

Practical Hematology Transfusion

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Practical Hematology

1. Determining the cause of anemia
2. Treating regenerative anemias
 - Blood loss
 - Hemolysis
3. Treating non-regenerative anemias
4. **Blood & plasma transfusions in general practice**
5. Determining the causing of coagulopathies
6. Treating coagulopathies in general practice
7. Finding the source of leukocytosis
8. Bone marrow sampling

Blood Units

1 canine U = amount of product collected from 450 ml whole canine blood

- **1 U whole blood** = 450 ml blood + 63 ml anticoagulant
- **1 U plasma** = 200-250 ml
- **1 U packed cells** = 200-250 ml
- **1 U cryoprecipitate** = 60-70 ml
- **1 U cryo-poor plasma** = about 100 ml
- **1U platelet rich plasma** = 200-250 ml

1 feline U = product collected from 50-60 ml whole feline blood

- **1 U whole blood** = 50-60 ml + 5-9 ml of anticoagulant
- **1 U plasma or packed cells** = 20-30 ml

Cat Blood Types

- 3 types in the AB group – A, B and AB
- Three alleles involved – A, a and b
 - AA, Ab, Aa, aa – Type A blood
 - bb - Type B blood
 - ab – Type AB blood
- In-practice typing cards are available
- Autoagglutinating blood will give a false AB blood type
 - Saline washing at a reference can give the true blood type
- Purebred Siamese are all Type A
- Turkish Van & Angora are 50:50 A and B

Cat Blood Types

- Type B cats have strong naturally occurring type A antibodies
- **Never give Type B blood to a Type A or Type AB cat**
 - <1 ml can cause acute death
- All feline blood donors should be Type A or Type AB
- Type all purebred cats prior to transfusion
 - Can offer as a wellness service to owners of purebred cats
- NI (neonatal isoerythrolysis) occurs when a type B queen gives birth to A or AB kittens
 - Queen is bb – Type B
 - Tom is aa, Aa, AA or ab – Type A or AB
 - All kittens are affected if Tom Type A
 - 50% affected if Tom is Type AB
 - Problems begin when kittens nurse

Dog Blood Types

- More than a dozen blood group systems in dogs
- Most important is DEA 1.1 – two blood types
 - DEA 1.1 positive
 - DEA 1.1 negative
- In-practice typing cards are available
- Autoagglutinating blood will give a false DEA 1.1 positive results
 - Saline washing at a reference can give the true blood type
- **Don't give positive blood to a negative dog the second time**
- Canine donors should be negative
- NI not a problem in dogs unless a negative bitch has been previously transfused with positive blood

Guidelines for Transfusion

Fresh Whole blood

- Premedicate with diphenhydramine 0.5-1 mg/lb IM 30 minutes prior
- 5-10 ml/lb/day
- Ideally over 2 hours or longer
- Monitor temp and RR every 10 minutes for 30 minutes, then every 30 minutes
- Stop or slow transfusion and consider dexamethasone if vomiting, tachypnea or weakness

Guidelines for Transfusion

Packed Red Cells

- Premedicate with diphenhydramine 0.5-1 mg/lb IM 30 minutes prior
- 3-5 ml/lb every 12-24 hours
- Ideally over 2 hours or longer
- Can add saline to packed cells to decrease viscosity and improve flow, if extra volume will be tolerated
- Monitor temp and RR every 10 minutes for 30 minutes, then every 30 minutes
- Stop or slow transfusion and consider dexamethasone if vomiting, tachypnea or weakness
- Once collected, packed cells or whole blood must be used within 30 days

Guidelines for Transfusion

Oxyglobin – Hb substitute

- Purified bovine hemoglobin in LRS
- Premedicate with diphenhydramine 0.5-1 mg/lb IM 30 minutes prior
- 3-5 ml/kg added to fluids running at 0.5-2ml/lb/hr
- Or 10 ml/kg/hr for up to 3 hours
- Maximum 30 ml/kg/day
- Watch for volume overload (especially cats)
 - Stop oxyglobin if tachypnea
- Use with care in animals with coagulopathy

Guidelines for Transfusion

Oxyglobin – Hb substitute

- Causes purple coloration of mucous membranes and urine
 - Affects colorimetric blood tests
 - Bilirubin
 - Liver enzymes
 - Creatinine
 - Glucose
 - Urine dipstick
 - Pulse ox still works fine
- Monitor by assessing Hb in RBC and plasma
 - iSTAT won't work
 - HemaVet & LaserCyte will work

Guidelines for Transfusion

Fresh Frozen Plasma

- 3-5 ml/kg every 8-12 hours
- Centrifuged within 6 hours for FFP
 - Otherwise "frozen plasma"
 - FFP better than FP for coag factors
- Once frozen, coag factors are stable for one year
- Albumin is stable for more than 5 years
- No data on how refreezing affects plasma

Guidelines for Transfusion

Fresh Frozen Plasma

- Not a good source of albumin
 - 45 ml/kg needed to increase albumin 1 g/dl
 - Try hetastarch instead
- Failure of passive transfer in puppies and kittens
 - 50 ml/kg SC or IP x 3 days
 - FFP or FP equally effective

Guidelines for Transfusion

Platelet Rich Plasma

- 3-5 ml/kg every 8-12 hours

Frozen platelet concentrate

- Platelets in DMSO and plasma
- Collected by plasmapheresis
- 1 U/10 kg every 8-12 hours
- Used for IMT
- DMSO can cause bradycardia – slow rate
- 1 dose increases platelets 20,000/ul for 24 hours

Guidelines for Transfusion

Cryoprecipitate

- Factors 8, 13, vWF and fibrinogen
- 1 U/10 kg every 6-12 hours
- Once frozen, should be used within 1 year

Cryo-Poor Plasma

- What remains after cryoprecipitate is removed
- Good for rodenticide intoxication
 - Contains factors 2, 7, 9 and 10
- 3-5 ml/kg every 8-12 hours

Guidelines for Transfusion

Human Immunoglobulin

- 1 unit produced from plasma of 1,000 donors
- Very expensive
- Has been used to treat IMHA and IMT in dogs
- Overwhelming the RBC and platelets with blocking antibodies decreases extravascular hemolysis
- Human IgG may also neutralize anti-RBC and anti-platelet antibodies
- Second infusion could theoretically produce severe anaphylaxis
- 0.5-1 g/kg IV over 6-8 hours

When to Transfuse

- **There is no set HCT/PCV or Hb**
 - If HCT <12% in dog or <10% in cat, transfuse
 - But many times you still need to transfuse at higher HCT/PCV
- **Transfuse if clinical signs from anemia**
 - Weakness
 - Tachycardia
 - Tachypnea
 - Collapse
- **Or if preparing for surgery**
 - Dogs PCV <25
 - Cats PCV <20
 - Increased risk of perioperative hemorrhage due to coagulopathy

When to Transfuse

- **Transfuse sooner if**
 - Evidence of bone marrow disease or lack of marrow response
 - Simultaneous cardiopulmonary disease
 - Blood loss or hemolysis is rapid
- **More conservative with cat transfusions**
 - Increased rate of fatal reaction
 - Fewer symptoms with severe anemia
 - More susceptible to volume overload
- **Remember that with each successive transfusion, risk of reaction is higher and duration of efficacy is shorter**

Pre Transfusion Testing

- **First Cat Transfusion**
 - Typing recipient and donor should be sufficient
 - Donor should be A or AB
 - Don't give B blood to A or AB cat
- **Subsequent Cat Transfusions**
 - Cross-match is essential
- **First Dog transfusion**
 - No testing necessary
 - Donor DEA 1.1 negative
- **Subsequent Dog Transfusions**
 - Type recipient and donor
 - Don't give DEA1.1+ blood to (-) dog
 - Also cross match

Pre Transfusion Testing

- RapidVet-H Major crossmatch kits
- RapidVet-H Canine DEA 1.1 Type cards
- RapidVet-H Feline AB Type cards
- Purchase from:
 - www.animalbloodbank.com
 - www.evbb.com
- [Canine Typing Package Insert – with whole blood controls](#)
- [Canine Typing Package Insert – without whole blood controls](#)
- [Feline Typing Instructions](#)
- [Feline Typing Package Insert](#)
- [Major Cross-Match Instructions](#)