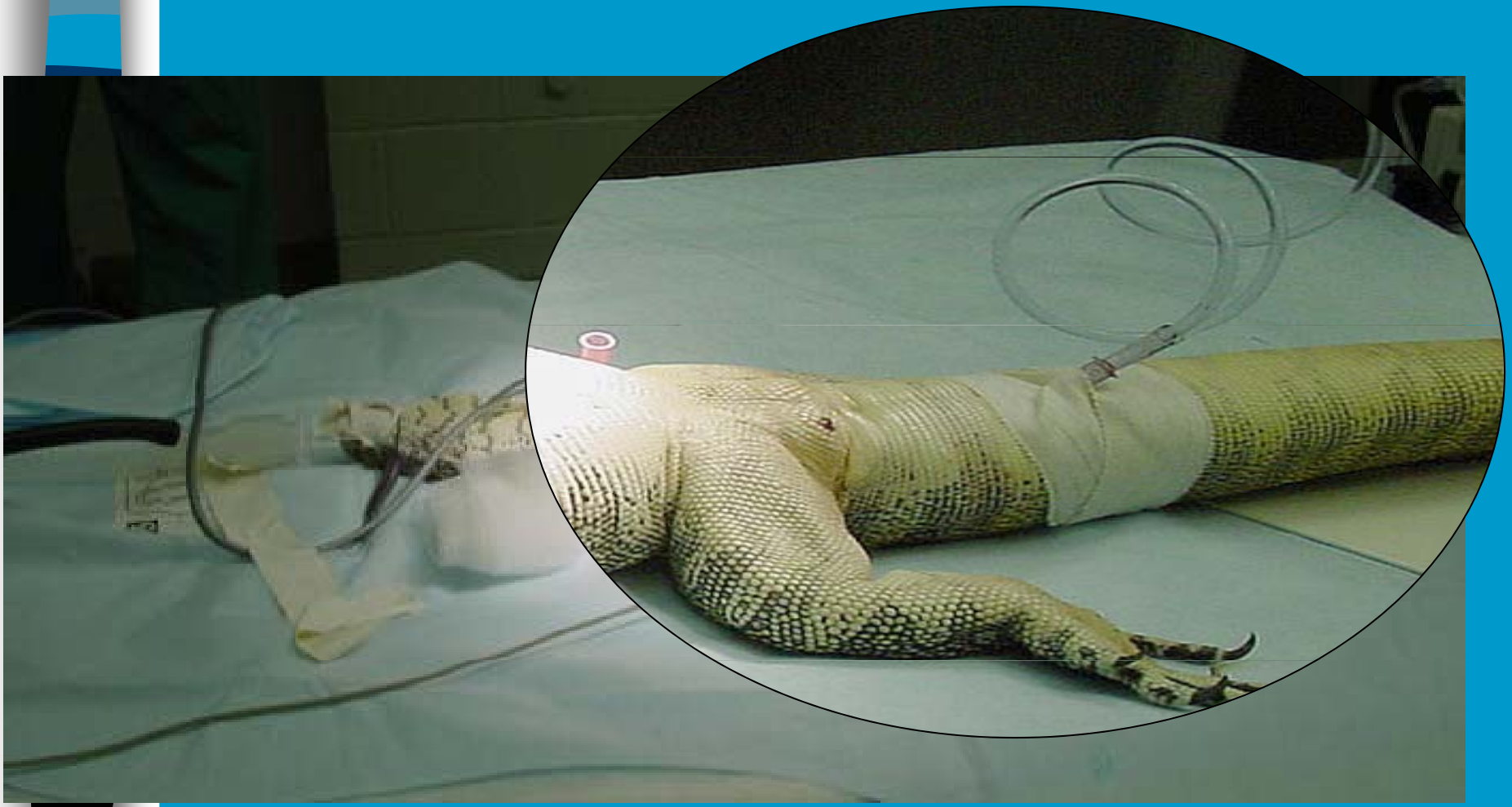
4. Intraosseous adv.-best if cannot get intravenous route, very small animals, relatively easy. disadv.-more equipment, some expertise, may require anesthesia.

5. Intraperitoneum adv.-absorption is relatively fast, can use to warm up animal, inexpensive, relatively easy. disadv. -may puncture an organ inadvertently.

INTRAVENOUS

INTRAVENOUS

Short-term Intravenous



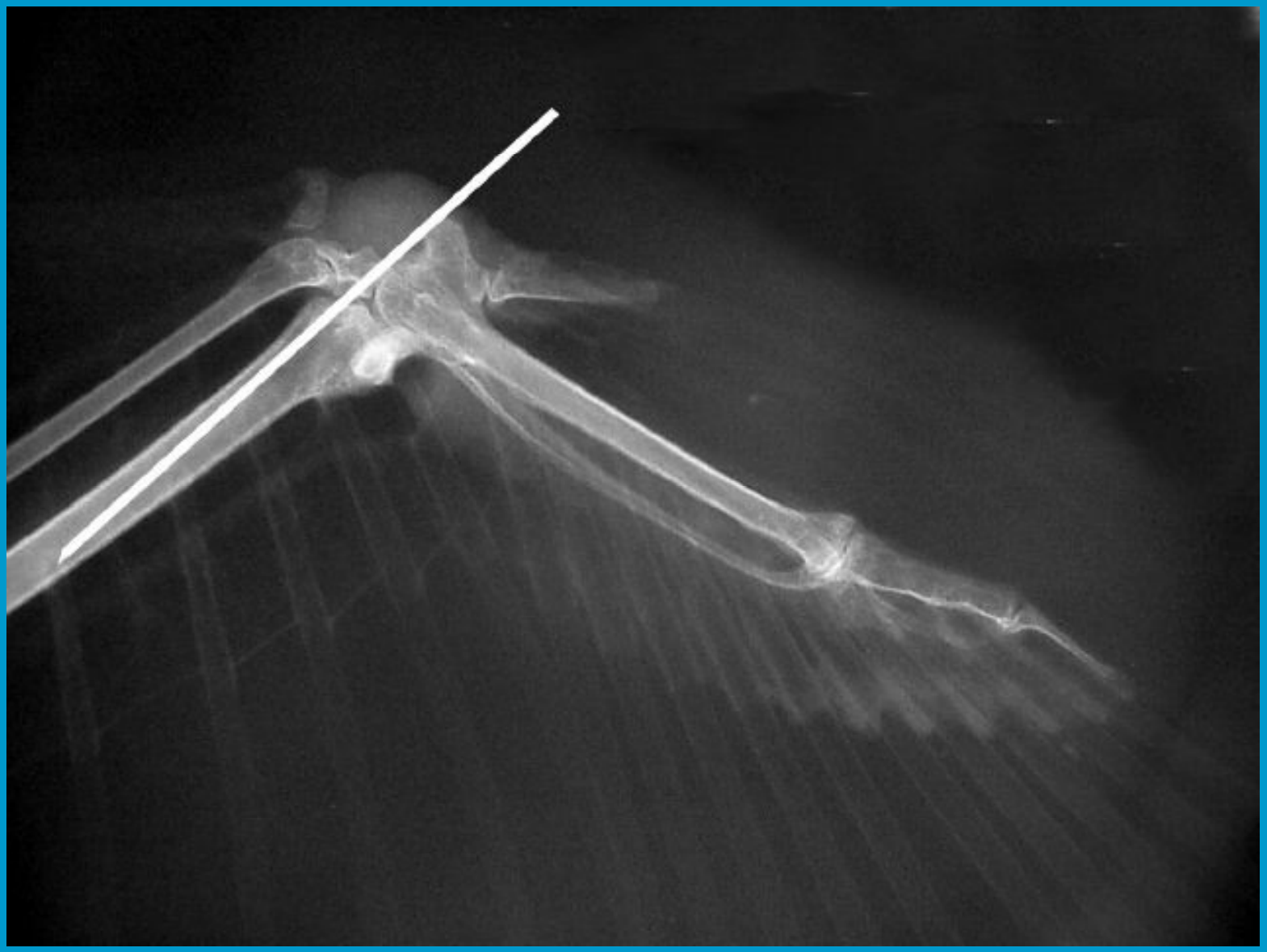
ROUTES OF ADMINISTRATION

Intraosseous

-Proximal, distal ulna, tibiotarsus

INTRAOSSEOUS

INTRAOSSEOUS



INTRAOSSEOUS

Intraperitoneal/Intracoelomic

-Limited use in birds, mammals

-Useful in reptiles

Soaking

Species-Specific Fluid Needs

250 kg Bear----------> 4.5 L H2O/Day (0.02%)

500 g turtle----------> 6 ml of H2O/Day (1%)

150 g owl----------> 20 ml of H2O/Day (13%)

30 g mouse----------> 6 ml of H2O/Day (20%)

Monitoring Fluid Therapy

-Weigh animal daily

-Repeat physical exam daily

-Consider **new** ongoing losses

-Repeat laboratory parameters

Complications

-Not enough fluids**

-Fluid overload

- Respiratory distress
- Increased heart rate

-Complications associated with site of administration

- Burns
- Sterile abscess
- Pressure necrosis

-Stress from handling!!

Questions?