Rounds Animal Health Department Medical Rounds "medicine for all"

NATIONAL MARINE LIFE CENTER Caring for Stranded Marine Animals

Notes Veterinary Research Department Under the microscope

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Rounds Notes is a report on the health of animals at the National Marine Life Center from Sea Rogers Williams VMD for the staff, volunteers, and community of the center including professionals involved the captive care of similar species, the views expressed are not necessarily that of NMLC. Information in Rounds Notes should be considered confidential and used solely to benefit the health of aquatic animals everywhere.

June 24, 2014 ***Rounds Notes*** *seals=3, sea turtles = 1, turtle = 13* **21**: 128-136 (2014)

Headline News: SeaCoast Science Center transfer

Star Island, Star Patient

Harbor seal: 14-015 - Rose PPv female

abandoned, blethrospasm left eye in field

wt= 6.3kg , SL=67.3 cm, BS=1.5/5

stranded: Star Island NH 6/7/14; admit 6/10/14

Last Blood: 6-10-14; 6-24-14 Last Rads:6-10-14

HX: blood and oil in feces, failure to gain weight

PE: BAR, vocal, thin, squinting eyes, but corneas are clear and bright, no aural d/c, mm pink, no lesions, limbs WNL, skin WNL, abdominal palpation is WNL, asculation can hear air movement in both lung fields, no abnormal sounds, HR= 120, RR= 40 with periods of apnusptic pattern. Eye stain, no dye uptake (no cobalt blue filter). Fecal exam: direct NPF, centrifugation float (oil droplets, NPF). CBC/SCP to IDEXX.

DDX: mucoid eyes (stain negative)
passing oil in feces
failure to gain weight

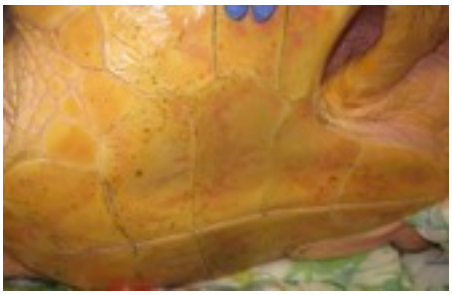
AC: transition to fish gruel.

TX:
doxycycline 50 mg PO q 12 hrs, 15 days
gentocin 0.3% ophthalmic 2 drops BOTH eyes q8hrs, 7d

We bid a fond farewell to the last three Kemp's from the 2013 cold stun season, Gage, North Start, and Cherry. Kathy supported the turtles for the transport to Maryland and with assistance from the National Aquarium oversaw the successful release. The NMLC was proud to assist these endangered species with the rehabilitation of 10 Kemps' Ridley sea turtles this year. Besides the typical hypothermia, perfusion problems and organ injury we also worked with one broken leg and one episode of mild osteolysis. It is good to return these animals back to their natural environment.

Sea Turtles:#41Tide

increased enzymes and WBC



wt=40.9 kg, SCL= 65.6 SCW=54.9, TPR=n/a, BS =3/5
CC: stranded 12/8/13 Brewster, cold stun
Last Blood:6/3/14: HIGH: AST (945), improved LDH (103) CK (2500), ALKP(24), ALT (17)
A:R/O liver skeletal, cardiac or renal disease
CBC: hetophilia (6732) eosinophilia (1326)
Last Rads: 1/7/14
PE: No change, 85% of carapace superficial keratin has been removed with healthy tissue below, plastron with red discoloration and small superficial black " pin points" Proliferation of the maxillary rhamphotheca leading edge.
A: black color may be another marine algae filling the natural irregularities of the plastron surface. Improved water clarity and disinfection to DFJ system may help.
TX
1- vit. B1, sea tabs, and calcium (oral)
2- enrofloxicin 800 mg (20 mg/kg) PO q7days, 4x (1 tx left)
P: repeat CBC/SCP post antibiotics, 2 week withdrawal

Harbor Seals :Belmont, 14-001 PPv abandoned

wt=11.4 kg, SCL=x cm, TPR=n/a, BS = 2.5/5
Problem List:
1- abandoned by mother 4/29/14 in New Hampshire
Last Rads:5/1/14, 5/6/14, Barium 5/29/14; Last Blood: 4/30/14
CBC: WNL; SCP: low Glob, hi Bil
Care Notes: doing well in ST2
Visual Inspection: weight gain and much better body condition, no visual lesions, doing well BAR active, swimming.
A: making excellent progress, taking fish on his own, he is essentially weaned.
TX:
1- feed standard pup "base" in fish
Plan: apply for release at 25 kg.

Harbor Seals : Barclay, 14-006 PPv abandoned

STRICT CONFINEMENT [1 week]
wt=9.7 kg, SCL=81 cm, TPR=n/a, BS = 2.5/5,
Report any bite/scrach to staff member immediately!
Last Rads:5/20/14, 6/3/14; Last Blood:5/19/14
CBC: WNL; CP: low Glob (1.7), hi Bil (16)
PE: Still thin but improved, no aural d/c, wounds healed, other body WNL
P: CWCT, weight gain and weaning
TX:
1- fish gruel or fish 6 am to 12 am q 4 hrs (5 Tx)
Plan: apply for release at 25 kg.

Eastern Box Turtles:

Terrapene carolina carolina

Remember these are now collection animals, and must be handled last, and you can not go back to rehabilitation animals without washing and changing clothes. They appear to be acclimating well, there is no specific treatment for these two, let them enjoy their improved living conditions for a while.

Box Turtle: 14-005 TTc (gray) Daisy

Confiscated, designated non-releasable

wt=392 g, SCL=13.1 cm, SCW=10.4 cm

Visual inspection: WNL, no ocular d/c doing well.

TX: prophylactic Vitamin A&D, 0.01 cc IM q3mo.

Box Turtle: 14-004 TTc (green) Violet

Confiscated, designated non-releasable

non-weight bearing Right hind lamness

wt=345 g, SCL=11.7 cm, SCW=9.4 cm Depth=6.1

Last Blood: Last Rads, 6-3-14; 6-24-14

HX: care giver noted non weight bearing Right hind

PE: No lesions, exam limited as turtle retreated into shell, no ocular discharge, could not preform complete exam of limbs, radiographs taken to rule out bone - lesions.

A: greatly improved, supports DDX of hypovitaminosis A

TX:Care Notes: monitor temp and humidity, increase temp to 85-89°F 14 hours each day, increase relative humidity, encourage to eat omnivore turtle diet, soak daily

1) vitamin A&D, 0.1cc IM q 3 mo.

Southern Diamondback Terrapins:

Malachemys terrapin

Remember these are now collection animals, and must be handled last, and you can not go back to rehabilitation animals without washing and changing clothes. They appear to be acclimating well, and the most important aspect of their medical care will be the improved water quality and husbandry at the NMLC, but we will start to treat the shell and metabolic bone disease once we get weights. Collection animals never share scales, calipers, tools, etc.

Diamondback Terrapins: Olof

14-002TMc

Confiscated, designated non-releasable carapace lesions, metabolic bone disease (SNHPTism), ulcerative skin disease

wt=81 g, SCL=7.1 cm, SCW=5.7 cm

Visual Inspection: no change, BAR and active, eating cuttle bone in tank, appetite for natural prey items is good.

A: improved husbandry and antibiotics should results in improvement of the metabolic bone disease and shell problems but progress will likely be slow: P: CWCT

TX:

1- betadyne soak of carapace 5min then flush SID

2- oral calcium glubinate 23mg/kg PO SID 30 d

3- vit D3 400 iu/kg IM (1000 iu/ml) q7d. 4x

4- ceftazadime 20 mg/kg IM q3d (200 mg/ml) for 2 months

Diamondback Terrapins: Sid

14-003TMc (male)

Confiscated, designated non-releasable carapace lesions, rock ingestion, questionable bone density

wt=174.3 g, SCL=9.3 cm, SCW=7.6 cm

Visual Inspection: no change, BAR and active, eating cuttle bone in tank, appetite for natural prey items is good.

A: improved husbandry and antibiotics should results in improvement of the metabolic bone disease and shell problems but progress will likely be slow: P: CWCT

TX:

1- betadyne soak of carapace 5min then flush SID

2- oral calcium glubinate 23mg/kg PO SID 30 d

3- vit D3 400 iu/kg IM (1000 iu/ml) q7d. 4x

4- ceftazadime 20 mg/kg IM q3d (200 mg/ml) for 2 months

Northern Diamondback Terrapins:

Malachemys terrapin

All three Northern diamondback terrapins at the center, who presented for cold-stun and pre-mature emergence from brumation passed release physicals today, and an application will be made to the state for wild release of all three to Wellfleet area of Cape Cod. Bubbles and Scholfied fared much better with uneventful gradual warming, acceptance of food in captivity, and re-integration to a brackish environment. Penny suffered a syndrome of superficial keratin loss over the carapace with exposure and death of the dermal bone. I believe the dermal bone necrosis precedes the superficial but visual changes. microvascular blood flow is presumed to be affected by the hypothermic event and a pre-determined but largely unknowable area of the dermal bone suffers avascular necrosis with subsequent epithelium death and eventually sloughing of the superficial structures, which is when the condition first shows itself. We were fortunate that the degree of bone loss with Penny was not as severe as Patty, and while Penny is not left unscared, we have high hopes for her once she is returned to the wild.

Diamondback Terrapins: Bubbles

14-008TMc pre-release (small)

wt=275 g, SCL=12.0 cm, SCW=9.7 cm (depth= 4.5)

Cold stun and shock, Wellfleet 11/30/13, Tufts Wildlife

PE: complete physical exam, no lesions found, WNL for size and species, acclimated to natural environment, OK for release application to state-C Rogers Williams VMD

Diamondback Terrapins: Scholfied

14-007TMc prerelease (larger)

wt=760 g, SCL=16.5 cm, SCW=12.9 cm (depth= 6.6)

Cold stun and abrasions Eastham 1/13/14, shedding resilved WildCare-Tufts Wildlife

PE: complete physical exam, no lesions found, WNL for size and species, acclimated to natural environment, OK for release application to state-C Rogers Williams VMD

Terapins:Penny

resolved carapacial dermal bone necrosis

wt=1.2 kg, SCL=18.2 cm, SCW=14.8 cm

PE: complete physical exam, mild generalized edema, scaring of carapace, no active lesions, no other lesions found, WNL for size and species, acclimated to natural environment, OK for release application to state-C Rogers Williams VMD

Red Bellied Cooters: 2014 hold-backs
MBD

Each of the 6 RBCs were given visual inspections. We'll continue with oral calcium glubinate 1iu PO SID, with available cuttlebone and husbandry with 85°F water, and UVB provided by mercury-vapor bulb, with daily water changes. 14-014 TPr is the second smallest but 'softest' cooter and is at the greatest risk.

Ozone and ORP

related but not the same

We use ozone as our primary disinfectant for salt water systems. If untreated the water would harbor unacceptable and unhealthy amounts of bacteria and viruses. The solution to pollution is dilution, and sea turtles and seals live in a vast ocean, so if bears shit in the woods we can only imaging what seals do. Still, the costal waters are an extension of the Atlantic Ocean, and literally flushed with each tide and local waters are safe for wildlife. On the other hand, maintaining water quality in small rehabilitation systems is challenging and requires a sophisticated water processing system (life support). The primary measurement of adequate disinfection is to show that the total coliform bacteria count is maintained at less then 1000 colony forming units (CFU) per 100 ml of water. Water clarity, pH, and other factors are also impacted by animal waists, uneaten food, and the biologic and chemical tank environment. It is important to remember that total coliform count is not a measure of all the bacteria in the water, but was designed as a measure of mammal fecal contamination. In modern water treatment plants, *Enterococcus* is also measured along with the total coliforms and other advanced parameters. While the total coliform level is essentially an arbitrary 'line-in-the-sand' it has wide acceptance, is mandated in the NOAA guide, Policies and Best Practices, Marine Mammal Stranding Responcse, Rehabilitation, and Release, Standards for Rehabilitation Facilities, and in the Animal Welfare Act standards for maintaining marine mammals in captivity. It has also been shown through years of application, and generations of healthy captive animals, to be an effective tool in the monitoring of water quality for seals and sea turtles in captivity.

Too little ozone, too many bacteria, however, too much ozone can cause significant damage to our hosts. We can purchase an ozone test kit made by LaMott or likely one from HACH which will directly measure the ozone. However, ozone is ephemeral and measurements should be made tank-side within minutes of removing the water from the

system. Also, the standard for ozone in animal tanks is zero, by the time ozone has worked it's way into the main tanks, it may already be too late. If anyone smells ozone at the tanks, open the doors and notify a staff member immediately, do not spend any time in the room if you can smell ozone.
So, what can be done ? We can measure the effect that ozone has the on chemistry of the water by the measurement of the oxidative-reduction potential of the system, or ORPs. ORPs are proportional to the amount of ozone the system has been exposed to, but are not a measure of ozone.

As pointed out in his comprehensive article (Holmes-Farley, 2003) the OPR can be thought of as a "pH" type measurement. Indeed, pH is
the log scale of acid-base balance, while the ORP is a log scale of oxidation-reduction reactions. These chemical and ionic interactions are varied and complex, but we can still use trends and levels to understand our systems better, kill off potentially harmful bacteria, and avoid toxicity. Like pH there is no specific "best value" for OPR in aquariums, and since it is a log scale, small increases (or decreases) represent a enormous change in the chemistry of the tanks.

Oxidation can be a powerful, and dangerous, disinfectant. Ozone (oxygen with an extra free radical oxygen atom: O_3, typically via production of hydroxide ion OH^-) like beach (sodium hypochlorite NaClO with it's negative ion: ClO^-) can rip apart bacteria, viruses, and damage living tissue via oxidation reactions. OPR measures the sum of these reactions along the surface of a probes, and prolonged exposure to an ORP of 650mV or higher will kill most bacteria in a few seconds (Holmes-Farley 2003). The gills of fish and most invertebrates are particularly sensitive to even low levels of ozone. In these systems we must use ozone indirectly. Ozone is very unstable, and unlike chlorine that must be neutralized chemically, ozone dissipates rapidly in a process known as degassing. By injecting ozone into a protein skimmer which discharges into a well aerated reservoir, we can avoid even trace amounts of ozone from getting into our tanks while delivering the ozone to where it will be most effective, inside the microbubbles created in the venturi system of the protein skimmer. This decreases the amount of ozone needed to provide adequate disinfection, and is our typical set-up. Our system discharges water from the protein skimmer (possibly with residual ozone) into the Stand Tank, which is a highly agitated resivor to promote degassing, and is mixed with water coming from the tank as well as from the protein skimmer (source of possible contaminate ozone). With this system, it is very unlikely that any trace zone could make it to the animal tank, however, by measuring the ORPs in this area, we would expect the ORPs in the mixed stand tank to be higher then in the animal tanks (DJF, ST2). It is likely that the OPR of the turtle tanks must be sustained at over 300 mV and close to 350mV to keep coliform bacteria under 1000 CFU/100 ml, but this scale is relative to many factors including the

number of turtles, feeding schedules, water temperature, and any number of complex interactions. The ORPs in the stand tank may need to be higher (350-500 mV or more).

The Normal OPR: The open ocean has an OPR of 0-450mV, with a range between 200-500mV. A target ORP value between 300-450mV for most marine aquarium systems (Holmes-Farley 2003) is typical. Strongly reducing environments, including some anoxic sediment can even have a negative OPR.

Our use of OPR: We use ORP to make sure we are not overdosing the systems with ozone, and all of our ozone generators have a negative feedback loop with an ORP controller. For most fish and invertebrate systems a cut off of 350mV - 400 mV at the tank is appropriate, for marine mammals and sea turtles, 450 mV may be used. If the sampled reservoir reaches the set value, the unit will stop producing ozone until the values drops, and then turn on again. Marine Mammals and reptiles can withstand higher ORP values.

Limits of OPR:

First and foremost, OPR is an indirect measure, and changes, abnormal values, and unexpected trends, must be investigated further. There is no substitute for a full water quality investigation when something unexpected happens (i.e. multiple reading of D.O., pH, ammonia, nitrite, OPR, chlorine, bromine, etc).

OPR is a measure at the probe, not necessarily the tank. A microenvironment can build on the probe and it can take hours for the probe to come to new equilibrium and give a more representative measure of the tank. Agitation of the probe helps. The probe can be rinsed with deionized water and blotted dry with a paper towel, the tip can also be cleaned with warm water and detergent while mixing, then rinsed with deionizer water.

Just because the OPR is <400mV does not mean a tank is safe for fish.
Because the oxidation/reactions are ongoing in a complex environment, like an aquarium, the solution is not simple and not at equilibrium, the changes seen in OPR measurements and wild swings observed on the meter may be a result of the dynamic situation in the tank.

Chlorine can also be used, but some animals are sensitive to the chlorine and it can cause eye problems, and irritation, and if not carefully monitored even more severe issues. Chlorine should not be mixed with ozone. We should be prepared to use chlorine as a back-up disinfectant for seals and sea turtles if necessary, we'll cover chlorine in a future Rounds Notes.

C Roger Williams VMD

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attending veterinarian and director of science

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