July 13, 2010

The Animal Medical Center has created this e-mail publication to keep you informed about the latest practices in veterinary medicine and how these practices are being applied at The AMC. If you are interested in obtaining past issues of “Pearls for the Practitioner” or if you would like to be removed from this mailing list, please e-mail allison.younger@amcny.org.

BENJAMIN!!!
Benjamin is a 6 year old male castrated Golden Retriever who decided one day to eat his sister’s entire phenobarbital prescription. All in all, Benjamin ingested over 100 mg/kg of phenobarbital! By the time his owner came home and discovered the scene of the crime, he had become very lethargic and weak. He was hospitalized at his local veterinary hospital where emesis was induced and activated charcoal administered. Unfortunately the majority of the phenobarbital had already been absorbed into his blood stream, and Benjamin was in a drug-induced coma. He could barely breathe on his own by the next day.

He was transferred to the Animal Medical Center for hemodialysis, along with charcoal perfusion, because phenobarbital can be removed from the body by dialysis. Within 30 minutes of starting dialysis, Benjamin was breathing better. By one hour, he was awake and raising his head. After 3 hours of dialysis, he had become a typical Golden Retriever: trying to get into the garbage! His phenobarbital level prior to dialysis was 160 ug/ml (therapeutic range: 15-45 ug/ml), and after 5 hours of dialysis the level was down to 25 ug/ml. After 24 hours of hospitalization, Benjamin was able to return home!

DISCUSSION
Dogs and cats can be exposed to a number of toxins, and the method of addressing a specific toxicity depends on a variety of factors. General principles include gastric decontamination (including inducing vomiting and oral administration of activated charcoal), increasing elimination (IV fluids, altering metabolism), and specific antidotes when available. Other available options include direct removal of the toxin when possible.

Hemodialysis is an extracorporeal therapy traditionally used to treat acute renal failure and chronic kidney disease patients. The main principle behind dialysis is that blood is removed continuously from the patient during the treatment, passes through a filter (the dialyzer)
which removes unwanted substances (uremic toxins), and certain substances can be added to
the blood (via the dialysate, such as bicarbonate) before returning the blood to the patient.
The continual replenishment of fresh dialysate (i.e. toxin-free) ensures a constant diffusion
gradient for the passage of unwanted substances from the blood to the dialysate via the
dialyzer (high gradient to low gradient). Many substances can be removed by dialysis,
including medications such as phenobarbital, and household substances such as ethanol
(alcohol) or caffeine. Ethylene glycol (antifreeze) can be readily removed from a patient and
renal failure averted if dialysis therapy is begun early enough after ingestion (within 6 hours).
Small molecules, especially those less than 500 daltons, but up to 1500 daltons or more, are
small enough to fit through the pores of the dialyzer membrane.

Charcoal hemoperfusion is a method of passing the blood over a substance (activated
charcoal) that binds toxins and removes them from the blood. Charcoal hemoperfusion can
be used to remove substances that are less effectively removed by dialysis, such as certain
antibiotics, non-steroidal anti-inflammatory drugs, some chemotherapeutic drugs, amatoxins
(poisonous mushrooms), and others. Charcoal perfusion therapy is sometimes combined to
standard hemodialysis to remove a greater fraction of a toxin.

Not all toxicities can be treated with these techniques, but they add to our abilities to
address toxicities for which there is no antidote. These therapies are reserved for cases that
are severe in which traditional management has failed. While hemodialysis can be performed
on dogs and cats, charcoal hemoperfusion is generally limited to medium to large dogs
because of the amount of blood that is required to be outside the body at a time.

In conclusion, hemodialysis and charcoal hemoperfusion can be used to rapidly remove many
toxins from the blood.[1-4] In Benjamin's case, it saved him from a much longer
hospitalization (and higher cost!), as well as potential complications from being in a drug-
induced coma such as aspiration pneumonia and even death.

The Dialysis Team of the Nephrology Service at The Animal Medical Center is available 7
days a week, 24 hours a day for emergencies. Veterinarians can reach us anytime at 212-
838-8100. Non-urgent inquiries or questions can also be addressed via email:
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To reach a Referral Coordinator, please call 212.329.8758/8890.
SUGGESTED READING


