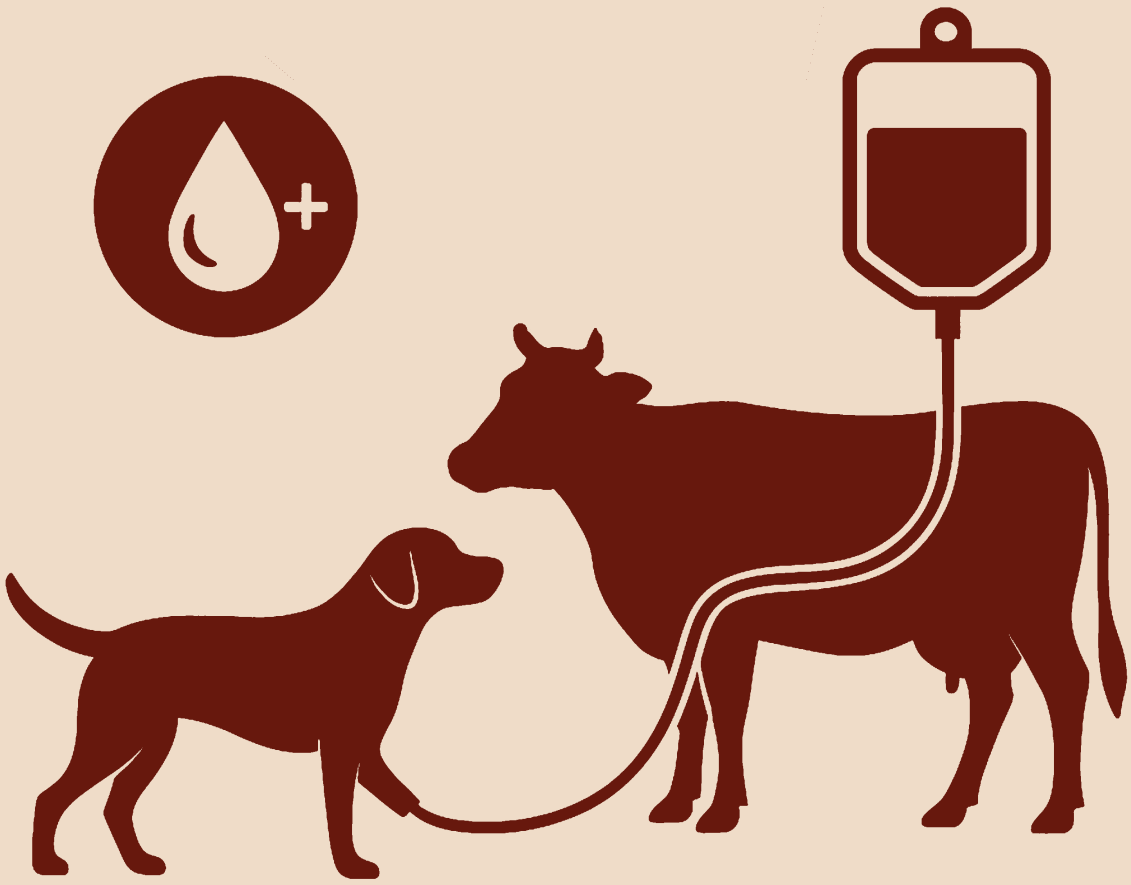
सत्यमेव जयते

GUIDELINES/SOP FOR
BLOOD TRANSFUSION AND BLOOD BANK FOR ANIMALS IN INDIA



Department of Animal Husbandry & Dairying
Ministry of Fisheries Animal Husbandry & Dairying
Government of India

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Executive Summary

India's livestock and companion animal sectors play a pivotal role in the country's agricultural economy and rural livelihoods. However, emergency and critical care veterinary services, particularly blood transfusion and blood banking, remain largely unstructured and presently lacks comprehensive national protocols governing veterinary blood transfusion.

This document outlines the Standard Operating Procedure (SOP) for blood transfusion and blood banking services for companion animals and livestock in India. It establishes national guidelines for donor selection, blood collection, processing, storage, transfusion protocols, donor welfare, and legal and ethical standards. The SOP aims to standardize transfusion practices, ensure donor animal welfare, and integrate One Health principles to minimize zoonotic risks.

Key highlights include recommendations for the establishment of state-regulated blood banks, mandatory donor health screenings, standard storage conditions for blood components, clear transfusion monitoring protocols, and a robust legal framework to support nationwide implementation. Emphasizing ethical considerations, voluntary non-remunerated donations, and public awareness initiatives, this document also advocates for capacity building through veterinary training programs and future research in advanced transfusion technologies.

This SOP provides a policy and procedural foundation to establish a structured and ethical animal blood banking network across India, contributing significantly to veterinary healthcare and animal welfare.

Disclaimer

This document has been prepared by the Department of Animal Husbandry & Dairying (DAHD) as an advisory framework to guide the development of veterinary blood banks and transfusion practices in India. The contents are illustrative and recommendatory, intended to support uniform, safe, and ethical practices, and should not be construed as having any statutory or regulatory force.

The document is dynamic in nature and may be revised in accordance with emerging scientific evidence, evolving best practices, or policy directions. Users are advised to exercise professional judgment and ensure full compliance with applicable laws, biosecurity norms, and ethical standards while adapting these guidelines to their local context.

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1. Introduction

India's livestock and companion animal sector is among the most diverse and economically significant in the world. With over 537 million livestock and more than 125 million companion animals, the country hosts the world's largest population of cattle and buffalo, the second-largest goat population, and a rapidly growing number of dogs and cats. The animal husbandry sector contributes approximately 5.5% to the national GDP and 30% to the agricultural GDP, serving as a backbone for food security, rural livelihoods, and public health.

With the evolution of veterinary practice in India, including advanced diagnostics and therapeutic capabilities, there is an urgent need to formalize critical and emergency veterinary care services, including blood transfusion support across species. Blood transfusion is increasingly recognized globally as a life-saving intervention, essential for managing trauma, severe anaemia, surgical blood loss, infectious diseases, and coagulation disorders.

At present, India lacks a national regulatory framework and standardized protocols guiding veterinary transfusion medicine with structured blood banking and transfusion practices. In India, most animal blood transfusions are still performed in emergency settings, relying on hospital-available or client-owned donors, without consistent screening, blood typing, or standard operating protocols.

This SOP aims to address these gaps by providing structured, ethical, and scientifically sound guidance on donor selection, blood collection, processing, storage, transfusion procedures, and safety monitoring. It is developed to support veterinary practitioners, institutions, and policymakers in establishing and managing blood banks for both companion animals and livestock species, while ensuring animal welfare and public confidence.

2. Background Note

The development of the *Guidelines on Blood Transfusion and Blood Bank for Animals in India* was initiated after the Department of Animal Husbandry and Dairying (DAHD) received a formal request from the Veterinary Council of India (VCI), along with guidelines on animal blood banks prepared by TANUVAS University for consideration. Recognizing the growing importance of veterinary transfusion medicine in clinical practice, a consultative meeting was convened at the VCI headquarters on 26.06.2025 to deliberate on the urgent need to standardize transfusion practices in the country. During this meeting, experts highlighted the lack of uniform procedures for donor selection, blood collection, storage, and transfusion in animals, and emphasized the need for a structured national framework.

Building on this, a high-level meeting was held on 04.07.2025 under the Chairpersonship of the Secretary, DAHD, at Krishi Bhawan, New Delhi, to discuss matters related to the establishment of blood banks in the veterinary sector. The meeting was attended by the Animal Husbandry Commissioner, President of VCI (virtually), and technical officers of the Department. The deliberations underlined the need for dedicated infrastructure, protocols for ethical and safe transfusion, and regulatory clarity for the functioning of veterinary blood banks. To take the process forward, a follow-up meeting was organized on 18.07.2025, again chaired by the Secretary, DAHD, in the presence of the President, VCI; Animal Husbandry Commissioner; Additional

Secretary (Livestock Health); and technical officers of the Department. It was unanimously decided that the Department should take the lead in developing a comprehensive set of *Guidelines and SOPs on Blood Transfusion and Blood Banks for Animals in India,* covering technical, ethical, and legal considerations, while drawing upon global best practices.

Accordingly, the Department prepared the draft document titled "Blood Transfusion & Blood Bank for Animals in India." The draft provides a structured framework for the establishment and operation of veterinary blood banks and for conducting transfusion practices in a safe, ethical, and effective manner. It covers detailed sections on infrastructure and equipment requirements such as space, refrigeration, centrifugation, and sterilization units; donor and recipient management, including selection criteria, welfare protocols, pre-donation screening, cross-matching, and post-transfusion monitoring; collection and storage protocols with clear guidance on aseptic collection, anticoagulant use, labelling, and shelf-life management; standard operating procedures (SOPs) for all stages of transfusion; quality assurance and record-keeping through donor and recipient registries; biosafety and biomedical waste disposal in line with national regulations; capacity building and training modules for veterinarians and para-veterinarians; and ethical considerations, particularly on voluntary and non-remunerated donation, informed consent from owners, and animal welfare safeguards. The draft was prepared with reference to the SOP developed by TANUVAS, international transfusion guidelines such as those from California, and relevant research articles in the field.

To ensure transparency and inclusivity, the draft guidelines were circulated widely to key stakeholders for review and suggestions. These included the Veterinary Council of India (VCI), Central Drugs Standard Control Organisation (CDSCO), Veterinary Universities and colleges, ICAR and its animal science institutes, State Animal Husbandry Departments, and the Animal Welfare Board of India (AWBI). In addition, the draft was hosted on the official website of the Department of Animal Husbandry & Dairying for a period of 10 days to invite comments from the wider veterinary and scientific community. This process elicited valuable inputs and suggestions from a diverse set of institutions and experts, including the Dean, College of Veterinary Science, Mhow; College of Veterinary and Animal Science, Navania, Rajasthan; PV Narasimha Rao Telangana Veterinary University; ICAR-IVRI; DUVASU Mathura; West Bengal University of Animal and Fishery Sciences; Directors of Animal Husbandry from Punjab and Mizoram; as well as individual practitioners and researchers. List of the contributors is given in Annexure.

All these inputs are being carefully examined and incorporated, with the objective of finalizing a robust, evidence-based national guideline. Once adopted, these guidelines will not only bring uniformity in veterinary blood transfusion practices across the country but also ensure animal welfare, biosafety, and institutional preparedness. The initiative marks an important step towards strengthening veterinary clinical services, supporting advanced care for companion and farm animals, and aligning Indian practices with international standards in transfusion medicine.

3. Objectives

- Establish national guidelines for donor selection, blood collection, processing, storage, and transfusion.
- Ensure donor animal welfare and adherence to ethical standards.

- Standardize transfusion protocols to optimize clinical outcomes.
- Ensure traceability and safety across the transfusion chain.
- Integrate One Health principles to manage zoonotic disease risks.
- Lay the foundation for a national blood bank network for animals
- Promote awareness and impart training among veterinary professionals

4. Scope and Definitions

This document applies to veterinary blood transfusion of companion animals (dogs, cats) and farm animals (cattle, buffalo, sheep, goats and horses) across India in case of emergency, critical and planned care.

Key Definitions:

- Animal: Domesticated mammals under veterinary care
- Community Sourced Donor: Animal voluntarily donating blood with owner consent
- Cross-Matching: Laboratory technique ensuring compatibility between donor and recipient blood.
- Donor Welfare: Protection of donor animals from harm, distress, or exploitation
- Blood Components: Whole blood, packed RBC, plasma, platelets, cryoprecipitate
- Adverse Event: Any unexpected reaction during or after donation or transfusion
- Leukoreduction: Process of removing white blood cells from blood components.
- Universal Donor: Donor with blood type that is least likely to cause reactions.
- Autologous Transfusion: Use of an animal's own blood for transfusion.
- Transfusion Reaction: Adverse immune response to transfused blood.
- Neonatal Iso erythrolysis: Hemolytic disease in newborns due to maternal antibodies.
- Hemolytic Reaction: Destruction of transfused red blood cells by recipient antibodies.

5. Indications for Blood Transfusion

The various components of blood can be used in different conditions as indicated below:

5.1 Fresh/ Stored Whole Blood

Fresh Whole Blood that is less than 8 hours old and has not been refrigerated and has all cellular and fluid components of blood. Stored Whole Blood is blood that is more than 8 hrs old. It can be stored at 33.8-42.8 °F (1 - 6 °C) for a maximum of 28-35 days.

a. Treatment for anaemia, severe thrombocytopenia and disseminated intravascular coagulation

b. As a preoperative procedure in severe anaemic patients

b. Animals with severe trauma requiring massive transfusion

c. As a preoperative procedure in severe anaemic patients.

d. Animals suffering from blood-related tick- borne protozoal diseases like Anaplasmosis, Babesiosis, Theileriosis, Ehrlichiosis and Trypanosomiasis.

e. Animals suffering from anaemia with hypoproteinaemia

f. For intravascular volume expansion and oxygen support

g. Immune mediated haemolytic anaemia

h. Animals undergoing major surgeries that warrant transfusion.

i. Whole blood transfusion is also indicated in conditions like parasitism, toxicosis, immune medicated haemolyticanemia.

5.2 Packed RBCs

Contains concentrated RBCs with a PCV of 80 percent. Depending on the anticoagulant used, it can be stored for 28-35 days stored at 2-6°C

a. Animals with symptomatic anemia including anemia due to hemorrhage, hemolysis, renal disease and decreased production of RBCs (bone marrow suppression)

b. Helps to increase RBC concentration in animals that require oxygen support

5.3 Platelet Rich Plasma (Platelet concentrate)

Obtained by centrifuging fresh blood at a rate slower than that used for production of packed cell volume and plasma. Platelet rich plasma can be stored up to 5 days with the help of platelet agitator and incubator. Can be used within 48 hrs if kept away from light at room temperature. Should not be refrigerated.

a. Consistently administered to animals with life threatening hemorrhage due to marked thrombocytopenia

b. Platelet Rich Plasma (PRP), is indicated in thrombocytopenia (prolonged epistaxis, hematemesis and hematochezia), sepsis and Disseminated Intravascular Coagulation (DIC).

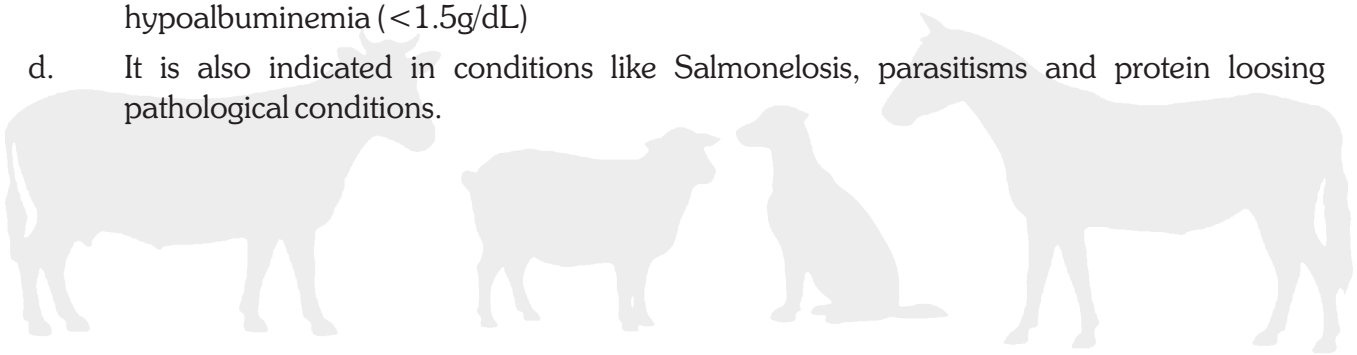
5.4 Plasma Transfusion

a. Plasma transfusion is a life saving in case of neonatal failure of passive transfer of maternal colostrum (FPT).

b. Plasma helps in expanding circulating blood volume and also an immediate source of immunoglobulins, total protein and coagulation factors.

c. Plasma transfusion is indicated in conditions like severe hypoproteinemia (< 3 g/dL) and hypoalbuminemia (<1.5g/dL)

d. It is also indicated in conditions like Salmonelosis, parasitisms and protein loosing pathological conditions.



5.5. Clinical indications for various blood products across species

(Standard dose recommendation in ml/kg)

Product	Indication	Dose Range (ml/kg)	Notes
Whole Blood	Hemorrhagic shock, anemia	10–20	Use lower end for mild cases; higher for trauma or surgery
Packed RBCs	Normovolemic anemia	6–10	Avoid volume overload in cats and small ruminants
Fresh Frozen Plasma (FFP)	Coagulopathy, hypoalbuminemia	10–20	May repeat 12–24h depending on coagulation panel
Platelet-Rich Plasma	Severe thrombocytopenia	1–3	Rarely available; short shelf life
Cryoprecipitate	vWD, hemophilia A	1–2	Highly concentrated factor VIII and vWF; useful in dogs

6. Blood and Blood Volumes of Animals

Blood is the vascular connective tissue composed of fluid parts termed plasma and of corpuscles viz - erythrocytes or red blood cells, leucocytes or white blood cells and platelets.

The shape and size of red blood cells vary in different animals eg. Dog's RBC is a typical biconcave disk, whereas the Goat's RBC is more spherical. RBC shape in Camel is elliptical, in Deer it is sickle shaped. Humans and animals have blood volumes of 7% to 9% of their body weight. When there is a reduction in the blood volume, transfusion is generally required.

Animals	Blood volume (ml/kg)	Average body wt (kg)	Total Blood Volume (ml)
Cattle	55	300	16500
Goat	66	20	1320
Sheep	66	35	2310
Dog	86	25	2150
Cat	55	5	275
Pig	65	60	3900
Horse	76	450	34200
Monkey (Rhesus)	54	8	432
Rabbit	56	4	224
Guinea pig	75	1.2	90
Ferret	75	2	150

6.1 Blood Types

Every species has specific cell surface antigens on its RBC which differ leading to the development of the blood groups in animals. In animals, there is a combination of blood factors leading to the terminology of Blood grouping system rather than blood groups.

Blood groups are produced by the presence of species-specific antigens on the cell membrane of red blood cells. These factors cause a devastating role in causing adverse-systemic reactions following transfusion. Antigens can also get adsorbed onto the leucocytes, platelets, and plasma protein failing transfusion. When these antigens encounter other organisms either by transfusion or through transplacental exposure, it induces the production of antibodies in the young ones and even causes neonatal isoerythrolysis in certain species in puppies, kittens and foals.

Species	No. of blood group	Description
Cattle	11	A, B, C, F, J, L, M, R, S, T, Z
Sheep	8	A, B, C, D, M, R, X
Goat	6	A, B, C, M, J
Horse	8	A, C, D, K, P, Q, U, T
Pig	15	A-O, C, F, G, H, I, J, K, L, N, O
Dog	9	DEA1.1,1.2,3,4,5,6,7,8, Dal antigen
Cat	4	A, B, AB, Mik antigen
Chicken	13	A, B, C, D, E, H, I, J, K, L, N, P, R

7. Mandatory Blood Typing and Cross-Matching:

7.1 Blood Typing: It is a technique by which the surface antigen of the erythrocytes can be identified. It works well to screen the blood donors of the animals before crossmatching and transfusion. They are determined in the laboratory and even blood-typing kits like card-based agglutination assay, immunochromatographic cartridge and gel column diffuse assay are available in the market. These cards are available for both felines and canine's blood- typing and can detect DEA 1.1 and felines type A, B, and AB. In samples of canine blood that is potentially DEA 1.1 – negative, the laboratory can also type the blood or DEA 1.2 to confirm that RBCs are negative for both DEA 1 alleles which could mean that dog is a Universal donor

7.2 Crossmatching: Ensures compatibility between donor and recipient blood to prevent transfusion reactions. A major, minor, and auto control crossmatch should be performed although the minor crossmatch is rarely used in dogs. The major cross matching should always be compatible at room temperature and at 370C. The end reaction to being noticed is hemolysis and agglutination

Major Crossmatching: Tests donor red blood cells against recipient serum to detect antibodies against donor antigens. To perform the test, mix 2 drops of recipient serum with 2-4% donor RBC suspension. Incubate the mixture for 30 minutes at 37°C, then centrifuge at 1500 rpm for 2 minutes. After centrifugation, examine the sample both microscopically for agglutination and macroscopically for hemolysis. Visible hemagglutination indicates incompatibility.

Major cross matching = Recipient's Plasma + Donor's RBC

Minor Cross matching: Tests donor plasma against recipient red blood cells, less common as most transfusions use packed red cells. To carry out the test, mix 2 drops of donor plasma with 1 drop of recipient RBC suspension. Incubate the mixture for 30 minutes at 37°C, then centrifuge at 1500 rpm for 2 minutes. Following centrifugation, examine the sample microscopically for agglutination and macroscopically for hemolysis.

Minor cross matching = Recipient's RBC + Donor's Plasma

Recipient's control = Recipient's Serum + Recipient's RBC

There are several in-house cross-matching tests like Alvedia, Rapid Vet H Major for both feline and canine species. Cross matching is not required before a first transfusion in a dog, due to the lack of naturally occurring alloantibodies (NOAbs), but is strongly recommended > 4 days after a subsequent transfusion. Due to the presence of highly immunogenic NOAbs in cats, major cross matching is strongly recommended both before a first transfusion in cats and then > 2 days after any subsequent transfusion.

7.3 A Veterinary Blood Bags Availability: 150 ml/ 350 ml and 1.5 litre available in India – Commercially available Collection Bag of different sizes, e.g. 1.5 Liter Bag for Large animals (Bovine and Equine) and 350 ml Bag for Small animals (Such as Dog, Cat, Sheep and Goat) and 150 ml for pets.

7.3 B Human Blood Bags Availability: 100 mL CPDA /350 mL CPDA / 300 mL transfer bags

7.4 Blood Collection Equipment

- Blood collection bags (with CPDA-1 or CPD anticoagulant) – single, double, triple or quadruple
- Needles – 14G, 16G or 18G sterile blood collection needles
- Blood collection monitor, Cryofuse, Tube sealer
- Blood bag weighing scale/mixer – to prevent clotting and ensure volume accuracy
- Sphygmomanometer cuff / Pressure bag – helps collect blood from jugular vein by mild pressure if needed
- Labeling tools – permanent markers, barcodes, stickers for unit ID and data
- Sterile gloves, antiseptic swabs, surgical clippers
- Rope Truss & wooden peg for farm animals help to collect blood from Jugular vein
- Blood Bag Refrigerator
- Centrifuge for separation of serum and plasma components

7.5 Donor Selection and Screening

To ensure safe and effective veterinary blood transfusion, donor animals—whether canine, feline, or livestock—must meet the following criteria:]

A. General Health and Suitability

- Must be clinically healthy with no signs of systemic illness.
- Free from tick-borne and vector-borne diseases
- Should be docile and temperamentally suitable for handling during donation.
- Not under any ongoing medication or treatment.

Restoration of blood volume and its components occur with in 2 weeks of blood withdrawal in healthy animals. Though volume is often replaced with in 24 hrs, two — four weeks may be required to replace all blood constituents. As a general principle, sample volumes and number of samples should be kept to a minimum.

B. Age and Weight Requirements

- Dogs: Age 1–8 years, minimum body weight 5-7 kg (small breeds), 15-20 Kg (medium breeds) and 25 kg (large breeds)
- Cats: Age ideally 1–5 years, minimum body weight 4 kg, not obese.
- Livestock: Healthy adults selected based on species-specific clinical norms.

C. Vaccination and Reproductive Health

- Donors must be vaccinated against major infectious diseases, especially against rabies. Must have a thorough vaccination history.
- Should be regularly dewormed.
- Female animals must not be pregnant or recently lactating.

D. Donation Frequency

- Dogs: Eligible for donation every 4–6 weeks.
- Cats: Eligible every 8–12 weeks.
- A minimum 30-day interval between successive donations is mandatory.

E. Mandatory Pre-Donation Screening

- A clinical examination and medical history review must be conducted before every donation.
- Laboratory parameters to be assessed:
  - » Packed Cell Volume (PCV): ≥ 35%
  - » Hemoglobin (Hb): ≥ 10 g/dL
  - » Platelet count: > 200,000/μL
  - » Total protein: Within species-specific normal limits

F. Infectious Disease Screening

Donors must , at a minimum, test negative for transfusion-transmissible infections:

- **Dogs:** Hemoprotozoan infections (e.g., Babesia, Ehrlichia), and von Willebrand factor levels (if indicated)
- **Cats:** FeLV, FIP (Feline Infectious Peritonitis), Haemoplasma, and optionally Bartonella spp.
- **Livestock:** Should be free from Brucellosis trypanosomiosis, babesiosis, and theileriosis

G. Informed Consent

- Written informed consent must be obtained from the owner or custodian prior to every donation.
- Donors must be voluntary and non-remunerated to uphold ethical standards.

H. Ethical Framework and Donor Charter: A sample "Donor Rights Charter"

- Voluntary participation
- Right to withdraw consent
- Post-donation care and welfare guarantees
- Protection from exploitation
- Data privacy and record confidentiality

I. Blood Collection and Compatibility Testing

- Blood must be collected aseptically via jugular venipuncture using sterile equipment.
- Blood typing and crossmatching are mandatory before transfusion to avoid incompatibility reactions.

J. Post-Donation Care and Observation

- All donor animals must be monitored for at least 1–2 hours post-donation for signs of hypovolemia or distress.
- Provide oral fluids, light feeding, and rest.
- Record vital parameters post-donation and advise follow-up care if needed.

K. Operational guidelines for Community Secured Donors

Community-based animal blood donation programs may adopt structured protocols to ensure safety, transparency, and animal welfare. Pre-registration should be facilitated through verified community networks, with donor health records maintained by a designated veterinary authority or partner organization. Eligibility criteria should align with those for individual donors, covering aspects such as minimum age, weight, vaccination status, and disease screening. Owner consent must be obtained through a formal agreement that clearly outlines rights, responsibilities, post-donation care, and the option to withdraw at any time. Routine health monitoring and wellness assessments should be conducted by the organizing body or designated blood bank to safeguard donor well-being. While monetary compensation is not permitted, non-financial incentives such as

complimentary deworming, health checkups, or community recognition may be provided to encourage ethical participation. Donor animals should be uniquely identified through tagging or microchipping, with all details recorded in the donor registry to ensure traceability. To further strengthen donor welfare, a risk assessment tool for repeat or high-stress donors and a wellness scoring system before and after each donation should be applied.

8. Blood Collection and Processing

Blood collection must follow species-specific protocols to ensure donor welfare, maintain blood quality, and minimize transfusion risks. The jugular vein is the preferred site across species due to its size and accessibility. Aseptic preparation of the collection site is mandatory in all cases.

A. General Principles

- Closed collection systems are recommended for dogs and livestock to prevent contamination and ensure sterility.
- Open systems may be used for cats, but only when a closed system is not feasible.
- Anticoagulants must be used appropriately based on species and collection volume (see Table 1).
- Blood collection must be performed by trained personnel under veterinary supervision.

B. Blood Volume Guidelines and Anticoagulants

Species	Safe Blood Volume	Recommended Anticoagulant	Anticoagulant-to-Blood Ratio
Dogs	15–20 ml /kg body weight	CPDA-1	1 mL per 9 ml of blood
Cats	10–12 ml /kg body weight	CPDA-1 or ACD	1 ml per 9 ml (CPDA-1); 50 ml per 450 ml (ACD)
Cattle/ Buffalo	Up to 1.6% of body weight (max ~6–8 L)	Sodium citrate or ACD	100 ml /L (sodium citrate); 50 ml per 450 ml (ACD)
Horses	6–8 liters	CPDA-1 or ACD	Species-specific; veterinary discretion

Note:

- Add Heparin @5 units per mL in blood in both Dog and Cattle.

-Maximum blood volumes are based on healthy adult donors and should be adjusted based on clinical assessment.

C. Collection Protocol

- Use sealed bags compatible with anticoagulants for collection and storage.
- In livestock, use specially designed 1.5-liter blood collection kits pre-loaded with anticoagulants.
- Gentle continuous shaking of the blood bag is necessary during collection to prevent clotting.

- Blood volume collected should be based on:
  - » Donor's body weight
  - » Expected packed cell volume (PCV) required for the recipient

D. Donor Monitoring and Post-Donation Care

- Monitor vital signs (heart rate, respiratory rate, mucous membrane color, capillary refill time) throughout the procedure.
- Watch for signs of hypovolemia, weakness, or discomfort.
- Provide oral or IV fluid support as appropriate post-donation.
- Observe donors for at least 1 hour post-procedure and record any adverse reactions.

8.1 Component Separation and Storage

Post-collection, blood may be separated into red blood cells, plasma, and platelets via centrifugation. It is important to mention expiry dates clearly and blood labaelling should meet ISO9001 traceability norms as much as possible. Storage requirements vary for each component:

Whole blood with anticoagulant ACD, CPD or CP2D should be stored at 1–6°C and used within 21 days (ACD) 28 days (CPD, CP2D) from date of collection and **whole blood with anticoagulant CPDA-1** should be stored at 1–6°C and used within 35 days from date of collection .

Plasma should be frozen at –18°C and is viable for up to one year.

Plasma thawing: Thaw at 37°C, use within 6 hours.

Cryoprecipitate handling: Store below -30°C; thaw and use within 4 hours.

Labelling: Use barcoded or QR-coded labels wherever feasible for traceability.

Blood Cold Chain: Align handling procedures with WHO and NABL standards

Platelets must be stored at 20–24°C with continuous agitation and used within 5 days. Using sterile equipment and proper anticoagulants is essential to preserve each component's functionality. Blood filters are routinely employed to remove any clots that may have formed during collection or storage.

8.2 Transfusion Protocols

Transfusions must be conducted under veterinary supervision with species-appropriate protocols to ensure safety, efficacy, and traceability. The procedure should follow a standard checklist, include pre-transfusion compatibility testing, and ensure that each transfusion is recorded in the animal's medical records.

A. Pre-Transfusion Requirements

- Conduct blood typing and major crossmatching to ensure compatibility.

- Maintain a transfusion checklist, including:
  - » Patient ID, species, weight, and clinical indication
  - » Donor ID and screening record
  - » Blood product type and volume
  - » Date and time of transfusion
- Ensure informed owner consent has been obtained and documented.
- Verify storage and expiry details of the blood product prior to use.

B. Administration Route

- Preferred route is intravenous via the jugular or cephalic vein.
- For neonates or critical patients, intraosseous access may be used when venous access is not possible.

C. Rate and Duration of Transfusion

- Start slow: 0.5–1 mL/kg/hr for the first 15–30 minutes to monitor for adverse reactions.
- Dogs and Cats: Total transfusion must be completed within 4 hours.
- Farm Animals:
  - » Begin gradually for the first 30 minutes.
  - » Transfusion rate gradually increases at the rate of 1-5 ml/kg/hr
  - » Total transfusion time should not exceed 4 hours.

D. Equipment and Asepsis

- Blood should be warmed to body temperature (37°C) before transfusion.
- Use non-heparinised saline to prime the IV line (never mix with calcium-containing fluids).
- Employ blood administration sets with inline filters (170–260 μm) to remove clots and debris.
- Use extension lines connected from the fluid pump to the catheter to maintain sterility.
- Ensure sterile technique during all handling of blood products.

E. Monitoring and Documentation

- Monitor vital signs every 15–30 minutes:
  - » Temperature, heart rate, respiratory rate, mucous membrane color
  - » Monitor for signs of transfusion reactions (e.g., fever, urticaria, tachycardia, hemolysis)
- Document the following in the animal's medical record:
  - » Transfusion start/end time
  - » Volume and type of product transfused
  - » Any observed reactions and action taken

8.3 Monitoring and Reaction Management

Close monitoring of the recipient animal during and after transfusion is essential for early identification of adverse reactions and assessment of transfusion effectiveness. All observations and actions must be **clearly documented in a dedicated transfusion logbook,** which serves as a critical tool for **traceability, audit, and future reference.**

A. Monitoring Schedule

- **During transfusion:**
  - » **First hour:** Monitor vital signs every **15 minutes**
  - » **Subsequent period:** Monitor every **30–60 minutes**
- **Post-transfusion:**
  - » Evaluate **Packed Cell Volume (PCV)** 2–4 hours after transfusion to assess efficacy
  - » Continue clinical observation for **at least 2 hours** post-transfusion

B. Common Signs of Acute Transfusion Reaction

- **In farm animals:** Increased respiratory rate, tachycardia, sweating, muscular tremors, violent movements
- **In dogs and cats:** Fever, vomiting, facial swelling, restlessness, panting, urticaria, or collapse

C. Emergency Response Protocol

- Stop transfusion immediately if any acute reaction is suspected.
- Administer appropriate supportive care:
  - » **Antihistamines** (e.g., diphenhydramine)
  - » **Corticosteroids** (as per veterinary discretion)
  - » **IV fluids** if required—but avoid hypotonic or calcium-containing solutions immediately after transfusion due to the risk of hemolysis

D. Documentation and Traceability

- Maintain a dedicated transfusion logbook capturing the following:
  - » Donor ID and screening details
  - » Recipient information and clinical indication
  - » Type and volume of blood product administered
  - » Start and end time of transfusion
  - » Vital signs and monitoring notes
  - » Any adverse reactions and treatment administered
- This record must be appended to the animal's medical file and retained for institutional audit and clinical reference.

8.4 Labelling

Labelling of blood and blood components must be accurate, standardized, and traceable to ensure safe clinical use, quality assurance, and regulatory compliance. Each unit must carry a tamper-proof label, wherever possible printed, with the following mandatory details:

A. Essential Product Information

- Product name (e.g., Whole Blood, Packed RBCs, Plasma, Platelets)
- Donor species (e.g., canine, feline, bovine)
- Blood type/group of the donor
- Collection date and expiration date
- Volume collected

B. Donor and Source Identification

- Donor ID number
- Unique lot or control number (for full traceability)
- Name and address of the facility or manufacturer

C. Process and Additive Information

- Name and volume of anticoagulant used (e.g., CPDA-1, ACD)
- Details of any additive solutions
- Leukoreduction status (e.g., "Leukoreduced" if performed)

D. Storage and Handling

- Recommended storage conditions (e.g., 1–6°C, frozen ≤–20°C)
- Storage expiry timeline based on the product type

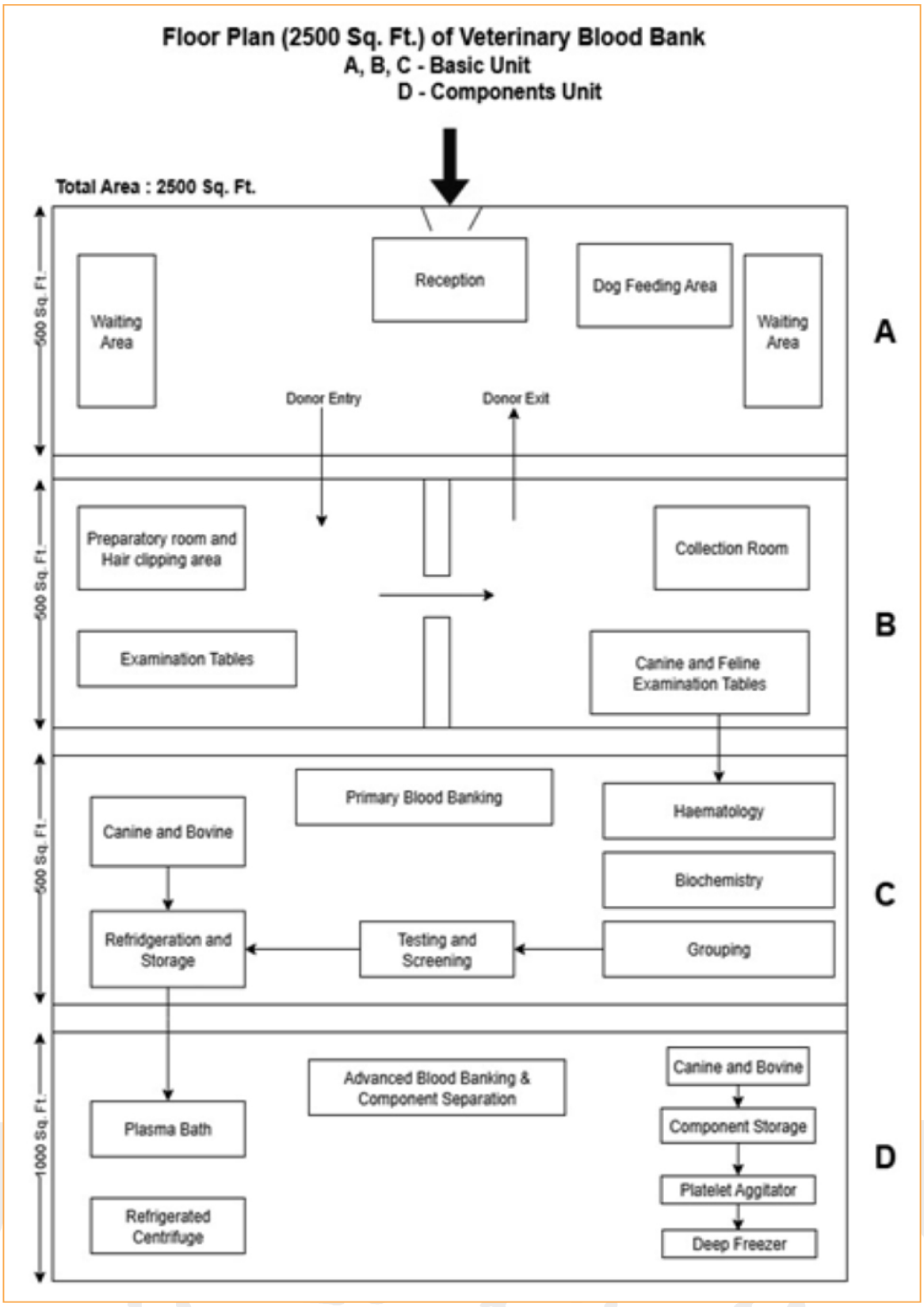
E. Tube Segment Identification

- Each associated tubing segment (pilot tube) must bear the same unique lot or donor ID number to allow for re-testing or crossmatching, if required.

Labels must be legible, permanently affixed, and printed in English (and optionally in the local language).

9. Establishment of Blood Banks

9.1 Model Layout



9.2 Infrastructure Requirements

A functional and ethically managed veterinary blood bank must be supported by appropriate infrastructure, personnel, and regulatory oversight to ensure biosafety, traceability, and clinical effectiveness. The design and operation of the facility must adhere to standardized layouts, biosafety practices, and quality assurance protocols.

A. Facility Layout and Biosafety

- The physical infrastructure must follow a standardized layout with clearly defined zones to prevent cross-contamination:
  - » Blood collection area (sterile environment)
  - » Component separation/processing room
  - » Storage room (cold chain maintenance)
  - » Record-keeping/administrative area
- Facilities should conform to Biosafety Level 2 (BSL-2) practices, including:
  - » Controlled access
  - » Proper ventilation and airflow
  - » Surface disinfection protocols
  - » Use of personal protective equipment (PPE)
- A site plan may preferrably be vetted by State Veterinary Department before operationalization.

B. Essential Equipment

- **Cold storage:**
  - » Refrigerators (1–6°C) for whole blood and RBCs.
  - » Freezers (–20°C or lower) for plasma.
  - » Temperature loggers with alarms and backups.
- **Laboratory and transfusion support:**
  - » Bench centrifuges for blood component separation.
  - » Blood bag sealers, weighing scales.
  - » Blood typing and crossmatching kits (species-specific).
  - » Leukoreduction filters (if applicable).
  - » Sterile, gas-diffusible blood collection bags with anticoagulants.
  - » Continuous power supply (UPS/generators).

C. Staffing and Critical Care Access

- 24/7 access to critical care facilities must be ensured, especially in veterinary teaching hospitals or referral centers where blood banks are established.

- Personnel must include:
  - » Veterinary transfusion-trained clinicians to supervise donor selection, compatibility testing, and transfusions.
  - » Qualified laboratory technicians trained in blood handling, biosafety, and quality control.
  - » Support staff trained in asepsis, donor care, and documentation.
- Regular training and capacity building should be mandated for all staff involved in transfusion services.

D. Institutional Licensing and Regulatory Oversight

- Until a national regulatory framework is formally established, state-level registration of veterinary blood banks should be made mandatory.
- Blood banks must be registered with the State Animal Husbandry Department, subject to periodic inspections and adherence to SOPs.
- An appropriate mechanism for developing acredition ftramework in the line of human blood transfusion is recommended to eventually regulate and accredit facilities nationwide.

9.3 Ideal Locations for Veterinary Blood Banks

Veterinary blood banks should be strategically located in institutions that possess the necessary veterinary infrastructure, clinical capacity, and round-the-clock emergency care facilities. The following are ideal host institutions:

- Veterinary colleges and universities
- Referral hospitals and polyclinics
- Large veterinary diagnostic centres
- Government-operated multispecialty animal hospitals

Key criteria include the presence of transfusion-trained veterinarians, diagnostic laboratories, and critical care support, ensuring that both donor welfare and recipient safety are maintained.

10. SOPs and Documentation

Robust Standard Operating Procedures (SOPs) and meticulous documentation form the backbone of safe and ethical transfusion practices. Institutions operating veterinary blood banks must maintain the following records:

- Donor registration and informed consent forms
- Donor health screening and testing records
- Blood collection and labeling forms
- Component processing logs
- Inventory, storage, and expiry tracking
- Transfusion monitoring and reaction management forms

- Post-transfusion outcome assessments
- Waste disposal and biosafety logs

All records must be securely maintained for a minimum of five years, and available for audit by regulatory or licensing authorities. Regular internal reviews should be undertaken to improve SOP adherence and address deviations. Model form for Donor registration and informed consent templet (owner/guardian), Transfusion Monitoring Sheet, Blood Product label sample, Transfusion monitoring and reaction management forms are given as Annexure

11. Legal Framework and Regulatory Considerations

India currently lacks a dedicated national law governing animal blood banking and veterinary transfusion medicine. However, several existing statutes can provide a **regulatory foundation** for institutional governance, ethical compliance, and clinical standardization:

A. Applicable Legal Provisions

1. Prevention of Cruelty to Animals Act, 1960

- Ensures donor animal welfare, humane handling, voluntary non-remunerated donation, and post-donation care.
- Blood collection and transfusion must comply with ethical norms defined under this Act.

2. Indian Veterinary Council Act, 1984

- Provides regulatory authority to the Veterinary Council of India (VCI) and State Veterinary Councils to oversee clinical veterinary practices.
- Transfusion medicine procedures will be formally integrated into veterinary clinical guidelines under this Act, including licensing, training, and accreditation of transfusion centers.

3. Biomedical Waste Management Rules, 2016

- Blood banks must comply with the Environment (Protection) Act provisions for disposal of biomedical waste, such as used syringes, blood bags, and contaminated materials.

4. Drugs and Cosmetics Rules, 1945 (Indicative Human Model)

- While framed for human blood banks, Part X-B of the Rules (Rules 122-F to 122-P) offers a model structure for:
  - » Licensing
  - » Infrastructure standards
  - » Donor safety
  - » Quality control and traceability
- These may be adapted to veterinary needs and act as a regulatory reference until a dedicated framework is notified.

B. Recommended Additions and Reforms

- Animal blood banks should be:
  - » **Registered with the State Animal Husbandry Department** (as an interim regulatory mechanism).
  - » **Eventually brought under the oversight of a national mechanism** as per the prevailing practices of human blood transfusion.
- Transfusion services be **recognized as clinical procedures** requiring licensing under the Indian Veterinary Council Act.
- Establishment of animal blood banks must ensure:
  - » Institutional accountability
  - » Ethical donor selection
  - » Standardized infrastructure
  - » Quality assurance practices

12. Ethical Considerations and Owner Education

Ethical principles must guide every aspect of veterinary blood donation and transfusion services. Donor animals are not mere biological resources but sentient beings whose welfare must be fully respected throughout the process. The following ethical commitments must be upheld:

- **Voluntary, non-remunerated donation** must be the cornerstone of veterinary blood banking. No monetary incentives should be offered to pet owners or livestock keepers.
- **Regular health checks** are essential to ensure donor suitability and welfare, with clear intervals between donations.
- **Humane handling, rest, and post-donation care** must be guaranteed for every donor animal.
- **Mandatory owner consent** (informed and written) should be obtained prior to every donation.
- **Awareness campaigns,** such as the proposed **"Gift of Life" initiative,** should be launched to promote community participation and build a sustainable and ethical donor base.

Pet owners and farmers must be made aware that donating blood can help save another animal's life and contribute to a humane and responsive veterinary care system.

13. National Veterinary Blood Bank Network (N-VBBN)

To facilitate standardized and equitable access to veterinary blood products across India, a **National Veterinary Blood Bank Network (N-VBBN)** may be considered under the Department of Animal Husbandry & Dairying (DAHD), Government of India. The network would serve as a national platform for:

- Digitally integrated donor registries, categorized by species, breed, location, and blood type.

- A real-time inventory management system, mapping availability of whole blood and components across participating centers.
- A helpline and online portal to connect veterinary clinics, hospitals, and donors in emergency situations.
- Standardization of practices, reporting formats, and adverse reaction logs across all registered blood banks.

Such a network would not only improve logistical efficiency but also promote transparency, traceability, and quality control across the country.

14. Training and Curriculum Development

Capacity-building is critical to the successful implementation of veterinary blood banking systems. Key recommendations include:

- Integration of transfusion medicine topics into the Bachelor of Veterinary Science & Animal Husbandry (BVSc & AH) curriculum, with emphasis on donor selection, transfusion protocols, and reaction management.
- Postgraduate (MVSc) courses should offer specialized modules on transfusion science and clinical transfusion medicine.
- Continuing Veterinary Education (CVE) programs must be developed for practicing veterinarians, including hands-on workshops and online certification courses.
- Nodal training institutes can be identified to act as centers of excellence in transfusion medicine, supporting regional knowledge dissemination.

15. Future Directions

To align with evolving clinical needs and technological advancements, the veterinary transfusion sector must pursue the following innovations:

- Development of mobile applications for donor-recipient matching, scheduling, and logistics support along with Real-time inventory dashboards with geo-tagged availability
- Establishment of cryopreservation and biobanking units to extend storage life and support rare blood type availability.
- Research into autologous transfusions (self-donation) and xenotransfusion techniques, where feasible and ethically permissible.
- Introduction of mobile blood collection units to expand access in underserved rural and peri-urban areas.
- Regular impact assessments and feedback loops to refine practices and incorporate new findings.

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Annexure

1. Donor Registration Form

(Linked with microchip/ID and donor registry)

Field	Details
Donor ID / Microchip No.	
Species / Breed	
Age (Y/M)	
Sex	☐ Male ☐ Female
Weight (kg)	
Vaccination Status	☐ Up to date ☐ Due
Deworming Status	☐ Yes ☐ No
Tick/Flea Control	☐ Yes ☐ No
Health Screening Results (CBC, hemoparasites, infectious diseases)	
Previous Donations (date & volume)	
Annual Donation Count	
Owner Name	
Owner Contact	
Community / NGO Linkage (if any)	
Consent Form Attached	☐ Yes ☐ No
Vet Officer Name & Signature	

2. Informed Consent Template (Owner/Guardian)

I, _____ (owner/guardian), hereby consent to voluntary donation of blood by my animal:

- **Species / Breed: _____**
- **Age: _____ Weight: _____**

I confirm that:

- Participation is voluntary, with the right to withdraw at any stage.
- No monetary compensation will be provided; only ethical in-kind incentives may apply.
- My animal will receive proper post-donation rest and care.
- Donation frequency will not exceed the SOP limits (max 6 per year dogs, 3 per year cats; min 30-day interval).
- My animal's medical data will remain confidential.

Owner Signature: _____ Date: _____

Veterinary Officer Signature: _____ Date: _____

3. Transfusion Monitoring Sheet

Parameter	Pre-Transfusion	15 min	30 min	Hourly	Post
Temperature (°C)					
Pulse Rate (bpm)					
Respiration Rate (/min)					
Blood Pressure (if feasible)					
Mucous Membrane Color					
Capillary Refill Time (CRT)					
IV Site Condition					
Adverse Reactions	☐ None ☐ Rash ☐ Shock ☐ Hemolysis ☐ Vomiting ☐ Collapse				

4. Blood Product Label Sample

BLOOD BANK ID: _____

Product Type: ☐ Whole Blood ☐ Plasma ☐ Cryoprecipitate ☐ PRBC ☐ Platelets

Donor ID: _____ Species: _____

Collection Date: _____ Expiry Date: _____

Volume: _____ ml

Storage Conditions: _____

Screening: ☐ Passed ☐ Deferred

QR/Barcode: [space for code]

5. Transfusion Checklist

Pre-Transfusion

- ☐ Cross-match performed and recorded
- ☐ Product verified (type, expiry, storage compliance)
- ☐ Donor-recipient ID verified
- ☐ Owner's Consent obtained
- ☐ Emergency kit ready (adrenaline, IV fluids, O
- ☐ Baseline vitals recorded

During Transfusion

- ☐ Infusion started slowly (first 15 min critical)
- ☐ Vitals monitored and recorded
- ☐ Observation for reaction signs (rash, dyspnea, collapse)
- ☐ Infusion rate adjusted as per SOP

Post-Transfusion

- ☐ Patient monitored 2–4 hrs post
- ☐ Vitals recorded at end
- ☐ Reactions documented & reported
- ☐ Monitoring sheet filed into records
- ☐ Used bag/tubing disposed as per biomedical waste rules

6. Adverse Transfusion Reaction Reporting Form

Patient ID	Species/Breed	Date	Blood Product	Donor ID	Reaction Type (tick)	Action Taken	Outcome	Reported By
					☐ Fever ☐ Rash ☐ Shock ☐ Collapse ☐ Hemolysis ☐ Other			

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Department of Animal Husbandry & Dairying
Ministry of Fisheries Animal Husbandry & Dairying
Government of India