Don't Let it Croak: Clinical Approach to Amphibian Emergencies

LafeberVet

Program # 803504

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Photo Credit: Bing

Amphibian Taxonomy

Photo Credit: I. VanLare

Class Amphibia (~8273 species)

- Order Anura: Frogs and toads
  - ~7299 species in 54 families
- Order Caudata (Urodela): Salamander and newts
  - ~760 species in 10 families
- Order Gymnophiona (Apoda): Caecilians
  - ~214 species in 10 families

www.amphibiaweb.org

Common Species

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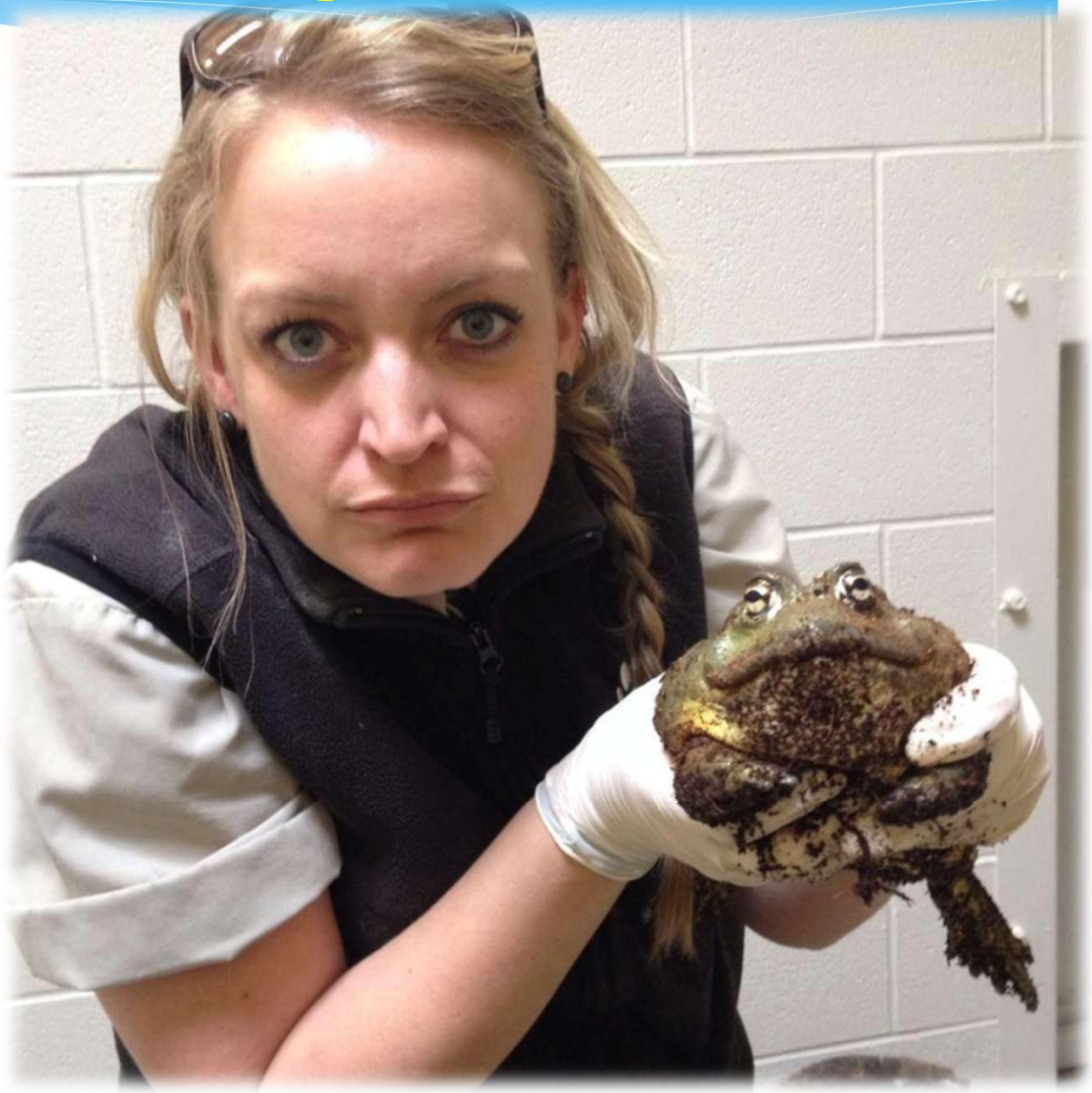
Common Species



Clinical Anatomy and Physiology

Photo credit: J.P. Clarke

Clinical Anatomy and Physiology

Preferred Optimal Temperature Zone (POTZ)

* Lower than reptiles

Clinical Anatomy and Physiology

Habitat	Temperature Range
Tropical Lowland	24-30 C (75-86 F)
Tropical Montane	18-24 C (64-75 F)
Subtropical	21-27 C (70-81 F)
Temperate	18-24 C (64-75 F)
Temperate Stream	16-21 C (61-70 F)
Temperate Pond	18-24 C (64-75 F)

Clinical Anatomy and Physiology

Preferred Optimal Temperature Zone (POTZ)

* Lower than reptiles
* Be wary of thermal shock
  * Transport
  * Handling

Clinical Anatomy and Physiology

Preferred Optimal Temperature Zone (POTZ)

- Lower than reptiles
- Be wary of thermal shock
  - Transport
  - Handling
- If higher:
  - Weight loss, agitation, immunosuppression
- If lower:
  - Inappetence, lethargy, bloating, poor growth, immunosuppression

Clinical Anatomy and Physiology

Keep me wet!!!

Photo credit: J.P. Clarke

Clinical Anatomy and Physiology

- Skin is most important organ
  - Fluid and electrolyte homeostasis
  - Gas Exchange
  - Thermoregulation
  - Reproductive functions

Clinical Anatomy and Physiology

- Skin is most important organ
  - Fluid and electrolyte homeostasis
  - Gas Exchange
  - Thermoregulation
  - Reproductive functions
- Mesonephric kidneys
- Plasma Osmolality:
  - 200-250 mOsmol/L

Physical Examination- Key Points

- Try to keep exam room temperature within POTZ of amphibian species
- Start with hands off “distant” exam to assess:
  - Body condition
  - Activity level
  - Movement
  - Posture
  - Skin colour and condition
  - Respiratory rate and effort
  - Response to stimuli.

Physical Examination- Key Points

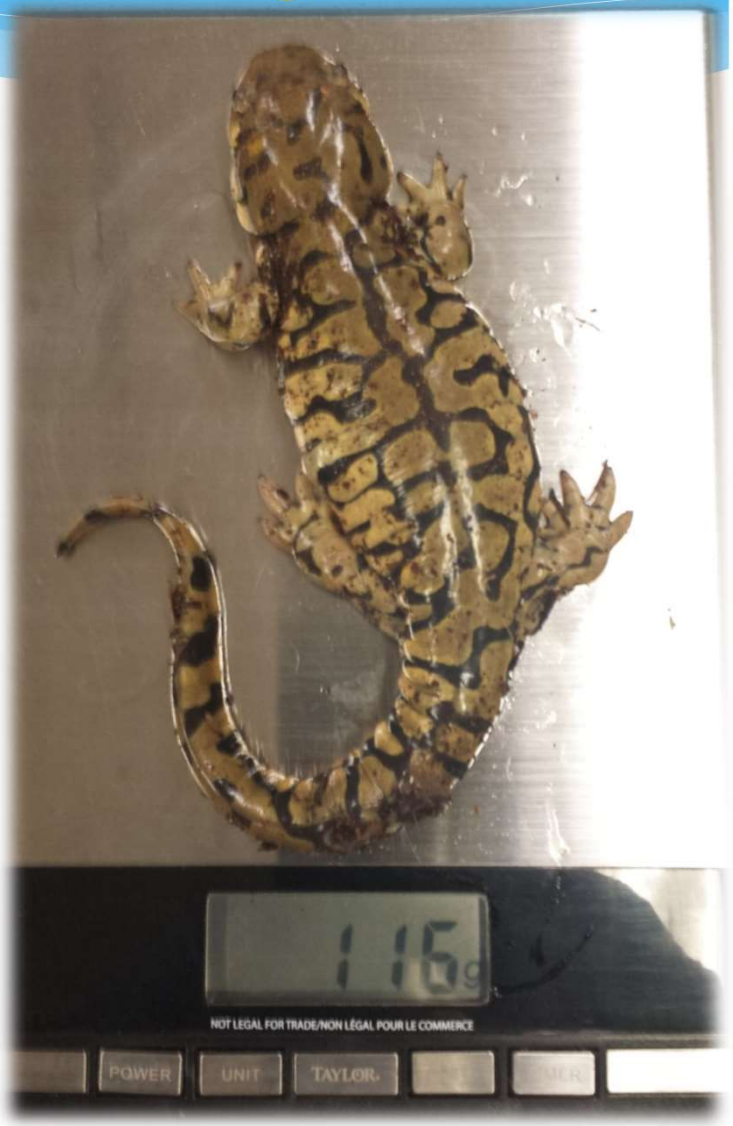
- Ensure all supplies are on hand before handling
- Exam should be thorough and systematic but as efficient as possible
- Collect diagnostic specimens while carrying out examination

Physical Examination

- Ensure all supplies are on hand before handling
- Exam should be thorough and systematic but as efficient as possible
- Collect diagnostic specimens while carrying out examination
- Watch for escapes!

Physical Examination- Key Points

* Always get a weight



Physical Examination- Key Points

- Wear moistened powder free nitrile, vinyl, or latex gloves
  - Decreases epithelial damage
  - Decreases danger of transdermal absorption of lotions/creams
  - Protects against toxic or noxious excretions

Physical Examination- Key Points

- Anesthesia is usually not required for examinations but may be required for diagnostics.
- Be gentle- no ribs to protect
- Magnification may be required for smaller species
- With the exception of caecilians, all other amphibians have palpebrae.

Physical Examination- Key Points

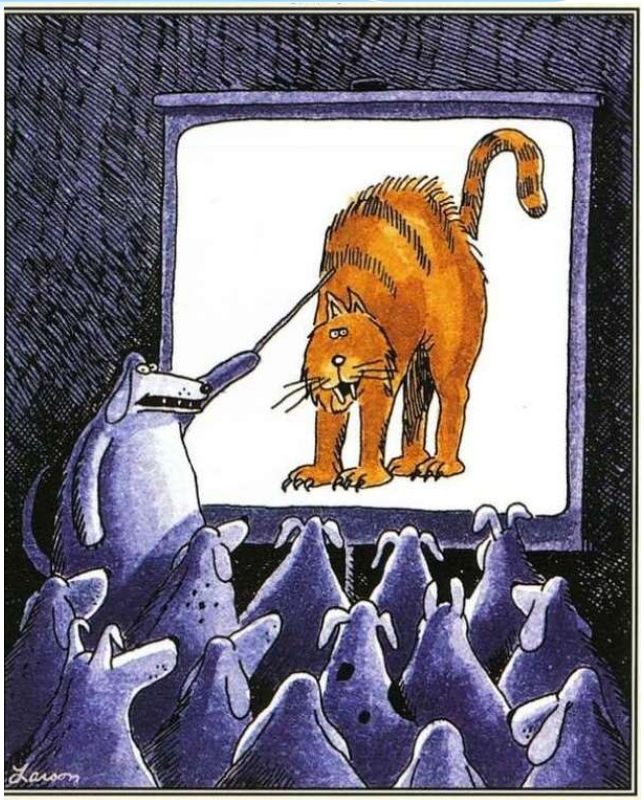
* Amphibians have voluntary control over pupils
  * Pupils are often small so assessment of pupillary light reflexes is not possible
  * Retinal exams are usually unrewarding with an ophthalmoscope.

Physical Examination- Key Points

* Amphibian mouths and jaws are delicate so care must be taken especially if metabolic bone disease is suspected.
* Unlike other amphibians, salamanders use their maxilla to hinge open their mouths instead of their mandibles.
* The oral cavity and mucous membranes are paler than mammals.

Physical Examination- Key Points

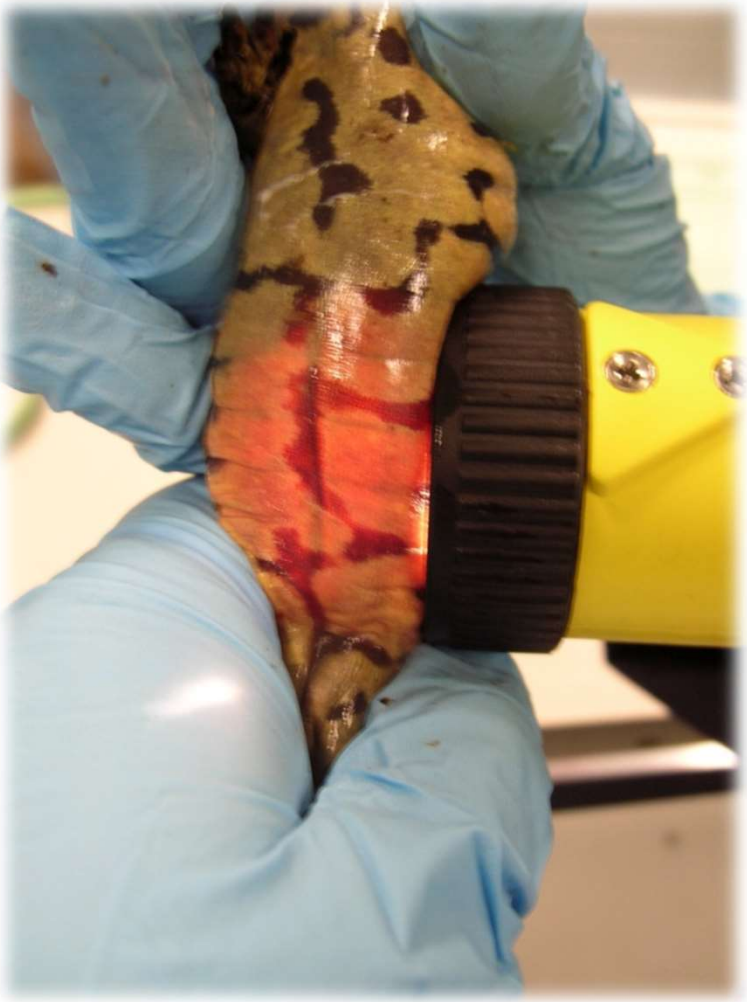
* Amphibians, particularly anurans, often will “puff-up” when being handled making coelomic palpation challenging.
* Patience is key!



“Now, in this slide we can see how the cornered cat has seemed to suddenly grow bigger. ... Trickery! Trickery! Trickery!”

Physical Examination- Key Points

* Ballottment and transillumination are useful techniques in amphibians.

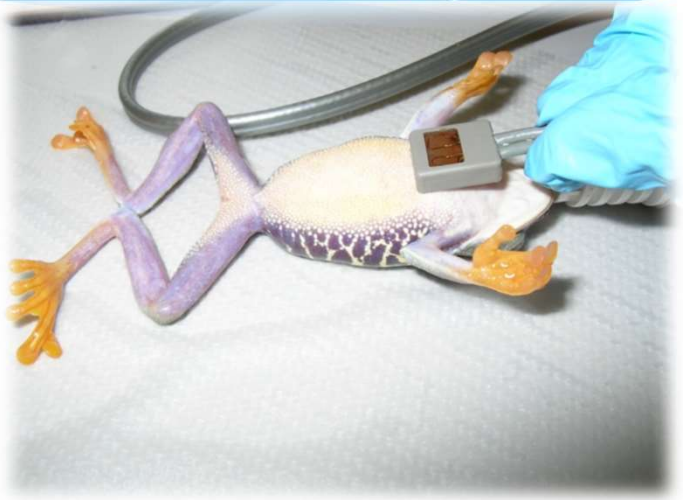


Physical Examination- Key Points

* Gular movements can be used for respiratory rate monitoring

Physical Examination- Key Points

* The heart rate can be determined by direct visualization of the apical heartbeat at the xiphoid or by use of Doppler or B-mode ultrasound.
* Pulses are usually not apparent.



Signs of a Sick Amphibian

* Appetite is one of best indicators of health
* Tacky skin=dehydration
* Terrestrial amphibians will often hang in or near water's edge
* Splayed legs, head down, eyes closed, reduced righting reflexes.

Signs of a Sick Amphibian

* Skin changes (colour, mucous production)
* Bloating, particularly in aquatic amphibians
* Prolapses (gastric, cloacal)
* Swollen limbs, eyes- many causes

Triage and Emergency Therapy

Common reasons for emergency care:

- Bloating (Five ”F”s)
- Trauma
- Infection
- Metabolic disturbances
- Toxicity
- Sudden inappropriate environmental change

Triage and Emergency Therapy

- Discuss prognosis with owner
  - Obtunded, semi-comatose to comatose= guarded to grave
  - Normal to dull reactions to environment and stimulation= better prognosis

Triage and Emergency Therapy

- Discuss prognosis with owner
  - Chronic process- poorer prognosis

Triage and Emergency Therapy

- Shock may be observed following dehydration, septicemia, or trauma
- Clinical signs:
  - Weakness/depressed mentation
  - Tachycardia
  - Vasoconstriction of the intraoral vessels and ventral abdominal vein
  - Prolonged capillary refill time
  - Dilated pupils

Triage and Emergency Therapy

- Basic emergency support:
  - Fluid therapy
  - Oxygen administration
  - Thermal support
  - Antimicrobial therapy
  - Analgesia
  - Quiet and secure environment in hospital tank

Triage and Emergency Therapy

Fluid therapy:

* Transdermal rehydration is very effective
* IV catheterization usually not practical except in larger salamanders
* Intracoelomic, intraosseous routes can be used in severe cases

Physiology Flashback

Recall that plasma osmolality is calculated by:

$2x\ [Na^+] + glucose + urea$

Triage and Emergency Therapy

Fluid therapy:

- Amphibian Ringers or diluted commercial crystalloid fluids

My favourite for rehydrating:

- Plasmalyte A-7.4
  - Osmolality: 294 mOsmol/L
  - Dilute at least 1:1 with sterile water
  - Use undiluted for hydrocoelom
- 30-60 minutes, longer if needed
- Dextrose can be added at <2.5%

Triage and Emergency Therapy

Oxygen Administration:

* Direct, in water (airstone), or nebulized
* **Be careful not to dry amphibian out**
* Doxapram (5 mg/kg) as general stimulant
* Intubation and IPPV can be carried out in respiratory arrest cases

Triage and Emergency Therapy

Thermal support:

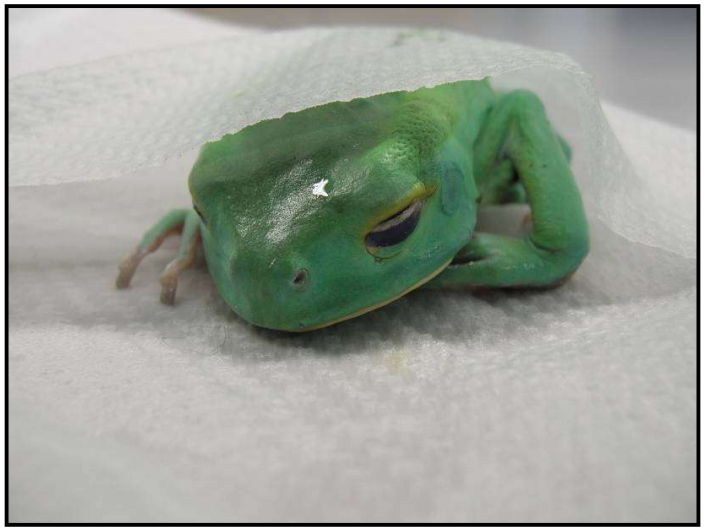
* Maintain amphibian in upper third of POTZ
* For terrestrial species, placing the hospital tank in an incubator where temperature and humidity can be controlled is ideal
* Ceramic heat bulbs, Heat cables/heating pads and cool humidifiers/foggers in hospital enclosures can be used.

Triage and Emergency Therapy

Analgesia

- Painful amphibians show decreased appetite and activity, will react to painful stimuli.
- Possess a well developed endogenous opioid system
- Dose dependent analgesic response to opioids and alpha-2 agonists such as (dex)medetomidine.

Triage and Emergency Therapy



Analgesia

- Always ensure good hydration before using NSAIDS.
- Good response to local anesthetics but watch for toxicity
- See accompanying sheet for analgesic doses

Triage and Emergency Therapy

Additional Pharmaceuticals:

- Antimicrobial therapy:
  - Targeted against gram negative bacteria
  - Antifungals for specific conditions
    - Chytridiomycosis
    - Saprolegniasis

Triage and Emergency Therapy

Additional Pharmaceuticals:

- Neurological conditions
  - 50-100 mg/kg Calcium gluconate
  - 25 mg/kg Thiamine

Triage and Emergency Therapy

Additional Pharmaceuticals:

- Skin trauma
  - Op-Site bandage spray
  - Triple antibiotic ointment

Triage and Emergency Therapy

Diagnostics

* Take advantage of the "little presents"
* Fecal O&P
* Gram stains
* Acid fast staining

Diagnostics- Blood Collection

- ~0.1 ml blood/10 grams (1% BW) in healthy
- ~0.05 ml/10 grams (0.5% BW) in ill.
- Common collection sites:
  - Midline abdominal vein
  - Femoral vein
  - Coccygeal (tail) vein
  - Cardiac

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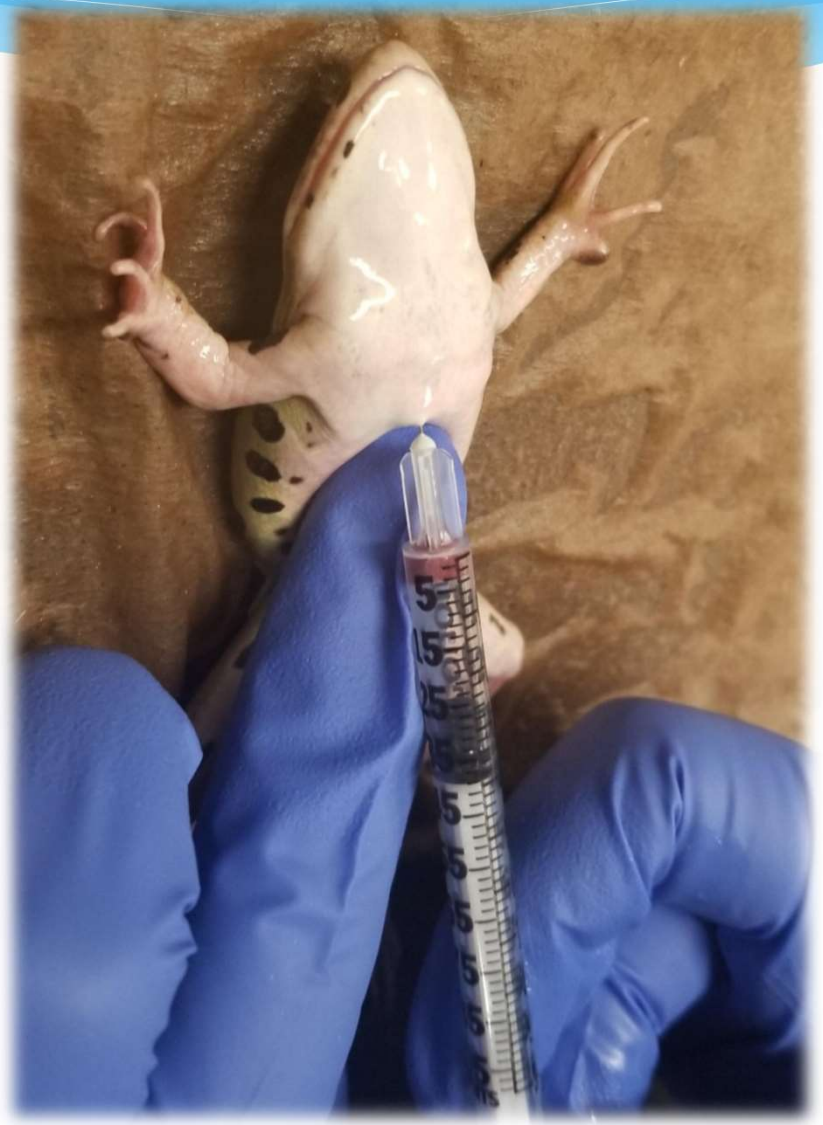
Diagnostics- Blood Collection

- Common collection sites:
  - Midline abdominal vein
  - Femoral vein
  - Coccygeal (tail) vein
  - Cardiac
    - Under anesthesia



Diagnostics- Blood Collection

Tips for Success:

- Pre-coagulate syringes in smaller species or “difficult” species with heparin
- Use adjunctive techniques:
  - Transillumination
  - Ultrasound

Diagnostics- Blood Collection

CBC

- Hct, WBC count
  - Neutrophils
  - Lymphocytes
  - Monocytes
  - Eosinophils
  - Basophils

Plasma Biochem

- Urea
- Serum electrolytes
  - Ca, P, Na, K, Cl
- AST
- CPK

Diagnostics- Radiology

* Digital radiographs or dental radiographs give best detail

Diagnostics- Radiology

* Utilize clear plastic containers or bags, or wet paper towel

Diagnostics- Radiology

Diagnostics- Radiology

COELOMIC EFFUSIONS

Diagnostics- Radiology

* Barium can be administered at 1:10 dilution (1-1.5 ml/kg)

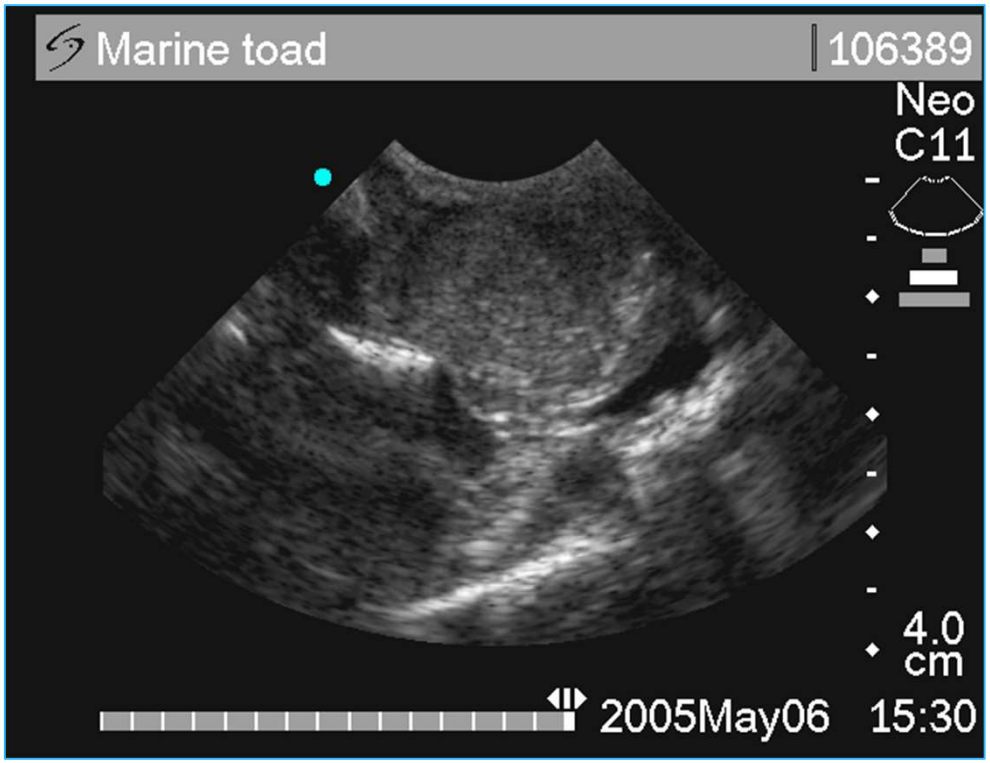
Diagnostics- Ultrasonography

* Excellent modality for assessing soft tissue
* Use high frequency probes
  * 8-12 MHz
* Gels can cause dermal erythema and irritation

Diagnostics- Ultrasonography

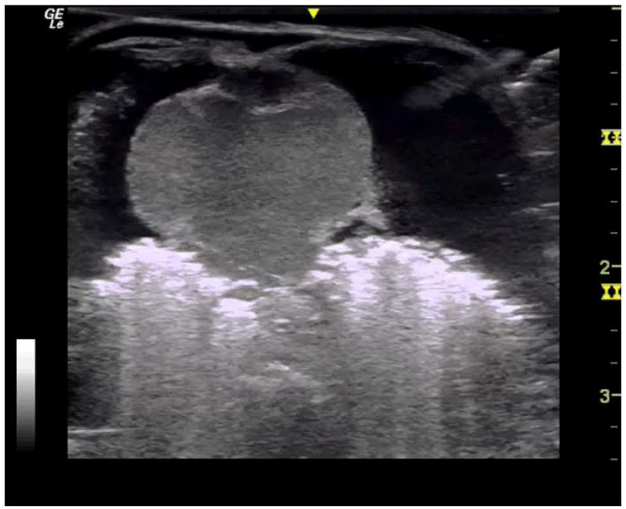
* Utilize plastic containers or bags while the amphibian is having a rehydrating soak
* Standard of care for bloated amphibians

Diagnostics- Ultrasonography



Diagnostics- Ultrasonography

Diagnostics- Ultrasonography

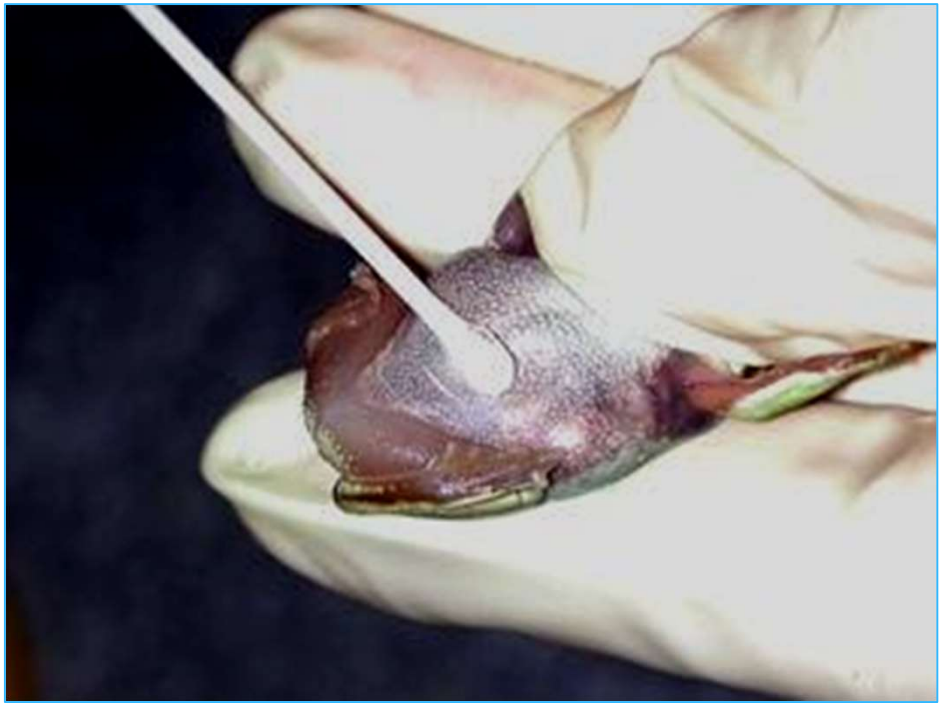


Other Diagnostics

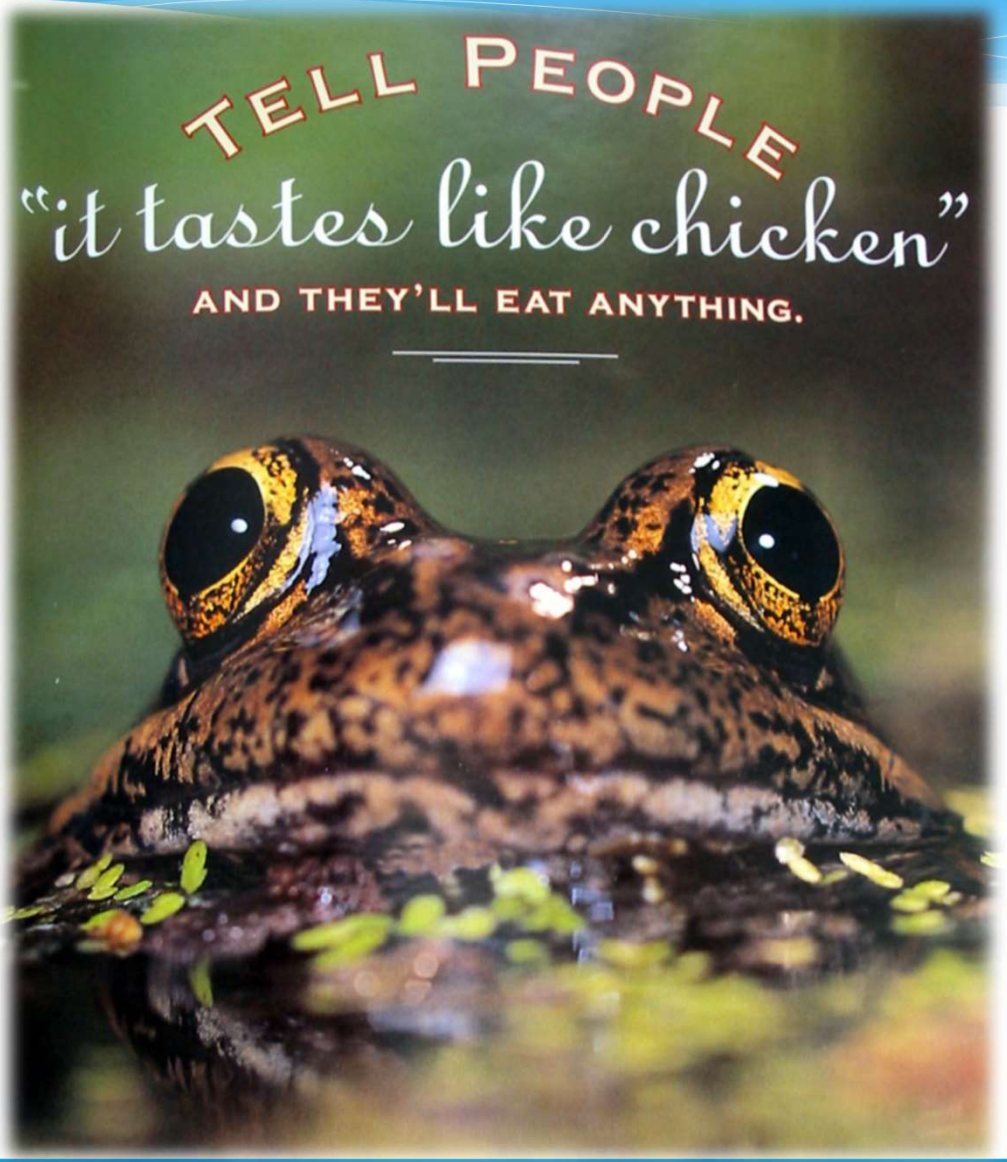
- Coelomic paracentesis
  - Cytology
  - Fluid analysis
    - Total protein, cell counts, specific gravity
  - Culture

Other Diagnostics

* Skin scrapings/swabs for skin lesions
  * Cytology
  * Special stains
    * Acid Fast
  * PCR for chytrid testing



Nutritional Support



Amphibian Metabolism

Calculating energetic needs (at 25º C, ml O_2/hr):

- **Anurans**
  - **SMR**= 0.02 (weight grams)$^{0.84}$
- **Caudates**
  - **SMR**= 0.01 (weight grams)$^{0.80}$
- **Caecilians**
  - **SMR**= 0.008 (weight grams)$^{1.06}$

- SMR ⇓ by 50% for every ⇓ 10ºC
- Multiply by 2 to convert to Kcal/day
- For example, a 30 gram frog's daily SMR= 0.34 ml O2/hr or 0.68 kcal/day

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Amphibian Metabolism

- For most amphibians in captivity:

  Daily energy= 1.2-1.5 x SMR

- Increases by 1.5-2x with disease or surgical recovery, 9x increase with strenuous activity

- In paedomorphs and larvae, metabolic rates linked to water temperature

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Nutritional Support

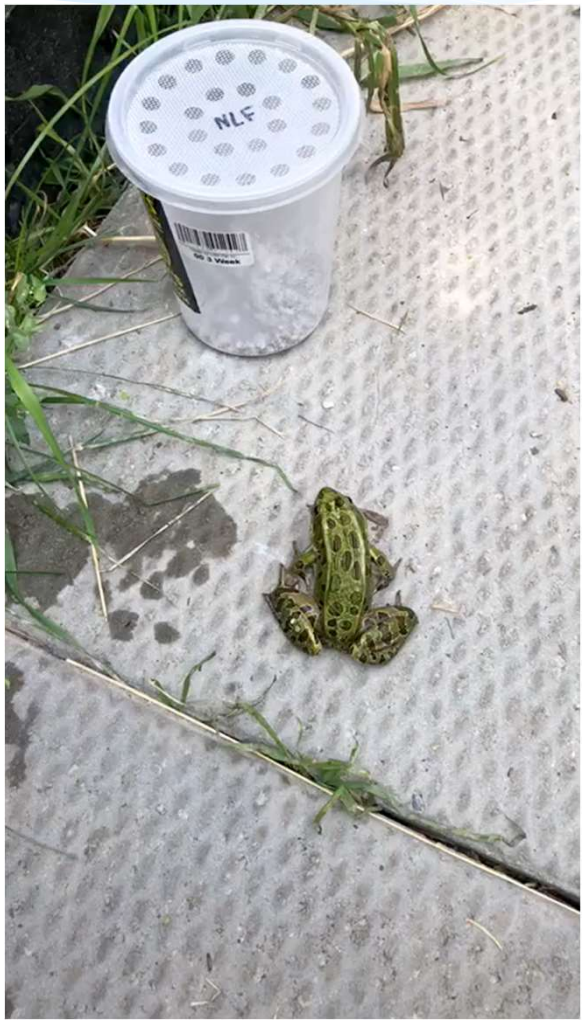
- Gavage gavage feeding is often needed initially.
- Suitable commercial options:
  - Lafeber's EmerAid IC Carnivore Diet
  - Oxbow's Carnivore Care Diet
  - Mazuri's Amphibian and Carnivorous Reptile gel
- If these are not readily available, then companion animal products such as:
  - Hill's A/D Canine/Feline Critical Care
  - Eukanuba High Calorie Veterinary Diet

Nutritional Support

* Initially feed at 1% of body weight (1 ml/100 grams) daily
* Gradually increase to 2-3% of bodyweight every 24-48 hours.
* Small pipettes or feeding catheters can be used.

Nutritional Support

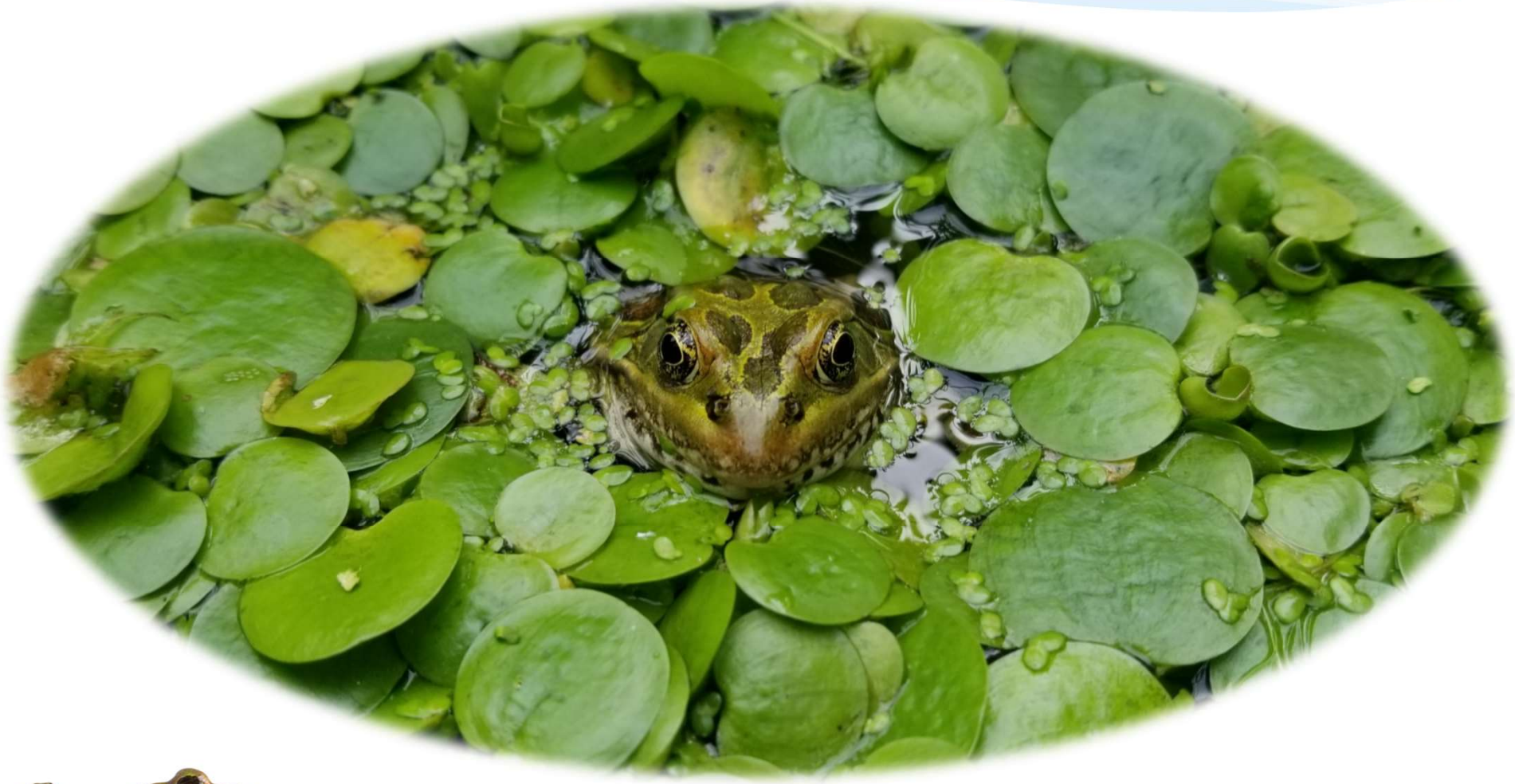
* When clinically recovering then small pieces of carnivore gels can be hand fed and appropriately supplemented prey items can be introduced.
* Most amphibians will readily start hunting once they have recovered enough to recognize prey.



Euthanasia

- Tricaine methanesulfonate (MS-222)
  - 1% (10 grams/liter) bath
  - 200 mg/kg intracoelomic
  - Buffer with $HC0_3$ (1:1)
  - Minimum of 30 minutes
- Sodium pentobarbital
  - 150 mg/kg
  - Intravenous best
  - Intracoelomic
  - Variable results
- Pithing with 20-22 gauge needle 30 minutes later and after no response

Thank you for joining. Questions?



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