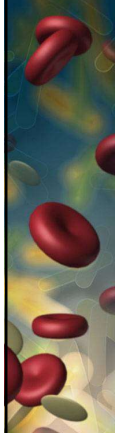


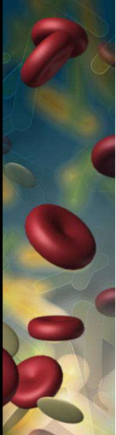
Cat Blood Types

- **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
 - Type A Tom - all kittens affected
 - Type AB Tom - 50% affected
 - Type B Tom – no problem
- Problems begin when kittens nurse



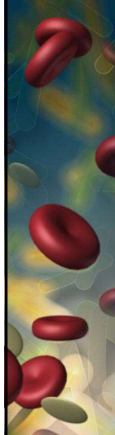
Dog Blood Types

- More than a dozen blood group systems in dogs
- Most important is DEA 1.1 – two blood types
 - DEA 1.1 positive (40% of dogs)
 - DEA 1.1 negative (60% of dogs)
- DEA 1.2 and 7 are of secondary importance to transfusion reaction
- In-practice typing cards are available for DEA 1.1
- Autoagglutinating blood will give a false DEA 1.1 positive results
 - Saline washing at a reference lab can give the true blood type



Dog Blood Types

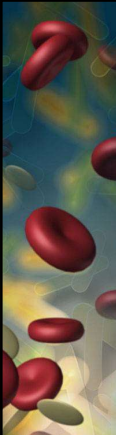
- **Don't give positive blood to a negative dog a second time**
 - No naturally occurring ant-1.1 antibodies
- Canine RBC donors should be DEA 1.1 negative
- All 2nd canine blood transfusions should be cross-matched
 - No type cards available for DEA 1.2, DEA 7 or others
- NI not a problem in dogs unless a negative bitch has been previously transfused with positive blood



Guidelines for Transfusion

Fresh Whole blood

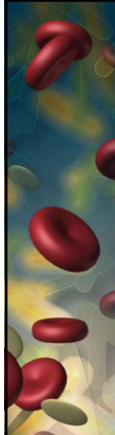
- Premedicate with diphenhydramine 0.5-1 mg/lb IM 30 minutes prior
- 5-10 ml/lb/day
- Ideally over 2 hours or longer
- Monitor temp and RR every 10 minutes for 30 minutes, then every 30 minutes
- Stop or slow transfusion and consider dexamethasone if vomiting, tachypnea or weakness



Guidelines for Transfusion

Packed Red Cells

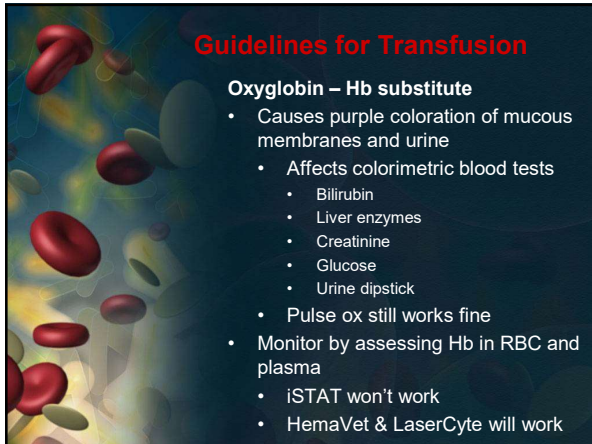
- Premedicate with diphenhydramine 0.5-1 mg/lb IM 30 minutes prior
- 3-5 ml/lb every 12-24 hours
- Ideally over 2 hours or longer
- Can add saline to packed cells to decrease viscosity and improve flow, if extra volume will be tolerated
- Monitor temp and RR every 10 minutes for 30 minutes, then every 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

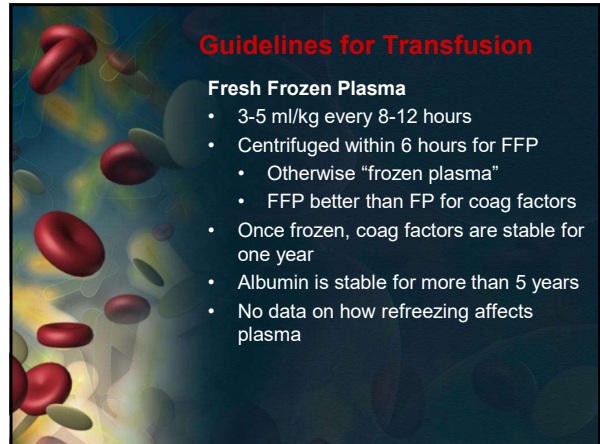
- Purified bovine hemoglobin in LRS
- Premedicate with diphenhydramine 0.5-1 mg/lb IM 30 minutes prior
- 3-5 ml/kg added to fluids running at 0.5-2ml/lb/hr
- Or 10 ml/kg/hr for up to 3 hours
- Maximum 30 ml/kg/day
- Watch for volume overload (especially cats)
 - Stop Oxyglobin if tachypnea
- Use with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



Guidelines for Transfusion

Oxyglobin – Hb substitute

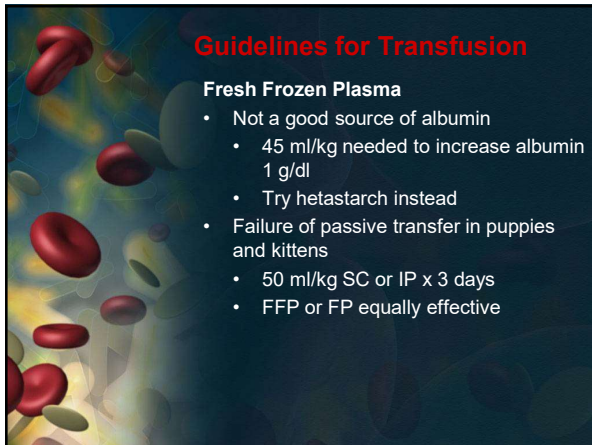
- Causes purple coloration of mucous membranes and urine
- Affects colorimetric blood tests
 - Bilirubin
 - Liver enzymes
 - Creatinine
 - Glucose
 - Urine dipstick
- Pulse ox still works fine
- Monitor by assessing Hb in RBC and plasma
 - iSTAT won't work
 - HemaVet & LaserCyte will work



Guidelines for Transfusion

Fresh Frozen Plasma

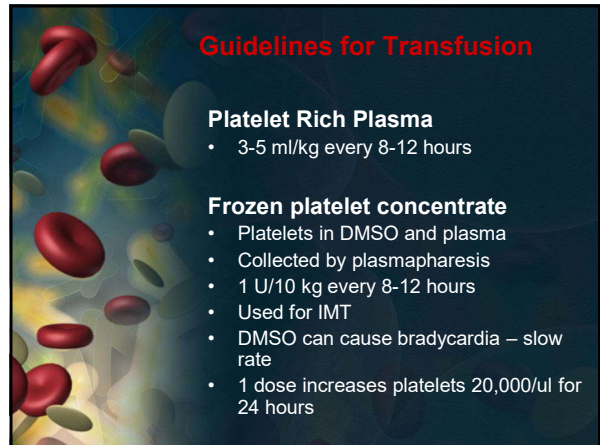
- 3-5 ml/kg every 8-12 hours
- Centrifuged within 6 hours for FFP
 - Otherwise "frozen plasma"
 - FFP better than FP for coag factors
- Once frozen, coag factors are stable for one year
- Albumin is stable for more than 5 years
- No data on how refreezing affects plasma



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



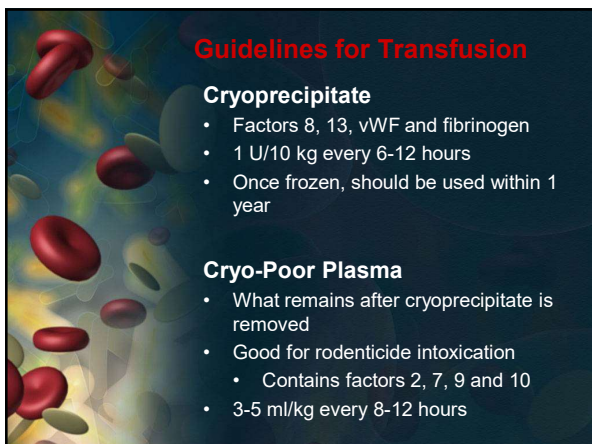
Guidelines for Transfusion

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



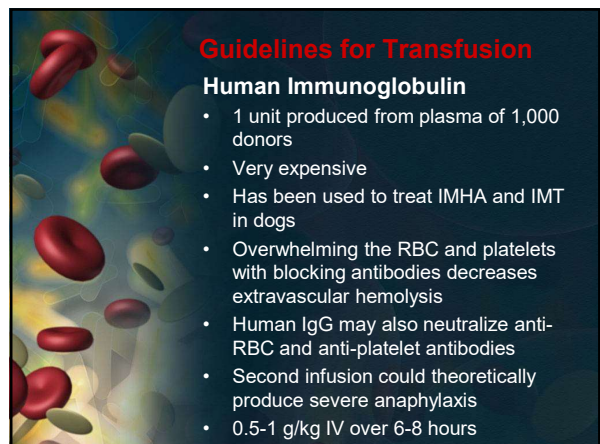
Guidelines for Transfusion

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

**Melinda Luper
Houston TX**



When to Transfuse

- **There is no set HCT/PCV or Hb**
 - If HCT <12-13% in dog or <10-11% in cat, transfuse
 - But many times you still need to transfuse at higher HCT/PCV
- **Transfuse if clinical signs from anemia**
 - Lethargy and Weakness
 - Tachycardia
 - Tachypnea
 - Weak pulses, 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

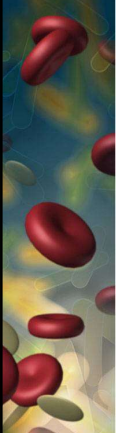
- **First Cat Transfusion**
 - Typing recipient and donor should be sufficient
 - Don't give A or AB blood to a B cat
- **Subsequent Cat Transfusions**
 - Cross-match is essential
- **First Dog transfusion**
 - No testing necessary
 - Donor DEA 1.1 negative, ideally
 - Especially if breeding animal
- **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](#)
- [Canine Typing Package Insert – with whole blood controls](#)
- [Canine Typing Package Insert – without whole blood controls](#)
- [Feline Typing Instructions](#)
- [Feline Typing Package Insert](#)
- [RapidVetH CrossMatch Kit Instructions](#)
- [CrossMatch Centrifuge List](#)
- [Major Cross-Match Instructions](#)


Acute Transfusion Reaction

- Fever and tachypnea are the first signs
- Hemolysis
- Anaphylaxis:
 - Vomiting, bloody diarrhea, abdominal pain in the dog
 - Pulmonary edema in the cat
 - Increased ALT within an hour
 - Coagulopathy within hours (PTT > PT)
- Shock, pallor, weak pulses, collapse
- Ultrasound - AFAST
 - GB edema, flat caudal vena cava, hemoabdomen
- DIC, SIRS




Delayed Transfusion Reaction

- Shortened RBC lifespan
- Icterus
- Post-transfusion purpura
- Immune mediated joint disease




Performing the Major Crossmatch

1. Take EDTA blood from donor and recipient
 - Note autoagglutination
 - Centrifuge 5 minutes
 - Separate plasma and RBC
 - Note hemolysis
2. Wash each RBC tube 3 times with 4-5 ml PBS
 - PBS – phosphate buffered saline
 - Centrifuge 1-2 minutes after each wash
 - Decant supernatant, keep RBC
3. Add a few drops PBS to each RBC tube to make a 3-5% suspension



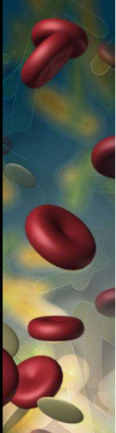
Performing the Major Crossmatch

4. Label empty tubes major, minor and recipient autocontrol
 - a. *Major Crossmatch:*
 - 1 drop donor RBC suspension
 - 2 drops recipient plasma
 - b. *Minor Crossmatch:*
 - 1 drop recipient RBC suspension
 - 2 drops donor plasma
 - c. *Recipient Autocontrol:*
 - 1 drop recipient RBC suspension
 - 2 drops recipient plasma



Performing the Major Crossmatch

5. Mix 3 tubes gently and incubate at body temperature for 15 minutes
6. Centrifuge tubes 15 seconds
 - Note hemolysis
7. Agitate each RBC pellet by tapping over a mirror
 - Look for autoagglutination as the pellet breaks up
 - Report each as:
 - Negative - no autoagglutination
 - Mild - a few small clumps
 - Moderate – many large clumps



Acknowledgements

Chapter 2: The Complete Blood Count, Bone Marrow Examination, and Blood Banking

- Douglass Weiss and Harold Tvedten
- Small Animal Clinical Diagnosis by Laboratory Methods, eds Michael D Willard and Harold Tvedten, 5th Ed 2012

Chapter 3: Erythrocyte Disorders

- Douglass Weiss and Harold Tvedten
- Small Animal Clinical Diagnosis by Laboratory Methods, eds Michael D Willard and Harold Tvedten, 5th Ed 2012