Pacific Tide

An informational newsletter

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About our Author

Colleen Brady, DVM, DACVECC

Dr. Brady received her Doctorate of Veterinary Medicine from Louisiana State University in 1997. At the University of Pennsylvania, she completed her internship in 1998 and her residency in emergency and critical care in 2001. That same year she became Board Certified. She stayed on at the University of Pennsylvania during 2001-2002 as staff lecturer at the School of Veterinary Medicine and joined PVSES in July of that year. She has published several articles on feline sepsis, sodium homeostasis, and the stress response to critical illness. Her areas of special interest include sepsis, acute heart failure, electrolytes and fluid therapy.

In her free time she enjoys spending time with her husband, two daughters and anything outdoors. She is available Thursdays through Sundays at PVSES.

Colleen Brady, DVM, DACVECC

Dogs LOVE Water.
Water toxicity and Fresh water submersion.

Dr. Colleen Brady
Diplomate American College of Veterinary Emergency and Critical Care

In Central California, water-related injuries can happen all year long. Dogs with water toxicity have a common history of excessive time swimming in a lake, pool or biting at a running hose/sprinkler shortly before onset of neurologic signs. The marked dilutional hyponatremia secondary to excessive water ingestion results in cerebral edema and neurologic impairment that can progress to apnea and death. Fresh water submersion victims (formerly called near-drowning) develop pulmonary edema due to laryngospasm or water aspiration causing loss of surfactant, resulting in atelectasis, increased capillary permeability and intrapulmonary shunting. Respiratory distress may not manifest for several hours after event.

The case below has been slightly modified from the original presentation but serves to illustrate the main features of fresh-water related emergencies and recommended therapeutic approaches.

Mick, a 5 year old male neutered black Labrador Retriever, spent the morning playing in the pool with the kids. The family was impressed with Mick's dedication to water and they frequently commented that Mick would stay in the pool 24 hours a day if they let him. But, in the early afternoon, the owners noticed that Mick started stumbling when he tried to climb the pool steps and was panting excessively. Thinking that Mick had overdone it, the family encouraged him to lay down for awhile and rest and they brought him some water. . . which he drank. This dog loved water.

The owners noticed that Mick was getting more and more wobbly and couldn't focus his eyes. As they watched, his legs became more rigid. Fearing the worst, they rushed him to the closest emergency hospital.

On arrival, Mick was carried in to the hospital. He was noted to be hypersalivating, in good body condition and damp. He was mildly hypothermic at 98.9F, mildly tachycardic at 130 bpm and markedly tachynpeic with a respiratory rate of 68 and bilateral crackles on auscultation. Abdominal palpation noted a distended but soft abdomen and a moderate bladder. Mick was non-ambulatory with intact spinal reflexes. Cranial nerve evaluation noted vertical nystagmus and midrange pupils with decreased pupillary light response.

Initial data base showed a sodium concentration of 125, potassium concentration of 2.4, chloride concentration of 96, blood glucose concentration of 62 and a PCV/TS of 34/4. Blood pressure was within normal range. His SpO2 was 89%.

At this point, Mick has at least two critical problems in two major body systems that require immediate attention: the respiratory and CNS systems. Neurologically, his clinical signs are consistent with

cerebral edema secondary to water toxicity rather than drowning. and the clinical findings of hypervolemia, the electrolyte profile and historical information support this. His respiratory signs are concerning for pulmonary edema and near drowning or aspiration pneumonia. Mick was likely at increased risk for submersion type injuries due to neurologic impairment before the owners ceased all pool activity.

Immediate triage intervention plan includes oxygen supplementation, IV access, diuretics and brain protective strategies for cerebral edema.

Mick is kept in lateral recumbency as long as his SpO2 is >93%. He is treated with flow by oxygen with a mask, peripheral catheter and 2 mg/kg of furosemide IV followed by a furosemide CRI. A urinary catheter is placed to monitor UOP and minimize anxiety associated with a large bladder. His head and neck are kept slightly elevated and he is carefully monitored to make sure his gag reflex remains intact. An anti-emetic is given to decrease hypersalivation to lessen chances of ongoing aspiration.

Maintaining normal electrolyte concentrations is essential for brain cell volume regulation and ATP production. In water toxicity, body stores of electrolytes are usually normal – just diluted. Removal of excess water will allow restoration of normal osmolality. Hypertonic saline (HTS) is contraindicated in this clinical scenario. By increasing plasma sodium concentration with exogenous HTS, Mick would be at high risk for even more severe volume overload which would worsen cerebral and pulmonary edema. Mannitol in this initial situation would be risky for the same reason.

Other brain protective strategies include medical management to keep blood glucose, pCO2 and pO2 concentrations normal. Blood glucose management is carefully monitored as euglycemia is essential for brain protection. 25% dextrose is given as a slow bolus once. Starting a constant drip as a source of dextrose supplementation is considered less ideal due to the volume load that may exacerbate pulmonary edema. If hypoventilation is present, intubation with ventilation is indicated. Hyperventilation as a brain protective strategy is not recommended as it can cause severe vasoconstriction and drop cerebral perfusion.

In summary, we are treating Mick's cerebral edema with diuretics and supplemental oxygen while trying to protect his brain by preserving the normal brain chemical environment as much as possible. If Mick's neurologic status deteriorated in the face of diuretics, mannitol therapy would have been indicated and ventilation started if needed to treat any subsequent lung worsening.

Mick's neurologic status steadily improved over the next few hours. He became much more responsive and started to try to move around. Furosemide CRI was stopped as neurologic signs resolved. Supplemental oxygen therapy was stopped after 48 hours when SpO2 remained above 91 on room air. His sodium concentration returned to normal by 36 hours after starting therapy. He was discharged after 3 days.

Many clinicians become confused about how to treat hyponatremia. In Mick's case, it was easy to identify the underlying problem. But in more chronic cases, it can be challenging. Sodium and water are regulated independently. The first step in evaluating disorders of sodium is determining the patient's volume status because the kidneys will always value volume over osmolality. Once you determine if a patient needs volume or volume loss, the therapeutic path becomes much clearer.

Our Doctors

Internal Medicine
Kelly Akol, DVM, DACVIM (SAIM)
Merrianne Burtch, DVM, DACVIM(SAIM)
Michelle Pressel, DVM, DACVIM (SAIM)

Surgery
Lisa Metelman, MS, DVM, DACVS
Tom LaHue, DVM, DACVS
Dean Filipowicz, MS, DVM, DACVS

Oncology
Theresa Arteaga, DVM, DACVIM(Oncology)

Critical Care
Colleen Brady, DVM, DACVECC
Lillian Good, DVM, DACVECC

Cardiology
Mandi Kleman, DVM, DACVIM(Cardiology)

Radiology (VRS)
Larry Kerr, DVM, DACVR
Mark Lee, DVM, DACVR

Emergency
Christian Robison, DVM
Kim Delkener, DVM
Mark Saphir, DVM
Jessica Kurek, DVM
Sara Heidelberger, DVM

Behavior
Jan Brennan, DVM (practice limited to behavior)

About Our Hospitals

Pacific Veterinary Specialists was founded to provide high quality, specialized medical care to companion animal patients. Our practice is dedicated to serving the veterinary community as a partner in total patient care. We offer comprehensive specialized services including endoscopy, Doppler ultrasound, surgery, 24-hour ICU care, and emergency and critical care. Our staff is committed to providing compassionate and thorough medical care that meets the needs of the patient, client, and referring veterinarian. In September 2011 we opened PVSM and offer internal medicine, oncology, and cardiology Tuesday through Thursday in Monterey. Behavior consultations by appointment are available on Mondays.

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