

SAVING PETS' LIVES, 24 HOURS A DAY, 7 DAYS A WEEK
PET POISON HELPLINE




**Beyond crystalloids:
 Advanced fluid therapy for the poisoned patient**

April 24, 2018

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 Pet Poison Helpline
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www.petpoisonhelpline.com | 3800 American Blvd. W. #725 Bloomington, MN 55431 | Pet Poison Helpline ©2018



PET POISON HELPLINE
 800.213.6680
 www.petpoisonhelpline.com

What is Pet Poison Helpline?

- **24/7 animal poison control center**
- **Veterinary & human expertise**
 - 20 DVMs, 50 CVTs
 - DABVT, DABT
 - DACVECC
 - DACVIM
 - 7 PharmDs
- **Case fee of \$59 includes**
 - Unlimited consultation
 - Fax or email of case report
- **Educational center**
 - Free webinars (archived)
 - Tox tools
 - Wheel of Vomit
 - Pot of Poisons (toxic plants)
 - Textbook
 - iPhone app
 - Newsletters for vet professionals
 - Free resources for clinics
 - Videos
 - Electronic material
 - Clings

Email us for info!

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**Pet Poison Helpline® and
 Nationwide®**




ONE NATION
 COMING TOGETHER
 CULTURE
 BELONGS

Nationwide® & PET POISON HELPLINE® working together

- > Shared mission in highlighting the importance of preparing for accidents and poisonings in small animals
- > Addressing the cost of veterinary care Nationwide® covers the \$59 Pet Poison Helpline® fee when an insured pet is brought in to your hospital for care
- > Enabling best medicine
Pet owners with Nationwide® spend twice as much on their pets than those without pet insurance



Pet Insurance

With more than 35 years of experience protecting pets, there's nothing we haven't seen...

<p>Accidents & Injuries</p> <ul style="list-style-type: none"> ✔ Poisonings ✔ Sprains ✔ ACL ruptures <p>Common illnesses</p> <ul style="list-style-type: none"> ✔ Ear infections ✔ Vomiting ✔ Diarrhea <p>Serious illnesses</p> <ul style="list-style-type: none"> ✔ Cancer ✔ Heart disease ✔ Diabetes 	<p>Chronic illnesses</p> <ul style="list-style-type: none"> ✔ Allergies ✔ Arthritis ✔ Skin conditions <p>Hereditary conditions</p> <ul style="list-style-type: none"> ✔ Hip dysplasia ✔ Eye disorders ✔ Blood disorders <p>Testing & diagnostics</p> <ul style="list-style-type: none"> ✔ X-rays, MRIs, CT scans ✔ Ultrasounds ✔ Blood tests 	<p>Procedures</p> <ul style="list-style-type: none"> ✔ Surgeries ✔ Endoscopies ✔ Chemotherapy <p>Holistic & alternative</p> <ul style="list-style-type: none"> ✔ Acupuncture ✔ Chiropractic ✔ Laser therapy <p>Wellness</p> <ul style="list-style-type: none"> ✔ Vaccinations ✔ Flea/heartworm ✔ Spay/neuter
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Available plans

<p>whole pet™ with wellness & ER Best for all veterinary bills</p> <ul style="list-style-type: none"> • Accidents & Injuries • Hereditary & congenital • Cancer • Use any vet • Specialty & ER coverage included • Dental diseases • Eye, musculoskeletal & blood disorders • Behavioral treatments • 50 therapeutic diets & supplements • Alternative & holistic treatments • Wellness <p>\$250 annual deductible unlimited annual maximum</p> <p>\$67.70/mo.*</p> <p>View coverage details</p>	<p>major medical™ Best coverage for accidents, illnesses & hereditary conditions</p> <ul style="list-style-type: none"> • All health incidents • Accidents & Injuries • Limited hereditary coverage • Cancer • Use any vet • Specialty & ER coverage included <p>\$250 annual deductible unlimited annual maximum</p> <p>\$34.25/mo.*</p> <p>View coverage details</p>	<p>wellness basic™ Coverage for shots, flea control & more</p> <ul style="list-style-type: none"> • Diets, shots, flea, testing • No deductibles • Use any vet <p>AKA ER, more coverage</p> <p>\$400 annual maximum</p> <p>\$17.75/mo.*</p> <p>View coverage details</p>
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Speaker Introduction





Katie Peterson, DVM, DACVECC
Emergency and Critical Care Specialist
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Outline



- Hypertonic fluids
- Synthetic colloids
- Blood products



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Hypertonic fluids



- Hyperosmolar solutions that shift fluid from intracellular compartment to intravascular compartment
 - Mannitol
 - Hypertonic saline



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Hypertonic fluids in toxicology


- Treatment of cerebral edema
 - Bromethalin
 - Chronic hypernatremia corrected too quickly
 - Acute hyponatremia
 - Secondary causes
 - Prolonged seizures
 - Hepatic failure
 - Cardiac arrest
- Acute renal failure
- Fluid resuscitation

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Cerebral edema

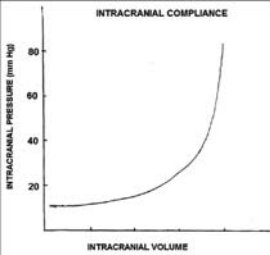

- Excessive fluid accumulation within the brain
 - Intracellular
 - Extracellular
 - CSF
 - Blood
- Edema in brain vs other tissues
 - Vital organ
 - Enclosed space
 - Limited regeneration



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Intracranial pressure



- Pressure inside the skull
 - Tissue
 - Fluids
- Normal 5-12mmHg
- Intracranial hypertension > 20mmHg (humans)
- Cerebral perfusion pressure (CPP) – maintains blood flow
- CPP = MAP-ICP

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Clinical signs of cerebral edema



- Decreased level of consciousness
 - Obtunded (depressed)
 - Stuperous (semicomatose)
 - Comatose
- Muscle tremors
- Seizures
- Brainstem reflexes
 - Pupil size and responsiveness
 - Eye position, nystagmus, oculovestibular
- Changes to respiration
- Motor responses
- Abnormal body postures
- Cushing Response



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Diagnosis


- History/toxin exposure
- Physical exam findings
- Imaging: MRI/CT
- EEG
- Invasive/direct monitoring




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Treatment


- Prevention of secondary brain injury
 - Oxygen
 - Ventilation (CO₂ between 30-35mmHg)
 - BP (MAP > 60mmHg, SAP > 90 < 180 mmHg)
 - Address clinical signs
- Head/upper body elevation
- Prevent jugular compression
- Reduce cerebral edema




 **Mannitol**


- Sugar alcohol, osmotic diuretic
- Not biologically active
- Dosage 0.5-1.5 g/kg IV over 5-20 min
- Seems like a large volume
 - 30kg, 1g/kg of 200mg/ml = 150 ml
- Administered through a filter
- Discontinue fluids during and 20 min after therapy



 **Mannitol**


- Immediate effect
 - Within minutes
 - Volume expansion
 - Reduced blood viscosity
 - Increased blood flow and oxygen delivery
- Delayed effect
 - 15-30 min post-administration
 - Osmotic effect
 - Persists for several hours




 **Mannitol**


Side effects:


- Free water loss/hypovolemia/dehydration
- Hyponatremia
- Fluid overload/heart failure
- Accumulation in the brain parenchyma




 **Hypertonic saline**


- Saline solution with higher than physiologic concentration of NaCl
 - 3%-7% common (up to 23.4%)
- Osmotic movement of free water
- Dose 3-5 ml/kg over 5-10 min
 - Not to exceed 1 ml/kg/min
- Shown to be as effective as mannitol
- Good for hypotension and hypovolemia



 **Hypertonic saline**


- Improves cerebral blood flow
 - Improves rheology/viscosity
 - Reduces endothelial swelling
- Decreases excitatory neurotransmitter activity
- Improves myocardial function
- Immunomodulatory
 - Neuts, lymphs and cytokines



 **Hypertonic saline**

Side effects:


- Hyponatremia
- Interstitial volume depletion/dehydration
- Fluid overload/heart failure
- Vasodilation
- Renal failure (people)



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Acute renal failure: mannitol


- Freely filtered by glomerulus
 - Not reabsorbed in renal tubule
- Osmotic diuresis
- Increased tubular flow rate
- Decreased serum urea
 - Reduced tubular reabsorption
 - Increased urea clearance



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Acute renal failure: mannitol


- Decreased renal vascular resistance
- Reduces cellular swelling
- Decreased RBC aggregation/improved rheology
- Free radical scavenger




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Acute renal failure: mannitol

- Tubular swelling and obstruction
- May increase urine production
 - Anuria/oliguria to polyuria
 - Fluid balance
- Prognosis with response (?)






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Fluid resuscitation: hypertonic saline



- Small volume resuscitation 3-5 ml/kg
 - Osmotic shift of fluid
 - Increased ECF by 3-5X volume infused
- Redistributes within 30 min – short lived effect
- Combine with colloids (1:2 ratio)
- Follow up with crystalloids



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Fluid resuscitation: hypertonic saline


- Improves cardiac output
 - Volume
 - Positive inotropy
 - Vasodilation
 - Reduced endothelial swelling)
- Good for cerebral edema!




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Colloids




 **Synthetic colloids**


- Crystalloid fluids containing larger molecules
 - Remain in vessels longer
 - Improve oncotic pressure
 - Draw fluid into the vessel
- Characterized by molecular weight, branching, substitutions, C2:C6 ratio = affects half life
- Hetastarch
- Vetstarch (tetrastarch)




 **Synthetic colloid uses**

- Shock-volume resuscitation
- Hypoalbuminemia
- Increased vascular permeability
- Dose
 - 3-5 ml/kg bolus over 5-15 min, repeat up to 20 ml/kg
 - CRI 20 ml/kg/day
- Clinical effect
 - Large increase in blood volume
 - Maintains up to 4 hours



 **Synthetic colloids: controversy**

- Coagulopathy
 - Decreased platelet function
 - Hemodilution
 - Effect on coag proteins
- Fluid overload
- Acute kidney injury?
- Increased mortality?



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Blood products




Nationwide

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pRBC transfusion

Toxin indications

- Anticoagulant rodenticides
- Bone marrow toxicity
 - Estrogen
 - Chemotherapeutics



Nationwide

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pRBC transfusion

<ul style="list-style-type: none"> • methHgb causes <ul style="list-style-type: none"> – Acetaminophen – Chlorates (fireworks, matches) – Local anesthetics – Methionine – Mothballs – Onions/garlic – Phosphides 	<ul style="list-style-type: none"> • Heinz body anemia <ul style="list-style-type: none"> – Acetaminophen – Onions/garlic – Zinc toxicity – Local anesthetics – Methionine – Mothballs – Propylene glycol – Pine oil
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Nationwide

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pRBC transfusion


Patient factors

- Pale gums, prolonged CRT
- Tachycardia
- Hypotension
- Tachypnea
- Weakness/lethargy
- Collapse
- On-going hemorrhage
- > 20% blood loss

Blood work factors

- Anemia <20% (Hgb 7)
- Elevated lactate
- Metabolic acidosis







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Canine blood types

- > 12 DEA blood groups
- Similar to people (Rh), either + or -
- DEA 1, 3, 4, 7 can be typed
- Dal
- Universal donor DEA 1 negative





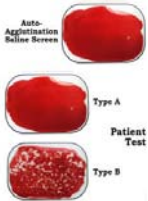
<http://www.alvetia.com/quick-test-blood-typing.html>
<http://www.rapidvet.com/canine.html>





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Feline blood types

- Type A
- Type B
- Type AB
- Mik




• No universal donor due to naturally occurring alloantibodies

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Pretransfusion testing


- PCV, CBC +/- path review
- Blood typing
- Crossmatch
 - Cats
 - Antibodies to other antigens (mik, dal, WBC)
 - Previous transfusions > 3 days
 - Major crossmatch
 - Minor crossmatch



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pRBC administration calculations

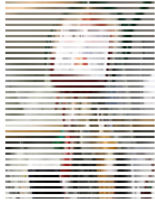

- Formula 1: $mL = 90 mL \times BW (kg) \times [(desired\ PCV - Patient\ PCV) / PCV\ of\ donor\ blood]$
- Formula 2: $mL = 1.5 mL \times \% PCV\ rise \times BW (kg)$
- 10-20 ml/kg



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pRBC administration

- Bolus if needed
- Typically < 4 hours
 - Start at slow rate
 - Increase if vitals remain normal
- Give through a filter
- Does not need to be warmed
- Drip vs fluid pump vs syringe pump
- Recheck PCV 1-2 hours after transfusion





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Plasma transfusion

Toxic indications


- Anticoagulants
 - Long acting anticoagulants
 - Warfarin
 - Novel anticoagulants
- Pit viper toxicity
- Liver failure from: xylitol, sago palm, NSAIDs, acetaminophen, mushrooms, blue-green algae
- Heparin overdose




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Plasma transfusion

- Blood work factors
 - Prolonged PT/PTT
 - Prolonged ACT
 - Hypocoagulable TEG
- Patient factors
 - Evidence of hemorrhage






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Plasma transfusion types

Fresh frozen plasma

- Provides: plasma, albumin, clotting factors and alpha-macroglobulins
- <1 year frozen at -20°C or below, separated within 8 hrs
- Dose 10-20 ml/kg dogs, 6-12 mg/kg cats
- Dose for albumin: 45 ml/kg increases albumin by 1 g/dl




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Plasma transfusion types

Frozen plasma


- Provides: plasma, albumin, stable coagulation factors
- Separated > 6-8 hours from whole blood
- Storage: 1-5 years frozen at -20C
- Great for warfarin or long acting anticoagulant rodenticide toxicity



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Whole blood

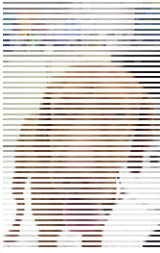

- Red blood cells and plasma
- Platelets if < 8 hours
- Good for:
 - LAAC blood loss
 - Anemia with coagulopathy/DIC
 - Lack of blood bank
- Risk for volume overload
- Higher risk for reaction



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Transfusion reactions


- Fever
- Vomiting
- Urticaria, pruritis, hives facial swelling
- Hemolysis
- Volume overload (TACO)
- Tachycardia or bradycardia, hypotension
- Anaphylaxis
- Infection
- Immune suppression
- Thrombocytopenia
- Transfusion associated lung injury (TRALI)
- Hypocalcemia (citrate toxicity)

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Transfusion reactions


- Close monitoring
- Start slow
- Pre-treatment (?)
- Check blood product
- Consider cross match
- Treatment
 - Slower rate
 - Diphenhydramine (?)
 - Steroids
 - Antiemetic
 - Stop transfusion
 - Epinephrine



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Questions?





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Pot of Poisons
Pet Dangers in the Garden

Preventing Pet Poisoning Emergencies

TOP 10 DOG TOXINS

1. Chocolate
2. Xylitol & All products containing Xylitol
3. Antifreeze
4. Rodenticides
5. Grapes & Raisins
6. Medications
7. Vitamin D
8. Vitamin E
9. Marijuana
10. Household Cleaners

TOP 10 CAT TOXINS

1. Lilies
2. Xylitol
3. Grapes & Raisins
4. Antifreeze
5. Marijuana
6. Household Cleaners
7. Medications
8. Vitamin D
9. Vitamin E
10. Household Cleaners

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- Carefully organized for ease of use in an emergency, with important toxicants arranged alphabetically within categories
- Details clinically relevant information on the most common toxicants encountered by small animals
- Presents a wealth of color photographs to aid in plant identification
- Includes 14 new topics to this edition covering cyclosporine A, sleep aids, tacrolimus, bath salts, synthetic marijuana, poisonous lizards, imidacloprid, spring bulbs, and sodium monofluoroacetate

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- Questions? Need more info? Visit our careers page at petpoisonhelpline.com/veterinarians/job-opportunities or email careers@safetycall.com.

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2018 CE Schedule

Free, RACE-Approved Webinars

FEBRUARY 13, 2018 - Renee Schmid, DVM
Approaching Poisonings Correctly, Right from the Start!


APRIL 24, 2018 - Katherine Peterson, DVM, DACVECC
Beyond Crystalloids: Advanced Fluid Therapy for the Poisoned Patient

JUNE 5, 2018 - Susan Holland, DVM
Gardening Perils Beyond Plants: Fertilizers, Herbicides and Lawn Insecticides

SEPTEMBER 25, 2018 - Ahna Brutlag, DVM, MS, DABT, DABVT
Pot & Pets: Updates on Marijuana Intoxication in Dogs and Cats

NOVEMBER 6, 2018 - Heather Handley, DVM
Managing Particulars of Feline Poisonings





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Thank you for attending!

[CE credit FAQs](#)

1. **When will I get my CE certificate?** We'll email it to you by the end of the day tomorrow.
2. **I attended the webinar but wasn't the person who logged in. Can I still get interactive CE credit?** Yes. Send your name and email address to info@petpoisonhelpline.com by **1pm central time on April 25, 2018** (strict deadline).
3. **Can I watch the recorded webinar online for CE credit?** Yes. You can receive non-interactive CE credit. Go to the "For Vets" page on our website, www.petpoisonhelpline.com for more info.

Comments? Questions? Email us! info@petpoisonhelpline.com

