



# Pacific Tide

An informational monthly newsletter

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## Author of the month:



## Colleen Brady, DVM, DACVECC

Dr. Brady received her undergraduate degree at UCSC, DVM at LSU and completed her internship and residency at the University of Pennsylvania. After remaining a year as clinical instructor, she left the snow and happily returned to Santa Cruz. Dr. Brady enjoys the fast pace of critical care and emergency medicine and especially enjoys the cooperative nature of practice shared between all the clinicians at PVSES. Her areas of interest are fluid and electrolyte physiology and her area of research currently is amanita toxicity.

## Acute Kidney Injury in Dogs of the Central Coast

An overview of some of our most common renal emergencies

### New Terminology

Acute Kidney Injury (AKI) vs. Acute Renal Failure (ARF). You have probably noticed that the term AKI is rapidly replacing ARF as the acronym of choice. This is happening in human and veterinary literature and reflects a need to better distinguish between acute injuries that impair kidney function vs. injuries that progress to permanent kidney failure. It is an important distinction as it emphasizes the need for early recognition, sometimes even before azotemia develops, which allows early intervention.

### Common causes of AKI

Common causes of AKI in dogs on the central coast include Leptospirosis, toxicities (ethylene glycol, diuretic overdose, raisins and grapes, some jerky treats, NSAIDs), neoplasia, and pyelonephritis. Addison's disease is included as it mimics AKI and can lead to renal failure if untreated. Post renal obstructive causes of AKI are not discussed in this newsletter.

Therapy for AKI is often complex and must be tailored to the individual patient but some common general guidelines apply to every case.

### Fluid therapy

Aggressive intravenous fluid therapy with a balanced electrolyte solution is the mainstay of treatment. Fluid therapy is often required for many days. Many dogs are polyuric and need very large volumes of fluids (3 to 6 mls/kg/hr or even higher). Vasculitis and hypoproteinemia are common in these patients and volume status has to be carefully monitored. Colloid therapy is very helpful in maintaining euvolemia without exacerbating peripheral edema.

Successful fluid therapy requires attentive monitoring.

1. Weigh patient (after urinating) every 8 to 12 hours.
2. Monitor urine output. A dog should be urinating within 6 hours of starting aggressive fluid therapy. If not, a urinary catheter should be placed immediately and evaluation for anuria/oliguria is indicated.
3. Check extremities for edema every 4 hours. Earliest location in dogs is often around the hock.
4. Electrolytes should be checked every 12 to 24 hours and supplemented as needed. Refractory hypokalemia often requires magnesium supplementation. Rising hyperkalemia requires more advanced intervention. Hyper- and hypocalcemia are common.
5. Although metabolic acidosis is typical and sometimes severe, it is rare to need to supplement Na Bicarbonate.

6. Oliguria/anuria require much more aggressive intervention and possible dialysis. Diuretic use in these patients can be very complex and requires hourly fine-tuning of fluids and dosing. These cases should be referred to a secondary or tertiary care hospital.

### Supportive Care

Supportive care for AKI includes blood pressure management, gastroprotectant therapy as GI bleeding is very common, anti-emetics, treatment of concurrent uveitis, oral care for ulcers, and nutrition. Evaluation for potential hyper- and hypocoagulation abnormalities is needed. Narcotic analgesics are often recommended for renal pain or discomfort associated with urinary catheters, central lines, etc.

### *Some notes about specific diseases:*

#### LEPTOSPIROSIS

Leptospirosis is a widespread zoonotic disease commonly seen on the central coast. This diagnosis should be considered in every dog that presents with acute kidney signs.

#### Diagnosis:

Clinical signs can include lethargy, anorexia, vomiting, fever, abdominal and/or renal pain, PU/PD, uveitis, icterus or diarrhea. Approximately 10-20% of dogs will have hepatic disease as well.

Clinicopathologic abnormalities may include anemia, leukocytosis, thrombocytopenia, azotemia, increased liver enzymes, hyperbilirubinemia and electrolyte abnormalities. Note that azotemia may not be present in the earliest stages of infection. However, decreased urine specific gravity or evidence of tubular dysfunction such as glucosuria or proteinuria can be detected early.

The two primary ways to diagnose leptospirosis are PCR testing of blood and urine and serology. PCR testing is more useful in the urgent care setting with some limitations. Samples must be obtained prior to any antibiotics. Test results are usually available within a day or two. A positive blood or urine PCR is confirmatory for Leptospirosis. But, a negative PCR in the face of high clinical suspicion for Leptospirosis is an indication for serology testing. Do not wait for test results before treating appropriately. Remember that unlike serology, vaccination does not cause a positive PCR test.

#### Treatment considerations:

1. See Fluid therapy and Supportive care sections above.
2. Doxycycline therapy for 3 weeks is the antibiotic of choice to treat leptospirosis. Intravenous doxycycline can be given with some safety precautions until it is tolerated orally. Pencillins are a second line choice. Most dogs will no longer shed spirochetes 24 to 36 hours after antibiotic therapy is started.
3. Many dogs will require 5 to 10 days of hospitalization and treatment as the polyuric phase of recovery requires large volumes of iv fluids. It is essential not to fall behind on fluids at this point as a second or third bout of dehydration can significantly compromise kidney recovery.
4. Staff should wear gloves when handling suspected leptospirosis patients or their urine for the first 48 hours after antibiotics are started. Zoonotic risks should be discussed with the patient's family.
5. Contracting Leptospirosis does not confer immunity to other strains.

#### ADDISON'S DISEASE

Addison's disease is called *the great mimicker* as dogs can present with a multitude of clinical signs. However, the most common presentation is the young to middle-aged dog with acute onset of vomiting, anorexia, marked dehydration and marked azotemia with hyperkalemia. Other hints that point towards Addison's disease include ionized hypercalcemia, lack of stress leukogram, history of skin infections or GI disease.

These patients require large volumes of iv fluids. Corticosteroid replacement should not wait for ACTH stimulation test results. Dexamethasone SP can be given at 0.25mg/kg iv at the same time as the test is done. This is a sufficiently high dose of steroid and it is very rare that higher doses would be indicated. If hyperkalemia is not resolving quickly in these patients, fluid therapy is not adequate. In general, mineralocorticoid supplementation should be started as soon as ACTH stimulation test results are available. If results are delayed or your patient is not responding to fluid therapy, do not withhold treatment. Monitoring at a 24 hour facility is recommended.

## PYELONEPHRITIS

Successful acute treatment of this disease requires vigilant monitoring of fluid balance. Kidney tubules plug easily with cellular debris in this situation and decreased urine output may be the first sign in a hospitalized patient. Mannitol therapy can be used to “flush out tubules” but must be timed to occur in an optimally volume-expanded and hydrated patient. Bolus doses or CRIs can be used in conjunction with loop diuretics if needed. Adequate duration of correct antibiotic therapy is essential and obtaining serial negative urine cultures may be needed to ensure this.

## DIURETIC INDUCED AKI

This is a more common scenario when small dogs with congestive heart failure are exuberantly overtreated with furosemide for acute dyspnea. Compromised renal perfusion and the widespread use of ace inhibitors can make these patients more vulnerable to diuretic induced AKI. There is no one set of guidelines for each CHF patient but most dogs do not require multiple doses of 4mg/kg or more of furosemide to improve pulmonary edema. Again, patient monitoring is essential here and your therapy will be influenced by the patient's ability to drink and the frequency of urination as well as severity of dyspnea.

Managing AKI in a patient with CHF requires creativity in fluid treatment. Use of water CRIs through feeding tubes can be very helpful in animals too weak or reluctant to drink. In our more severely affected patients, concurrent parenteral diuretic therapy and water administration through a feeding tube is sometimes used.

## Toxins and Kidney Injury

### 1. NSAIDS (Note that flunixin is not recommended for dogs).

Overdose of NSAIDs requires immediate intervention. Acute ingestion should be treated with induction of emesis and activated charcoal. Depending on dose or concurrent risk factors of the individual patient, gastroprotectant therapy and iv fluid diuresis should be instituted. Misoprostol may be indicated. IV fluid therapy is ideally continued for 48 hours and often longer. If renal values are increasing, diuresis should be continued. It can take several months before creatinine returns to normal and subcutaneous fluid therapy at home is usually indicated.

When treatment is delayed, hemodialysis is the gold standard of therapeutics. If this is not an option, intensive fluid therapy with acid-base management may be needed for many days. Prognosis is guarded for these patients.

### 2. ETHYLENE GLYCOL(EG)

Although less common on the California coast, these cases do occur. Severe hypocalcemia and metabolic acidosis are indications to evaluate for this. Hemodialysis is the gold standard of treatment. Early intervention can be successful with use of 4MP product.

### 3. RAISINS, GRAPES AND CURRANTS

The toxic agent behind this insult is unknown although does seem to be the flesh of the fruit rather than the seed. Tentatively suggested toxic amounts include Grapes: 0.7 oz/kg and Raisins 0.11 oz/kg, although any amount should be considered risky until the toxic principle is identified. This is roughly 6 grapes or 60 raisins per kg. In general, dogs will start to show vomiting and anorexia within 12 to 24 hours if toxicity is significant and creatinine and Phosphorus will rise within 24 hours.

### 4. CHICKEN JERKY TREATS FROM CHINA

The FDA released another warning on November 18, 2011 regarding chicken jerky treats from China and development of Fanconi-like syndrome in dogs. Potential exposure should be asked of every client. Glucosuria is an early sign indicating possible exposure. Prognosis for this toxicity is guarded although most dogs survive with supportive care.

5. Amanita toxicity can cause AKI as well as acute hepatic failure. This will be the topic of another newsletter.

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## About Our Organization

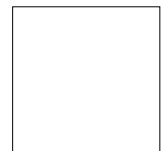
PVSES was founded to provide high quality, specialized medical care to companion animal patients. Our practice is dedicated to serving the veterinary community as a partner in total patient

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.

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