Aquatic Preventative Medicine 9/15/21 Questions

1. **Which of the following is true regarding formalin as a prophylactic chemotherapeutic in the routine quarantine of fish?**
   1. It is non-toxic to most invertebrates, elasmobranchs, and aquatic plants
   2. Personal protective equipment (PPE) is not required during handling
   3. It decreases dissolved oxygen so supplemental aeration is necessary
   4. Tanks/systems should be darkened for the duration of treatment
   5. It should be added slowly (e.g., drip system) and gradually increased

Answer: C

1. **Which of the following diagnostics are less commonly performed on elasmobranchs compared to teleosts undergoing routing quarantine?**
   1. Physical exam and blood work
   2. Direct fecal analysis and flotation
   3. Ultrasonography
   4. Gill biopsies
   5. Coelomic flushes

Answer: D

Question: Which adverse effect was seen with intramuscular injection of enrofloxacin in striped bass (Morone saxatilis)?

Answer: Injection site hemorrhage, necrosis, and inflammation

Question: Which of the following treatments was shown to reduce inflammation during wound healing in common carp (Cyprinus carpio)?

a. Cold temperatures

b. Manuka honey

c. MicroLyte Ag Vet

d. Silvasorb gel

e. No treatments were found to significantly impact wound healing

Answer: b

Zec, S., Hadfield, C., & Hungerford, L. (2021). Retrospective review of copper sulfate immersion treatment in marine teleosts during quarantine at the national aquarium of baltimore from 2004 to 2016. *Journal of Zoo and Wildlife Medicine*, *52*(1), 97-102.

Abstract: Copper sulfate immersion is common for the prevention and treatment of *Cryptocaryon irritans* during quarantine of marine teleosts. **The National Aquarium in Baltimore has followed a consistent copper sulfate protocol for marine teleost quarantine since 2004. The protocol used copper sulfate pentahydrate as a slow drip to increase copper ions over 3–5 days to a level of 0.18–0.21 mg/L. This level was maintained for 21 days, and then copper ions were rapidly removed with activated carbon filtration and water changes. Quarantine records from 2004–2016 were used to examine mortality of marine teleosts during copper treatment and identify factors that might have influenced mortality.** The following records were excluded: brackish and freshwater teleosts (salinity <25 g/L); long-term treatment at subtherapeutic levels (<0.18 mg/L); intentional short courses (<14 days); and use outside of quarantine. Species, system volume, temperature, parasitic outbreaks, concurrent medications, and water quality concerns were evaluated. **During this period, 4,835 individual teleosts belonging to 347 different species were treated. From 2004 to 2016, mortality during copper treatment was 4.1% (199/4,835 individuals) and was higher when treatment was started during the first week of quarantine (7.7%, 68/884) rather than later (3.3%, 131/3,951 individuals). Of the mortalities, 24.1% (48/199) occurred during the initial subtherapeutic period, and 75.9% (151/199) occurred during the therapeutic period. No mortalities occurred in 75.5% (262/347) of species during copper treatment.** When using a similar methodology, copper sulfate is a safe immersion for quarantine of marine teleosts. **Mortalities during copper treatment can be reduced by increasing copper ion levels to therapeutic ranges more slowly (e.g., over 7 days) and starting copper treatment after the first week of quarantine.**

Question:

Which of the following is true regarding the use of copper sulfate immersion as a quarantine treatment for marine teleost fish?

1. Higher mortality is expected in smaller volume recirculating systems.
2. Copper sulfate treatment should be delayed for at least 1 week after fish arrival.
3. Increasing to therapeutic copper sulfate concentrations over 24-48 hours is recommended.
4. Risk of mortality during copper treatment is high for most marine teleost species.
5. Copper sulfate dosing is based on alkalinity in marine systems.

Answer: B

Jalenques, M., Vergneau-Grosset, C., Summa, N., Youcef, W. A., St-Cyr, J. F., & Lair, S. (2020). A cluster of cases of thyroid hyperplasia in aquarium-housed tropical marine teleosts following a change of salt mix brand. *Journal of Zoo and Wildlife Medicine*, *51*(3), 725-728.

Abstract: Follicular thyroid hyperplasia was diagnosed in nine out of 32 (28%) marine tropical teleosts housed in a public aquarium over a 9.5-mo period. These proliferative lesions were considered to be the cause of death in five of these fish. **Iodine concentration was undetectable in nonozonized water (<0.005 mg/L), suggesting that an environmental iodine deficiency was the cause of these hyperplastic thyroid lesions. The only significant modification in the husbandry was a change, 18 mo before the first case, of the commercial salt mix brand used to make artificial seawater. The iodine content in this replacement salt mix was five times lower than that of the salt mix used before.** This case series suggests that the iodine concentration in this new salt mix was insufficient to maintain thyroid homeostasis in reef teleosts under the husbandry provided in this institution.

Key Points:

* Limited access to iodine can result in development of thyroid hyperplasia (goiter).
* Majority of iodide uptake in teleosts from water rather than food.
* Iodate (IO3-), elemental iodine (I2), iodide (I-) forms in SW – Only iodide absorbed by fish.
* Thyroid hyperplasia in fish has been assoc with iodine deficiency in water or diet, exposure to goitrogenic factors (high environmental nitrate), and water treatment with ozone.
* Sea salt mix changed from Instant Ocean to Crystal Sea Bioassay Marinemix salt.
* Starting 18 mo later, thyroid hyperplasia diagnosed in 28% of tropical marine fish on necropsy.
* Clinical signs only seen in two cases (one presented with classical goiter in ventral branchial arches, another had nonspecific clinical signs).
* Iodine water concentration measurements performed on water made with the two different salt mix brands. Tested with benchtop MultiTest Iodine/Iodide test kit. Crystal Sea salt iodine concentration almost five times lower.
* Each salt mix brand added to two identical tanks with cycled filters and devoid of fish.
  + Iodine concentration decreased dramatically and was undetectable after 4 days with Crystal Sea salt.
  + Supplemented the system with Reef Iodide (potassium iodide complex) to maintain concentration of 0.08 mg/L. After few months, no new cases of thyroid hyperplasia.

Takeaway: Cases of thyroid hyperplasia in a group of marine teleosts were associated with recent switch to different aquarium salt mix deficient in iodide.

Question:

What form of iodine is the only form that is biologically available to fish?

Answer:

Iodide (I-)

Describe three routes for vaccine administration in fish and discuss the pros and cons of each.

* Waterborne/immersion: useful for large colonies, not cost effective for large fish, protection for 3-12 months which is often not long enough for the production cycle of some fish
* Injection: often used in more valuable fish, impractical in fish <5 grams
* Oral: used least commonly as they are not hugely protective, not cost effective for larger fish

AAZV guidelines for Zoo and Aquarium Veterinary Medical Programs and Veterinary Hospitals

Which of the following is true regarding the veterinarian’s role at zoos and aquariums as outlined by the AAZV?

1. All institutions must have a full time veterinarian.
2. A pathologist must perform a necropsy whenever a collection animal dies
3. The veterinarian should oversee nutrition, husbandry, and pest control
4. The veterinarian program coordinator must be a veterinarian or RVT
5. Surgical care of collection animals can be referred off site.

Answer: C