

# Hemodialysis

## What is hemodialysis?

Hemodialysis is a method of blood purification that removes blood from the body through a catheter and filters it through a dialyzer (artificial kidney). Hemodialysis is used to purify the blood by eliminating toxic metabolites, balancing electrolytes, and removing excess water that builds up when the kidneys are unable to excrete it.

This is most commonly performed in the acute setting (acute kidney injury) for animals but may also be elected for patients with chronic kidney dysfunction.

While acute kidney injury is the most common reason for performing hemodialysis, it can also be used to treat acute intoxications to enhance elimination of a toxin.

## Indications for Hemodialysis

### Acute Kidney Injury

This is the most common indication for hemodialysis. This procedure should be considered when clinical uremia, hyperkalemia, acid/base disturbances, and fluid overload cannot be managed with conventional medical therapy. The best time to start hemodialysis is still unknown (even in human medicine), but starting treatment sooner means fewer side effects from uremia. Thus, hemodialysis should be considered sooner rather than later.

When hemodialysis is performed, pet owners should be prepared both emotionally and financially for at least

10-14 days of hospitalization and treatment. With acute kidney injury, the kidneys typically start to regain some function within this time period, but a lack of response does not mean the kidneys will never recover.

There are instances when it may take up to four weeks to become dialysis independent. Patients are generally transitioned after the 10-14 days to outpatient treatments to continue to provide time for the kidneys to recover. Outpatient treatments allow families to play an active role in facilitating recovery.

#### What are the indications for hemodialysis in patients with acute kidney injury?

- **Oliguria/anuria:** low urine output in combination with an increase in body weight
- **Fluid overload:** plays a large role in patient morbidity, mortality and cost of treatment
- **Elevated potassium:** high potassium concentrations can lead to cardiac arrhythmias
- **Acidemia:** hemodialysis is able to correct acid/base disturbances much more safely than the administration of sodium bicarbonate
- **Azotemia:** there are no defined cutoffs for BUN and creatinine concentrations to start hemodialysis; each case is evaluated on an individual basis. A good indication to start treatment is if azotemia is not improving with medical therapy.

#### How many hemodialysis treatments are necessary?

Patients in the early stages of disease are typically treated every 24 hours. These treatments are then extended to every 72 hours until improvement in kidney function is observed (via serial creatinine measurements). The average number of treatments for acute kidney injury is four to six, but could be more, depending on kidney function. As mentioned previously, there is generally improvement in kidney function within the first 10-14 days, but hemodialysis may be necessary for up to four weeks in some cases.

#### What to expect as an owner with a patient receiving hemodialysis?

Owners should expect a financial and emotional investment for up to two weeks in the hospital. These two weeks of treatment will provide a clearer picture of the kidneys' ability to recover function. Depending on the patient's condition and response, some animals can be treated on an outpatient basis, requiring visits every 48-72 hours for treatment.



## Hemodialysis - continued

### Chronic kidney disease

Hemodialysis can be performed on patients with end-stage renal disease that is refractory to medical therapy. The treatment goals are different than with acute kidney injury. The goal is to provide the patient with improved quality of life. This is accomplished by performing treatments three times per week. Chronic dialysis is feasible, but it takes a financial and emotional investment from owners to maintain quality of life. The Veterinary Medical Center (VMC) can provide chronic dialysis under limited circumstances.

### Non-renal extracorporeal therapies

#### Immune-mediated diseases

Diseases in which the body's immune system is attacking itself are treated with therapeutic plasma exchange (TPE). During TPE, the pathologic antibodies and immune complexes that form are removed with the patient's plasma. The machine that is used separates the plasma from the patient's red blood cells and discards the "dirty" plasma. The red blood cells are returned, along with healthy donor plasma.

Typical immune mediated diseases that can be treated are immune-mediated hemolytic anemia (IMHA), immune-mediated thrombocytopenia (ITP), myasthenia gravis, glomerulonephritis (Lyme nephritis), and polyradiculoneuritis (Coonhound paralysis). This treatment allows for rapid elimination of antibodies, allowing time for immunosuppressive medications to take effect. This treatment is successful in cases refractory to medical management, with response rates around 80-90 percent in patients with IMHA.

### Intoxications

Hemodialysis is one modality used to remove toxins that are small in size and unbound to protein in the blood. Other modalities, such as charcoal hemoperfusion and TPE, can be utilized in patients that ingest toxins that are larger in size and highly protein bound. These patients will typically receive one treatment to help increase the elimination of the toxin. These therapies have been used to treat a number of intoxications including:

- Non-steroidal anti-inflammatory drugs (NSAIDs); the most common toxin removed
- Alcohol
- Caffeine
- Phenobarbital
- Ethylene glycol (antifreeze)
- Baclofen
- Chemotherapeutic overdoses

When exposure to a large intoxication is documented or suspected, please contact the VMC Dialysis Service to determine if extracorporeal therapies are indicated, to prevent the manifestation of the toxin exposure.

It should be noted that various veterinary poison hotlines are not aware of the benefits of hemodialysis for the treatment of toxin exposure. Consultation with the Dialysis Service may provide additional treatment options.

### General Referral Guidelines

- Consult the VMC Dialysis Service soon after diagnosis and/or early in the course of disease. Early consultation after review of patient's history, blood work and clinical condition will allow for assessment of the patient's candidacy, as well as provide general prognosis and complications.
- Avoid using the jugular veins in any potential candidate for hemodialysis. Due to the size of our patients, the jugular veins are used for vascular access and should be protected.

*Cathy Langston, DVM, DACVIM (SAIM) and Dan Gordon, DVM, DACVECC are available 24 hours a day, 7 days a week to speak with referring veterinarians.*

*To discuss any potential case, please reach out to the VMC Dialysis Service at **614-292-3551**.*

