



DONOR PROFILE

Criteria to be a blood donor

| | |
|---------------------------------|--|
| Age | Between 1 and 8 years old. |
| Weight | At least 4.5 kg. |
| General health condition | No sign of a potential disease (vomiting, diarrhea). |
| Diet | Balanced diet. |
| Sex | <ul style="list-style-type: none">• male;• spayed nulliparous female. |
| Character | Calm and docile. |
| History of transfusion | No history of previous blood transfusion. |
| Medical treatment | No current treatment. No antiparasitic preventative just before blood collection. |
| Medical follow-up | Clinical examination before each donation. Annual check-up. |
| Typing and compatibility | Determination of donor's blood group is compulsory, (cf. compatibility). <i>NB : in any case, a crossmatch test is needed before transfusion.</i> |
| Infectious disease | To minimize exposure to feline infectious diseases, feline blood donors should be strictly indoor cats, with no exposure to outdoor cats. Depending on geographical area and age of animal, additional laboratory testing may be required for feline leukemia virus, feline immunodeficiency virus, dirofilariasis and hemobartonellosis. |

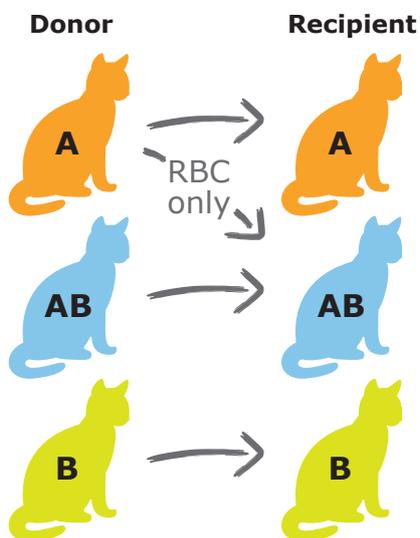


BLOOD GROUPS & COMPATIBILITY

1. Blood group in cats

Three feline blood groups have been described. They are A, B, and AB. Blood type A is the most frequent blood group, type B is much less frequent and type AB is extremely rare. Feline blood type frequencies differ in geographic location, as do the frequencies of A and B in purebreds.

Unlike dogs, cats possess naturally occurring antibodies against the A or B antigen absent from their own red cells : type A cats have naturally occurring antibodies against the B antigen, and type B against A. These antibodies can be responsible for transfusion reactions and neonatal isoerythrolysis.



Blood group compatibility in cats

Frequency

Relatively little information is available on the prevalence of the different blood groups in cat populations. But there may be noticeable geographical variations and certainly profound differences between pedigree breeds. There should be a low prevalence of type B cats among large relatively free-breeding populations.

Neonatal isoerythrolysis (haemolytic disease) of the kitten

As type B cats have very strong naturally occurring anti-A alloantibodies, if a kitten of the A group receives alloantibodies through the colostrum from a B queen, these alloantibodies will provoke a serious life threatening reaction called "haemolytic disease".



2.2

Alvedia's datasheets

Blood transfusion in cats

BLOOD TYPING

2. Blood typing

Although naturally occurring blood transfusion reactions are uncommon in cats, it is clear certain breeds run a much higher risk of a major reaction. Blood typing before transfusion is therefore routinely recommended as the safest approach.

The system is based on the migration of red blood cells on a membrane. This membrane has previously been specially treated, under the influence of a buffer flux moving along due to capillary action. Two monoclonal antibodies specific to A and B antigens has been incorporated into the membrane. These antibodies will retain positive A and/or B red blood cells, showing one or two red lines on the membrane.

Alvedia's blood typing test : **Quick test.**

The Alvedia's blood typing test is the easiest and most reliable test on the market with a 2 minutes procedure time.



Positive reaction for A group.



Positive reaction for A and B group.



Positive reaction for B group.

**3.1**

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Blood transfusion in cats

BLOOD COLLECTION

1. For a feline donor

- **Volume** : remember that the volume of blood drawn from a feline donor is considerably less than that of its canine counterpart. A typical feline donation is between **50 and 60 mL**. Blood bags used for the collection of canine blood are not used with cats since the needle is too large for the feline jugular vein.
- **Frequency** : Blood may be donated once every 3-4 weeks.

2. Equipment needs

- **Essential** : a bag of 60 mL containing anticoagulant and preservatives. Most frequently used anticoagulants are CPD (Citrate Phosphate Dextrose) and CPD-A (CPD and adenine).
- **Complementary** :
 - bag
 - syringe (60cc)
 - 7,5 ml CPDA-1 anticoagulant (in the syringe)
 - 19G butterfly needle
 - 10 mL additive (AS-1 Adsol®, AS-3 Nutricel®, AS-5 Optisol®)
 - 1 donor tubing
 - 1 transfer tubing of 27 cm
 - 1 3-way stopcock on the syringe
 - 2 spike ports
 - 1 safety ring

NB: When a syringe or bag of feline whole blood is collected in an open system, it should be transfused as soon as possible.

Blood collection systems are available in a variety of configurations. They are composed of the primary bag and satellite bags. The syringe contains anticoagulant. Other bags, which are attached to the primary bag through sealed ports, are the satellite bags. Satellite bags are intended for storage of red cells, plasma or platelets.

3. Puncture

In any case, animal has to be healthy.

Clinical exam is always recommended before blood collect.

Cats that donate blood on a monthly basis should be given an iron supplementation in their diet.

Almost all cats require sedation or anaesthesia.

Recommended sedation and anaesthesia protocols include :

- Ketamine 100 mg mixed 1:1 or 1:2 with diazepam 5mg/ml. Give 0.1 ml/kg i.v. Additional boluses of one-quarter to one half the initial dose may be given to prolong anaesthesia
- Ketamine 10mg/kg and midazolam 0.2 mg/kg, mixed together, i.m. Additional boluses of ketamine 1.0mg/kg i. v., may be given to prolong anaesthesia
- Ketamine 2mg/kg and midazolam 0.1 mg/kg, mixed together, i.v. Additional boluses of one-quarter to one-half the initial dose may be given to prolong anaesthesia.

Caution : the elimination half-life in the cat of the ketamine is approximately 1 hour (Plumb's Veterinary Drug Handbook sixth edition 2008). This period is extended after the ketamine blood outside the body, but weighted by the ratio of blood collected / total blood of the cat. It is best to wait at least 1-2 hours before injecting the blood collected.



BLOOD COLLECTION

3. Collection in a few steps

- 1 Prepare intervention :
 - shaving : jugular vein is the most common puncture site;
 - cleaning : use of chlorhexidine is recommended;
 - disinfection.
- 2 Apply anaesthetic gel.
- 3 The patient is restrained in a **either lateral or sternal recumbency**.
- 4 Wear gloves (sampler).
- 5 Compress jugular groove. Set stopcock on position 1, facing towards syringe.
- 6 Stretch skin in order to locate vein clearly.
- 7 Fill in syringe (anticoagulant is already in the syringe) until blood quantity is reached.
- 8 Set stopcock on position 3, facing towards blood bag.
- 9 Apply **compress on puncture** site and if needed, bandage for 30 minutes.
- 10 **Push blood** present in tube into the collection bag.
- 11 **Seal tube** close to the bag.
Label collection bags indelibly : date and time of collection, expiration date, type of animal, name of donor, blood group.

NB : in case the animal moves and the needle slips out of vein, either push needle forward or remove it and start the puncture again.

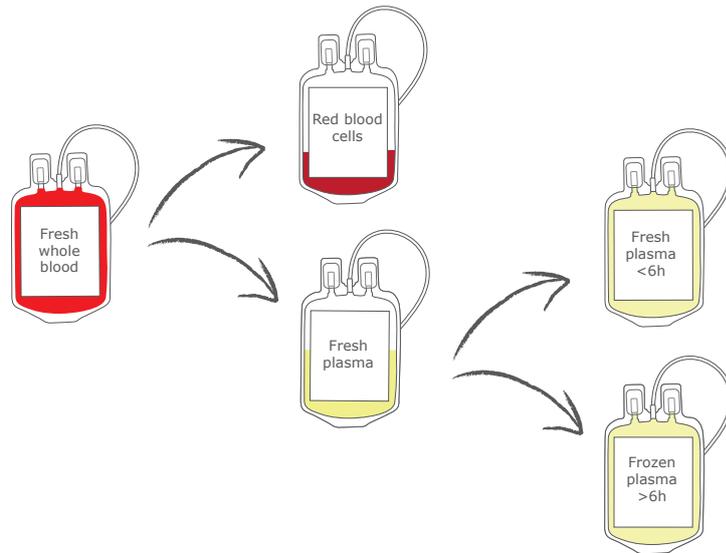


BLOOD PRODUCTS

1. Blood Product Overview

Treatment of whole blood to obtain packed red blood cells and plasma is the easiest to carry out in practice.

Thanks to the separation of blood in its two components, two products are obtained and two animals can be treated.



2. Characteristics and use of blood products

| Blood product | Use | Precautions |
|---|---|--|
| Whole blood <ul style="list-style-type: none"> until 24 hours after collection | <ul style="list-style-type: none"> Haemostasis disorders : thrombocytopenia, thrombopathias, coagulopathies; Anaemia, hemorrhage; Renal failure; Liver failure; Septic shock. | <ul style="list-style-type: none"> In anaemic patients, risk of volume overload. |
| Fresh Plasma <ul style="list-style-type: none"> separated for less than 4 h use within 24 h Frozen Plasma <ul style="list-style-type: none"> frozen within 6 to 8h | <ul style="list-style-type: none"> Hypovolemia (trauma, surgical resuscitation); Acquired or hereditary deficiency of coagulation factors; Antivitamin K poisoning Hypoproteinemia; Pancreatitis; Antioxydant properties. | <ul style="list-style-type: none"> Because of the short half-life of coagulation factors, several transfusions may be necessary. |
| Packed Red Blood Cells <ul style="list-style-type: none"> Erythrocyte suspension obtained after centrifugation : 2000 rpm for 30 min, or 5000 rpm for 5 min 50% < Ht < 80% | <ul style="list-style-type: none"> Anaemia. | <ul style="list-style-type: none"> High viscosity reduces administration speed. Dilution with NaCl 0,9% (0,5mL per mL of concentrate). |



BLOOD PRODUCTS

3. Separation process

Material



Refrigerated centrifuge



Plasma extractor



Scale

Centrifugation

Blood bags should be placed in the centrifuge bucket with the label facing out. This reduces the centrifugal force on the sealed margins of the bag.

The unit of whole blood should be centrifugated at 5000 g during 10 minutes.

Once centrifugation has ceased, allow the centrifuge to stop without assistance to avoid disturbing the red cell/plasma separation, which would contaminate the plasma with red cells.

Separation

- 1 Remove the unit of blood from centrifuge without agitation so as not to disturb red cells and plasma. Then place the blood unit on a plasma extractor in order to express the plasma into the satellite bag.
- 2 Clamp off the line of the bag containing the harvested plasma. Then break the seal from additive and let it flow into the red cells. Seal the bag containing the red cells and additive and remove it from the plasma bag.
- 3 Gently mix the red cells.
- 4 The final products should be labeled with the product name and volume.



BLOOD PRODUCTS

4. Conservation

| Blood product | Storage | Remarks |
|-------------------------------|--|---|
| Whole blood | CPD-A 35 days | <ul style="list-style-type: none">• Changes in blood with time: progressive cell alteration, rise in haemoglobin, potassium and plasmatic ammonia products, reduction of potassium in erythrocytes.• Gently agitate blood bag twice a week.• Thanks to vertical or lateral storage of the bags, shocks are minimized, sorting facilitated, diffusion of oxygen inside the bags and carbon dioxide outside is easier. |
| Fresh plasma | 24 hours at 1-6°C | |
| Frozen fresh plasma | 6 month to 1 year between -18°C et -30°C | <ul style="list-style-type: none">• At -30°C, coagulation factors remain active during one year.• At -20°C, in the freezer, coagulation factors remain active during 6 month.• For albumin and K-dependant coagulation factors (II, VII, IX, X), shelf life of 3 years.• It is not recommended to use an auto-defrost freezer.• Once frozen, the bag becomes fragile and has to be handled with carefully. Wrap the bags. |
| Packed red blood cells | 3-4 weeks at 1-6°C | <ul style="list-style-type: none">• Beyond 2 weeks, do not administer to dogs in a critical state: loss of a part of ATP and of the 2,3DPG of erythrocytes, their membrane becomes rigid and half-life is reduced.• Gently agitate blood bag twice a week in order to maintain sufficient rate in ATP and 2,3DPG.• Vertical or lateral storage of the bags.• Avoid opening and closing freezer too often. |

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Alvedia's datasheets

Blood transfusion in cats**ADMINISTRATION OF BLOOD PRODUCT****Flow**

| Blood product | Indications | Volume and administration speed | Frequency |
|---|--|---|----------------------|
| Whole blood | Anaemia, deficiency in platelets, coagulation factors, immunodeficiency, hypoproteinemia, haemorrhagic hypovolemic shock, leucopenia | 12-20 mL/Kg 3-6 mL/min <ul style="list-style-type: none">• 4 mL/kg/h for dogs with heart diseases. | Every 24 hours |
| Packed red blood cells | Anaemia | 6-10 mL/Kg 3-6 mL/min <ul style="list-style-type: none">• Addition of 10 mL of NaCl 0,9% pro 30-40 mL of concentrate in order to improve the flow. | Every 12 to 24 hours |
| Fresh Plasma Fresh Frozen Plasma | coagulopathies, DIVC, hypoproteinemia, Von Willebrand disease, pancreatitis, immunodeficiency, non haemorrhagic hypovolemic shock | 6-12 mL/Kg 3-6 mL/min | Every 8 to 12 hours |



TRANSFUSION AND POST-TRANSFUSION ACCIDENTS

Reactions during transfusion and post transfusion reactions

| | Reactions during transfusion | Post transfusion reactions |
|--------------------------|--|---|
| Immunological | <ul style="list-style-type: none">• Haemolysis;• Type I Hypersensitivity;• Anaphylactoid reactions;• Reactions to white blood cells and platelets;• Bacterial infection;• Citrate intoxication. | <ul style="list-style-type: none">• Extravascular hemolysis;• Purpura. |
| Non immunological | <ul style="list-style-type: none">• Erythrocyte distortion;• Volume overload;• Embolus;• Hyperammonaemia;• Hypothermia;• Electrolyte disorder. | <ul style="list-style-type: none">• Transmission of infectious agents;• Iron Overload. |