Manatee Medicine in a Rehabilitation Setting at SeaWorld

Claire Erlacher-Reid, DVM, Dipl. ACZM
Veterinarian, SeaWorld Orlando
SeaWorld Florida has been involved in the rescue, rehab, & return of manatees to the wild since 1976

A total of 650 manatees have been rescued to date
Rescue efforts and return to the wild are coordinated by FWC.

Veterinarians may be consulted or provide triage in the field to help determine if an animal needs to be admitted into a rehab facility.

SeaWorld also participates in numerous manatee health assessments locally & out-of-state.
Our Rehab Facility

Six pools:

- 2 with false bottom floors to facilitate treatment & care
- 1 shallow pool for orphaned calves or critical adults
- 1 habitat with above & underwater public viewing
- Freshwater & saltwater capabilities
- Water temps: 20-24°C (68-75°F)
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Examination

External
• Weight & Morphometrics
• Body Condition
• Position in Water
• Body Symmetry
• Eyes, Nares, Ears, Mouth, & Urogenital
• Integument
• Auscultation
Examination

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• Peanut Head
  – Loss of Nuchal Fat
• Prominent Scapula, Ribs, Pelvis, & Spine
• Flat or concave ventrum with longitudinal skin folds
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Adult Heart Rate = 40-60 bpm
Calf Heart Rate = 60-75 bpm
Respiratory Rate = 3-5/5 mins
Internal

• Blood Collection & Analysis
• Fecal & Urine Analysis
• Radiographs
• Additional Diagnostics:
  – Ultrasonography
  – Thermography
  – Endoscopy
  – CT Imaging
  – Surgery
Venipuncture

Brachial Vascular Bundle

• Interoosseus space between the radius & ulna

• Medial or lateral approach

• Mixed arterio-venous sample

Adults: 18-20ga 1-2 inch needle
Calves: 21-25ga ¾-1 inch needle, clot quickly so heparin may need to be utilized
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Radiography

- Aid in diagnosis of fractures, pneumothorax, pyothorax, GI disorders, severity of entanglements etc.
- DV views
- Lateral views may be possible in smaller animals
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Ultrasonography

- Pregnancy
- Guiding Thoracocentesis
- Echocardiogram
- Performing in water may aid visualization of abdominal organs
- Evaluation of SQ abscesses
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Gerlach et. al JZWM 44(2) 2013
Ultrasonography

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Endoscopy

- Bronchoscopy
- Gastroscopy
- Colonoscopy
- Hysteroscopy
- Surgical Laparoscopy
  - Evaluate pleural & lung surfaces
CT Imaging

- Off property, human hospital
- Smaller individuals (<650lb)
Sedation & Anesthesia

- Techniques differ by veterinarian & facility
- Midazolam: 0.1-0.2mg/kg
- +/- Butorphanol 0.1mg/kg
- Mask Induction with Gas
- Endoscopic Guided Nasal Intubation
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- Midazolam: 0.1-0.2mg/kg
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- Mask Induction with Gas
- Endoscopic Guided Nasal Intubation
• Fluid Therapy
  – Fresh water or electrolyte solution
  – Oro- or nasogastric tubing BID-TID
  – IV bolus if necessary

• Nutritional Support
  – Dilute Gruel
  – Increase concentration slowly over time
Therapeutics

• Systemic Antibiotics
  – Excede (Ceftiofur)
  – Draxxin (Tulathromycin)
  – Danofloxacin/Enrofloxacin
  – Amikacin
  – Metronidazole

• Anti-inflammatories/Analgesia
  – Banamine (Flunixin)
  – Ketoprofen
  – Tramadol

• Antiparasitics
  – Praziquantel
  – Fenbendazole

• GI Support
  – Mineral oil
  – Prokinetics
  – Simethicone
Common Presentations

- Watercraft Injuries
- Cold Stress
- Brevetoxicosis
- Orphans
- Displacement or Entrapment
- Entanglement
Watercraft Injuries

- Commonly occur along the dorsum
- Injuries may be due to blunt trauma (hull), sharp shearing trauma (propeller blades), or both
- Deaths from blunt force trauma are more common than from sharp trauma
Watercraft Injuries

• Severe internal damage can occur even when minimal to no external wounds are visible

• Thoracic injuries common due to the manatee’s unique anatomy & position in water
Thoracic Anatomy

Thoracic cavity positioned in a horizontal plane

Each lung lobe is divided into its own horizontal pleural cavity complete with distinct hemidiaphragms.
Thoracic Anatomy

Transverse diaphragm in other marine mammals
Watercraft Injuries

• Common thoracic injuries:
  – Skeletal damage (fractures or luxations)
  – Laceration of the lung and/or diaphragm
  – Hemothorax, Pyothorax, or Pneumothorax
  – Kidney Damage
Pneumothorax

- **Clinical Presentation**
  - Listing
  - Positive buoyancy
  - ↑ RR &/or effort

- **Diagnose with**
  - radiographs,
  - advanced imaging
  - or thoracocentesis
Pneumothorax

- Clinical Presentation
  - Listing
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Normal Lung
Pneumothorax

• Clinical Presentation
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Pneumothorax

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Treatment

- Flotation devices
- Thoracocentesis
  - Multiple attempts may be necessary
- Chest tubes have had mixed results
- Thoracoscopy to assess & attempt repair
  - Technique still in development
Pneumothorax

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Photo courtesy of Miami Seaquarium
Pneumothorax

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Pyothorax

- Poor prognosis, euthanasia often recommended
- Treatment attempts may involve serial drainage, chest tubes & antimicrobials based on culture of exudate
- Radiographs, Ultrasound, Thoracocentesis, &/or Thoracoscopy help confirm
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• Radiographs, Ultrasound, Thoracocentesis, &/or Thoracoscopy help confirm
Sharp Trauma & Wound Care

• Lavage with dilute chlorohexidine, betadine, or sterile saline
• Raw honey or other topical treatments
• Cold Laser
• Supportive Care
• Radiographs & Advanced Imaging
  – Fractures & Osteomyelitis
CT Imaging
Cold Stress

- Water temp <20º C/ 68º F
- Subadults at greatest risk
- Acute or chronic exposure

Clinical Signs & Sequela:
- Emaciation & Lethargy
- Dehydration & Constipation
- Enterocolitis
- Secondary Infections
- Thromboembolic Dz
- Dermatitis

- Muzzle, head, & extremities typically most severely affected with skin lesions.
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Cold Stress

May occur locally or when animals fail to travel South in the winter. Proactive relocation is preferred before clinical signs develop.
Cold Stress

MANATEE AT MYSTIC AQUARIUM
MOVING TO SEAWORLD ORLANDO
Cold Stress

- Treatment
  - Warm, clean water
  - Correct dehydration & electrolyte abnormalities
  - Mineral oil &/or enemas as needed for constipation
  - Treat secondary infections
    - Systemic antibiotics &/or antifungals
  - Nutritional support
Brevetoxicosis

- **Brevetoxicosis (Red Tide)**
  - *Karenia brevis*
  - Dinoflagellate
  - Ingestion and/or inhalation
  - Potent neurotoxin
  - FL West Coast > East Coast

- **Clinical presentations**
  - Weakness, disorientation
  - Tremors, seizures
  - Diminished palpebral or vibrissae response
  - Nictitating membrane covering portion of eye
  - May see respiratory or GI signs, depending on route of exposure
**Brevetoxicosis**

- **Treatment**
  - Removal from toxic environment
  - Flotation and/or shallow water to prevent drowning
  - Anticonvulsants if needed
  - Atropine may hasten recovery: 0.02mg/kg given ¼ IV and ¾ SQ
  - Supportive Care
  - Systemic Meds if needed
  - Neurological signs generally recover in 24-48 hours
Orphans

- Calves that have been separated from mother
  - Dependent until 2 yrs

- Common Clinical Presentations
  - Lethargic
  - Dehydrated
  - Hypoglycemic
  - Evidence of cold stress
  - Poor body condition
Orphans

• Treatment
  – Correct Hypoglycemia
  – Correct Hydration & Electrolyte abnormalities
  – +/- Antibiotics

• Nutritional Support
  – Feed every 3 hours
  – Tube feed until animal accepts a bottle
  – Gradually increase concentration of formula
  – Monitor weight daily
• Historically, less success with Esbilac or Zoologic 33/40

• Advancements in 2010:
  – Elecare & Prosource
  – Oils (2:2:1 ratio)
    • Red Palm fruit
    • Macadamia nut
    • Coconut oil
  – Lecithin

• Closer in composition to manatee milk
• ↑ Survivability
• Less GI complications
Formula

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Survivability

Less GI complications
GI Complications

- Diarrhea
- Constipation
- GI inflammation
- Pneumatosis intestinalis
  - Often fatal
  - Intramural gas accumulation
  - Interactions among mucosal integrity, intraluminal pressure, gas, & bacteria flora may play a role
Pneumatosis intestinalis

- Predisposing factors
  - Necrotizing enterocolitis
  - Mechanical or functional obstruction
  - Vascular compromise

- Artificial milk formula may play a role in development

- Calves with pneumatosisis are fed elemental formula
Pneumatosis intestinalis

Intraluminal GI Gas Pattern

Pneumatosis Intestinalis
Displacement & Entrapment

19 manatees were rescued from a storm drain in Florida February 2015
Displacement & Entrapment
Displacement & Entrapment
Entanglement

- Disentanglement in the field may be possible
- When damage is severe, chronic, and life threatening, transport to a rehab facility may be necessary for continued care.
- Treatment may include:
  - Disentanglement
  - Wound Care
  - Systemic Meds
  - Anesthesia & Surgery if necessary

To Be Continued . . . .
Return to the Wild!
Thank you!

Current Clinical Vet Team
- Dr. Lara Croft
- Dr. Stacy DiRocco
- Dr. Claire Erlacher-Reid
- Dr. Lydia Staggs

Current Vet Techs
- Cindy Reyes
- Jennifer Sadoski
- Stacey Thibault
- Sara Eberle

Animal Rescue Team
- Manager: Jon Peterson (JP)
- Supervisor: Lorri Braso
Thank you!

Any Questions?