**CHAPTER I**

**INTRODUCTION**

Rodenticide is a chemical agent used to destroy rats or other rodent pests or prevent them damaging food, crops, etc. Toxicity is the quantity or amount of a poison that causes a toxic effect in living individuals. Rodenticide create toxicity in all kinds of animal species ( Konnie H. Plumlee,2004). Rodenticideare different kinds such as Coagulopathy Anticoagulant rodenticides, Brown recluse spider, Coumarin glycosides , Pit vipers , Sulfonamides, Aspirin etc. ( Konnie H. Plumlee,2004). Anticoagulant rodenticides are the largest group of pesticides used for control of harmful rodents (Litovitz et al., 1998;Morrissey et al., 1995; Murphy and M.Johan., 2002). At present, they are among the most commonly employed Rodenticide and therefore responsible for numerous accidents involving humans and animals – both domestic and wild( Eason et al., 2002; Fournier-chamberlain et al., 2004 ; Berny et al., 1997). Most commonly, domestic and wild animals are intoxicated by intake of anticoagulant rodenticides (primary opportunity). The lack of odor and its pleasant taste due to the schools' content appear to be additional reasons for the extensive incidences of intoxication in humans and animals ( Endepols et al., 2003; Binev et al., 2005 ). Another main cause is the ingestion of dead or alive poisoned rodents (secondary opportunity) by dogs, cats, swine, wild mammals, or birds ( Kohn et al., 2003). The number of incidents involving intoxications following a direct skin contact (Spiller et AI., 2003) or through drinking water ( hydroxycoumarin derivatives are water soluble) are less frequent. Spontaneous intoxications with anticoagulant rodenticides are reported in dogs ( Hansen et al., 2003; . Lewis et al., 1997; Mount et al., 2003; Woody et AI., 1992), horses ( Boermans et al., 1991), cats ( Petterino et al., 2001), wild animals (deer, polecats, owls, eagles, falcons, ducks, martens, foxes, etc.) (Newton et al.,1990 ), and humans(Crowther et al., 2000; Huic et al.,2002; Lagrange et al.,1999). The initial symptoms are general and non-specific – somnolence, weakness, pale mucous, decreased or lacking appetite, frequent urination, increased thirst, decreased locomotion and perception, and rapid and easy exhaustion ( Petterino et al., 2004; Robben et al., 1997; Stone et al., 2003; Munger et al., 1993). Other clinical symptoms are bloody faeces (Lutze et al., 2003). It is essential for the precise and confident diagnosis of anticoagulant rodenticide intoxication in animals (Buckle A.P. 1994). Hematological abnormalities – anemia and hypochromasia, decreased haematocrit values, leukocytosis with neutrophilia, thrombocytopenia, enhanced erythrocyte sedimentation rate, and decreased mean corpuscular volume (Boermans et al., 1991). For anticoagulant rodenticide toxicity high dose Vitamin K1 is used (Crowther et al., 2000; Franco et al., 2004; Schmid et al., 1986 ). In emergency case, vitamin K1 should be applied subcutaneously at a dose of 5 mg/kg at several sites after the stabilization of the patient via transfusion of whole blood or blood plasma (Hanslik et al., 2004). Fresh or frozen plasma (9 ml/kg) or whole blood (20 ml/kg) IV is required to replace needed clotting factors and RBC if bleeding is severe (Mohan Tiwari and Malini Sinha, 2001 ). Red blood cell (RBC) transfusions have become an important tool in veterinary critical care and emergency medicine (Weingart et al., 2004). Fresh whole blood is composed of RBCs, white blood cells (WBCs), platelets, all the coagulation factors, albumin and immunoglobulin’s (Chiaramonte, 2004). The transfer of blood or blood components from one person (the donor) into the bloodstream of another person (the recipient) that is called blood transfusion. The present study describes about Blood transfusion in dog in case rodenticide toxicity. The main goal of this study was to-

 1. Assess effect of whole blood infusion in a dog for rodenticide toxicity.

 2.To know the technique of blood transfusion in dogs treating for other hemolytic disorder.

**CAPTER II**

**REVIEW OF LITERATURE**

**Rodenticide:** Rodenticides are pesticidal compounds that are used to destroy rodentsparticularly mice, field mice; rats and sewer rats ( Mohan Tiwari and Malini Sinha, 2001). Rodenticide are different kinds such as Coagulopathy Anticoagulant rodenticides, Brown recluse spider, Coumarin glycosides , Pit vipers ,Sulfonamides, Aspirin etc **(**Konnie H.Plumlee, 2004).Anticoagulant rodenticides are probably the most commonly used of such means around the world. It has been estimated that approximately 95% of all rodenticides used are anticoagulant baits. Anticoagulant rodenticides are classified into two principal groups: derivatives of coumarin and indanedione. The preparations from the first group are more extensively used and provoke severe injury to vascular permeability, resulting in massive haemorrhages and the rapid death of rodents (Samama et al., 2002; Radi and Thompson, 2004).All anticoagulants have the basic coumarin or indanedione nucleus. The “first-generation” anticoagulants **(**warfarin**,** pindone, coumafuryl, coumachlor, isovaleryl indanedione, and others less frequently used) require multiple feedings to result in toxicity. The “intermediate” anticoagulants (chlorophacinone and in particular diphacinone) require fewer feedings than “first-generation” chemicals, and thus are more toxic to nontarget species. The “second-generation” anticoagulants (brodifacoum and bromadiolone) are highly toxic to non target species (dogs, cats, and potentially livestock) after a single feeding.

**Table 1.** **Classification and toxicological features of anticoagulant rodenticides.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  Group | Generic namepreparations | Commercialformula | Chemicalformula | Acute oral toxicity LD50 (mg/kg) dog |
| Hydroxycoumarin | First generation | Coumachlor | Tomorin | C19H15ClO4 | 900 |
| Coumafuryl | Kumatox, Ratafin | C17H14O5 | 0.4 |
| Coumatetralyl | Rodentin | C19H16O3 | 16.5 |
| Warfarin | Warfarat, Zoocoumarin | C19H16O4 | 58 (11-323) |
| Second generation | Brodifacoum | Folgorat, Klerat, Talon, Rodend | C31H23BrO3 | 0.26 |
| Bromadiolone | Lanirat, Contrac, Bromorat, Musal | C30H23BrO4 | 1.125 |
| Difenacoum | Matrac, Rastop, Ratak, Silo | C31H24O3 | 1.8 |
| Difethialone | Frap, Quell | C31H23BrO2S | 0.56 |
| Flocounafen | Storm | C33H25F3O4 | 0.46 |
| Indandione | Chlorophacinone | Delta, Patrol | C23H15ClO3 | 20.5 |
| Diphacinone | Ratindan, Ratik | C23H16O3 | 3 |
| Pindone | Pival, Tri-ban | C14H14O3 | 50 |
| Valone |  | C14H14O3 |  |

**Mechanism of the toxic activity:**

The action mechanism of hydroxycoumarin and indandione anticoagulant rodenticides isidentical, which yields similar clinical manifestations, hematological alterations or abnormalities, and treatment schedule, regardless of the preparation group (Samama et al., 2002). Anticoagulant rodenticides inhibit the recycling of vitamin K1, a cofactor of primary importance for postribosomal carboxylation (activation) of blood clotting factors II (prothrombin), VII (proconvertin), IX (Christmas factor), and X (Stuart-Prower factor), by the enzyme vitamin K- dependent carboxylase, maintaining the active form of vitamin K (Petterino et al.,2001; Smith et al.,2000). By the enzyme vitamin K-dependent carboxylase, the active vitamin K is transformed into an inactive epoxide that is thereafter reconverted into vitamin K (vitamin K quinone), by the enzyme vitamin K epoxide reductase. In the next step, the vitamin K reductase converts vitamin K quinone into vitamin K1 hydroquinone that is integrated again in the carboxylation cycle of blood clotting factors II, VII, IX, and X. Then the enzyme vitamin K reductase converts vitamin K quinine into vitamin K1 hydroquinone that enters once again the carboxylation cycle of blood clotting factors II, VII, IX, and X (Buckle. A.P, 1994). Anticoagulant rodenticides inhibit vitamin K epoxide reductase, resulting in a lack of active vitamin K. This mechanism contributes to blood clotting factors (II, VII, IX, and X) that are not carboxylated and remain nonfunctional (Litovitz et al.,1998; Murphy and M.johan, 2002). Because anticoagulant rodenticides do not block these factors, their concentrations in blood decrease about 12-24 hours after the intoxication coinciding with the first massive bleeding episodes (Petterino et al., 2001; Woody et al., 1992). The half-life in canine plasma of warfarin is 15 hours, diphacinone is 5 days, and bromadiolone is 6 days, with maximum effects estimated at 12-15 days. Brodifacoum may continue to be detectable in serum for up to 24 days(Petterino et al., 2001; Woody et al., 1992).

**Clinical signs:**

The initial symptoms are general and non-specific – somnolence, weakness, pale mucosa,decreased or lacking appetite, frequent urination , increased thirst, decreased locomotion and perception, and rapid and easy exhaustion (Fournier-Chambrillon et al., 2004; Sheafor et al.,1999). The data about rectal body temperature (BT) are contradictory Petterino et al.,2004 reported decreased BT, while Binev et al., 2005 reported hyperthermia. These data result from the application of various doses and types of toxic compounds, but depend mostly on the stage of intoxication. In the early phase, hypothermia is rather encountered and at a later stage (after 2-3 days) BT increases. The findings about the changes in heart and respiratory rates are however uniform. All investigators report tachycardia and polypnea with dyspnea in spontaneous or experimental intoxications, regardless of the animal species, the amount or the type of the toxic substance, and the stage of intoxication. Other clinical symptoms are bloody feces, hemorrhages (petechiae and ecchymoses) on the skin and mucosa (Lutze et al., 2003), hyphema (hemorrhages in the anterior eye chamber between the cornea and the iris) and petechial hemorrhages in conjunctivae, vomiting and hematemesis, nasal bleeding, vaginal bleeding, and ear bleeding, dysuria, and hematuria (Lewis et al., 1997). The presence of pulmonary edema, intrapulmonary and pleural hemorrhages (Kohn et al., 2003), correlated with the observed 2-sided, air- and blood-containing nasal discharges (Binev et al., 2005).

**Diagnosis:**

Anticoagulant rodenticide toxicities is usually diagnosed based on history of Ingestion of the substance. Differential diagnoses when massive hemorrhage is encountered include disseminated intravascular coagulation, congenital factord efficiencies on Willebrand’s disease, platelet deficiencies, and canine ehrlichiosis. A prolongedprothrombin, partial thromboplastin, or thrombin time in the presenceof normalfibrinogen, fibrin degradation products, and platelet counts is strongly suggestive of anticoagulant rodenticide toxicosis, as is a positive therapeutic response to vitamin K1 (Frederick w. O., 1998).

**Table 2: Consolidated table showing average Hb%, RBC, WBC & platelets count in after exposure to bromadiolone** by K. Revathi1 and M. Yogananda (2006) is given below

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameters** | **APC\* ml/kg** | **Hb%** | **RBC** | **WBC** | **Platelets** |
| Control | - | 84.58±0.40 | 5.26±0.17 | 6766±0.22 | 3.15±0.22 |
| 06 hrs | 2.693 | 68.5±0.20 | 3.3±0.15 | 6808±0.16 | 2.90±0.09 |
| 12 hrs | 5.388 | 74.25±1.04 | 3.42±0.12 | 7166±0.12 | 2.31±0.10 |
| 24 hrs | 12.098 | 70.33±0.52 | 4.12±0.08 | 9583±0.20 | 2.21±0.10 |
| 48 hrs | 12.526 | 77.5±0.51 | 4.20±0.11 | 8633±0.15 | 2.18±0.11 |

**Treatment**:

The administration of emetics and active charcoal suspension are recommended in the first 4 hours of the intoxication (Murphy and M. Johan., 2002; Mount et al., 2003 and Franco et al.,2004). At the time of the appearance of clinical signs, it is necessary to begin the specific antidote therapy. It consists in the application of high doses of vitamin K1 (Hanslik et al.,2004; Franco et al., 2004). In dogs, the preparation is applied perorally at average doses of 1.5-2.5 mg/kg twice daily (Murphy and M. Johan, 2002)**.** Recommended dosages vary from 0.25-2.5 mg/kg in warfarin(coumarin) exposure, to 2.5-5 mg/kg in the case of long-acting rodenticide intoxication (diphacinone, brodifacoum, bromadiolone)(Konnie H. Plumlee, 2004). Vitamin K1 is administered Subcutaneously (with the smallest possible needle to minimize hemorrhage) in several location to speed absorption. Intra Venus administration of vitamin K1 is contraindicated, as anaphylaxis may occasionally result (Konnie H. Plumlee, 2004).Warfarin exposures should be treated for 14 days, bromadialone for 21 days, and other second-generation anticoagulant exposures for 30 days. ( Mohan Tiwari and Malini Sinha, 2001). Administration of oral vitamin K1 with a fat-containing ration, such as canned dog food, increases its bioavailability 4-5 times as compared with vitamin K1 given alone ( Mohan Tiwari and Malini Sinha, 2001). Fresh or frozen plasma (9 mL/kg) or whole blood (20 mL/kg) IV is required to replace needed clotting factors and RBC if bleeding is severe or anemic( Mohan Tiwari and Malini Sinha, 2001).

**Blood transfusion:**

The transfer of blood or blood components from one person (the donor) into the bloodstream of another person (the recipient) that is called blood transfusion. Anaemia is the most common reason for administering blood transfusion in veterinary practice .It can be the results of blood loss (hemorrhage or RBC destruction). Although blood transfusion is life saving, they are not a definitive treatment for disease. Hence, they are use to Provide support, correct deficiencies and control disease with an underlying diagnosis is found ( Jenny Helm and Clare Knottenbelt,2010).

**History of blood transfusion:**

The history of transfusion medicine dates back to the Early Modern Period immediately following the Renaissance, with landmark discoveries, such as William Harvey's theory of circulation (1628), making advances in this field possible. It was not until the 19th century that transfusion became a more common occurrence, albeit as a high-risk procedure, in women suffering from postpartum hemorrhage. The 20th century saw several major breakthroughs that made this practice safer and more widespread, including the discovery of anticoagulants and preservatives for blood products, the description of human blood groups, and the development of compete compatibility assays (Bird GW, 1991). The tragic occurrence of World War II enhanced developments in transfusion medicine, including large-scale blood-banking under the Red Cross. In the veterinary field, transfusion medicine emerged as a practice from the 1950s onwards (Hosgood G, 1990). Recently, research on substitutes for oxygen transport led to the approval in 1998 by the United States Food and Drug Administration of a hemoglobin-based oxygen carrying solution for use in dogs ( Anne Lanevschi and K. Jane Wardrop, 2001).

**Relation with Blood transfusion and toxicity:**

In case toxicity, Mohan Tiwari and Malini Sinha,2001 suggested that in case of in severe anemic condition 9ml/kg fresh/frozen plasma or 20ml/kg whole blood is supplied to improve the condition of patients.

**Key facts of blood transfusion:**

* Transfusion like with like: Blood transfusion should be carried out using the same blood group for a given species.
* Replace what is needed: Only replace what the patient is missing or has lost in order to reduce the risk of blood transfusion.
* Blood is a biological drug: It should therefore be treated the same way as every other prescribed medication.
* Blood products are not a cure: In most circumstances, blood products do not provide a cure . Instead they give support until a diagnosis is reached and /or a treatment is instigated( Jenny Helm and Clare Knottenbelt,2010).

**Table 3: Normal range of blood component**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Canine(Dog)** |
| Hematocrit (PCV) | % | 40-59 |
| Hemoglobin | g/dl | 14-20 |
| Red Blood Cell Count | x106/µl | 5.6-8.7 |
| White Blood Cell Count | /µl | 6,000-17,000 |
| Neutrophils | /µl | 3,000-12,000 |
| Lymphocytes | /µl | 530-4,800 |
| Monocytes | /µl | 100-1800 |
| Eosinophils | /µl | 0-1,900 |
| Basophils | /µl | <100 |
| Platelets | /µl | 145-440 |

**Table 4: Blood groups of dog**

There are 8 major group in dog, labeled as DFA (Dog erythrocyte antigen) 1-8.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **DEA group** | **"old" name** | **Populationincidence\*** | **Natural antibody** | **Transfusion significance** |
| **1.1** | A1 | 40-60% | No | Acute hemolytic reaction |
| **1.2** | A2 | 10-20% | No | Acute hemolytic reaction |
| **3** | B | 5-20% | Yes | Delayed hemolysis |
| **4** | C | 85-98% | No | None |
| **5** | D | 10-25% | Yes | Delayed hemolysis |
| **6** | F | 98-99% | No | Unknown |
| **7** | Tr | 10-45% | Yes | Delayed hemolysis |
| **8** | He | 40% | No | Unknown |

 (Jenny Helm and Clare Knottenbelt,2010)

**Cross matching**:

Cross matching are mainly two types

 1. Major matching

 2. Minor matching

**Major matching:**

 Donor blood Recipient plasma

 Clot of blood

 Avoid of blood transfusion.

**Minor matching:**

 Donor plasma Recipient blood

 Clot of blood

 Avoid of blood transfusion.

**Method of cross matching:**

1. Centrifuge (1000 x g or 3400 rpm) whole blood from a red-top (no anticoagulant) tube (Vacutainer; Becton-Dickinson, Franklin Lakes, New Jersey, USA) in order to obtain serum, and whole blood from a purple-top (EDTA) tube (Vacutainer; Becton-Dickinson) in order to obtain RBCs from both the patient and donor.
2. Washing RBCs: resuspend 0.25 mL of RBCs in 2 to 4 mL of saline; centrifuge 1 min, remove supernatant, and repeat the procedure twice; remove supernatant.
3. Resuspend 0.1 to 0.2 mL of RBCs in approximately 4.8 mL saline in order to obtain a 2% to 4% RBC solution.
4. In 3 tubes identified "Major," "Minor," and "Control" add the following:

|  |  |  |  |
| --- | --- | --- | --- |
|  | "Major" cross match | "Minor" cross match | Control |
| Patient | 2 drops serum | 1 drop RBC solution\* | 1 drop patient RBC solution\* + 2 drops patient serum |
| Donor | 1 drop RBC solution\* | 2 drops serum | 1 drop donor RBC solution\* + 2 drops donor serum |

1. Incubate tubes 15 min at 37°C.
2. Centrifuge tubes 15 s.
3. Reading results: Note serum color and record any hemolysis. Then gently resuspend the red cell button into the overlying serum layer, noting the presence of agglutinating clumps. Next, place a drop of resuspended RBCs on a slide, apply coverslip, and read at lOOX and 400X. If the cross match is compatible, the RBCs should be individually distributed. Hemolysis (compared to control) or agglutination is seen with an incompatible cross match.
4. Rouleaux, a physiological plasma-related phenomenon, may sometimes be observed. In order to distinguish this from agglutination, centrifuge the tubes again for 15 s, remove serum, and add 2 drops of saline; then centrifuge the tubes once more and reexamine the RBC suspensions saline solution containing 2 to 4% RBCs; EDTA - ethylenediaminetetraacetic acid ( Anne Lanevschi and K. Jane Wardrop, 2001).

**Calculating the amount of blood to be transfusion:**

 (Required PCV –Recipient PCV)

Blood volume to be transfusion = K X Weight of Recipient X

 (Kg) PCV of donor

 Where k is a constants, which is 90 in dog ( Pichler and Turnwald,1985).

**Table 5: Doses and rates of blood transfusion**

|  |  |
| --- | --- |
| **Parameter**  |  **Blood** |
|  Dose | Dose should be calculated using the formula, but a rough guideline is 12 to 20 ml/kg. |
|  Dose rate | 1to 5 ml/kg/hour. |
|  Other considerations |  Start at a low dose rate and increase it gradually while monitoring the patient closely. |

The doses and dose rate provided above are a guideline only. However the flow rate may be increased and depending on an individual patient. The total dosage will also depend on the patient’s needs. Any blood transfusion should be completed within four hours (Helm and Clare Knottenbelt, 2010).

**Donor selection:**

Donor welfare is paramount and therefore careful selection of a donor and a clear understanding of the methods and amounts of blood that can be collected are vital. Donors need to be matched to the recipient; in dogs, this is less important for first transfusions, but becomes vital for subsequent transfusions ( Helm and Clare Knottenbelt, 2010).

**Blood collection:**

Under optimal circumstances to ensure that a donation goes smoothly, at least three members of staff should be available for blood collection, with one person restraining the donor, another holding the needle in place and a third weighing and gently mixing the donation bag or applying suction and mixing the syringe to make sure that anticoagulant is thoroughly mixed with the blood. A skilled phlebotomist is preferred to minimize stress to the patient, aid blood flow and to help prevent complications such as the development of microthrombi at the site of venepuncture. During collection, the needle should be held as still as possible while another person gently mixes the bag or syringe. The bag should be weighed periodically until the target weight is obtained.

**CHAPTER III**

**MATERIALS AND METHODS**

**Materials:**

22 years Labrador donor dog, 5 months Labrador recipient dog, whole blood, Blood bag, and Blood transfusion equipments, vitamin k1 and antihistamine.

**Study area and period:**

The study was conducted in Veterinary College & Research Institute teaching hospital, Namakkal, Tamil Nadu, India. This study period was at 1st -14th October, 2012 in Small animal unit during my internship program.

**Case history:**

A five months old Labrador dog weighing 4Kg was brought to the Small Animal Medicine unit of VC & RI Teaching Veterinary Hospital at 1st October, 2012 , with history of eating households rodenticide before two days back with clinical signs, weak and lethargic and after examination of the patients following observation was seen, Body temperature was found100 $℉$ ,Heart rate100/min, Pulse rate 65/min, CRT(capillary refilled time)was 4 sec, pale mucus membrane and SFT(Skin fold test) was 3 sec that indicated moderates types of dehydration.

**Laboratory test:**

The blood sample was collected for different types of Blood test such as PCV, TLC, WBC, Hb, Total bilirubin, Creatinine. After the test, PCV was found 15%, TEC was found 2.3x106million/μl, WBC was found 19.1 G/L, Hb was found 72 g/L, Total bilirubin was 28.6μmol/L and Creatinine was found 148 μmol/L.

**Diagnosis:**

On the basis of clinical history, physical examination, close inspection, laboratory test the case was diagnosed as anticoagulant rodenticide toxicity and dog was severely anemic.

**Treatment:**

After diagnosis, at first we used vitamin k1 2ml Sub cutaneous injection as a antidote of anticoagulant rodenticide to neutralized the blood level rodenticide toxicity and that was prescribed for two week 2ml daily. After first injection of vitamin k1, we transfused 120 ml of whole blood to the patient to minimize the anemia. During blood transfusion the patient was closely observed and monitored. Immediately after blood transfusion 1ml antihistamine (Pheneramine meleate) intra muscularly was given to protect any kinds of hypersensitivity reaction and prescribed for 3 days.

**Donor selection:**

The owner had 22years old brown body colour Labrador dog weighing 29 kg. We used the dog as a donor dog. Before blood collection the normal parameter were found as body temperature -101.5℉, Pulse rate 80/min, heart rate 120/min, CRT (capillary refilled time) 2sec, pink mucus membrane and PCV-60%.

**Calculating the amount of blood to be transfused:**

For calculating the require amount of whole blood we were used Pichler and Turnwald equation. In the equation K is constant and for dog that’s was 90.Weight of the recipient was 4 Kg. The normal range of the PCV of dog is 40-59.Pationt PCV level was found 15%. Required PCV level was 35% which was around the normal range of PCV level. Donor PCV was found 60%, so required volume of blood transfusion was:

 (Required PCV –Recipient PCV)

Blood volume to be transfusion = K X Weight of Recipient X

 (Kg) PCV of donor

 **So,** Volume= 90 x 4 x (35-15)/60

 = 120 ml blood.

**Equipments required for blood transfusion:**

For blood collection, we were used 350ml blood collection bag with anticoagulants, for blood collection from donor 16 gauge needle was used and for blood transfusion to the recipient 22 gauge needle was used. Local anesthetic solution and Antiseptic solution was used during needle insertion. A saline stand was used during blood transfused to hang the blood bag. Mask wear also used for restraining the patient.

 **Blood collection:**

The procedure was completed within 15 to 25 minutes .At that time, two persons were helped to complete the blood transfusion. The donor dog was so much friendly so there was not needed any sedative. One restrained the dog and other person inserted needle into the jugular vein, and collected blood in the collection bag, during collection of blood gently mixing the bag every few minutes. 120 ml of blood was collected from a donor. During collection of blood the donor place lateral or Sternal recumbence.

**Storage:**

we were stored the blood in 350ml blood collection beg , after collection of blood we transferred it to the Recipient immediately.

**Blood transfusion:**

Collected blood was immediately transfusion to the recipient. The blood bag was attached to transfusion line and used a 22 gauge needle to transfuse. First restrained the patient then inserted the needle to the cephalic vein of left leg. In that case, we used Ockler’s methods to blood transfusion, it is a suitable method for field level, it is applied in first time of blood transfusion in any patient, if second time it was done, then cross-matching is to needed. During first10- 15 minutes blood transfusion was given slowly and kept a close observation to the patient. The process was completed within 45 minutes.



**Fig-1: Clinical Examination of the dog. Fig-2: Blood transfusion in the dog.**

**CHAPTER IV**

**RESULT AND DISCUSSIONS**

After blood transfusion the patient was kept close observation and regular monitoring. To ensure the condition of patient blood tests was performs 4th and 8th days and toke the data in a record shed for compare the condition of patient.

**Table 6: Different parameters of patient before and after blood transfusion**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Transfusion | Heart rate | Pulse/ min | CRT | Mucus membrane | Body tem$℉$ | PCV% | Hb g/L | WBC G/L | Total bilirubin μmol/L | Creatinine μmol/L |
| Before | 130 | 65 | 4 sec | pale | 100 | 15 | 72 | 19.1 | 28.6 | 148 |
| After(day 4) | 109 | 75 | 2 sec | Somewhat pink | 102 | 36 | 82 | 15.2 | 22.8 | 124 |
| After(day 8) | 115 | 82 | 2 sec | pink | 103 | 40 | 88 | 16.4 | 23.5 | 109 |

Before blood transfusion normal parameters of patient was body temperature was100$℉,$ heart rate 130/minute, pulse rate 65/minute, CRT 4 seconds, pale mucous membrane, PCV 15%, Hb 72 gram per litter, total bilirubin 28.6 μmol/L, Creatinine 148 μmol/L respectively. After blood transfusion the value was changed; day 4 and 8 the heart rate was found 109 and 115 respectively, Pulse rate was found 75 and 82, CRT 2 seconds, Body temperature 102 and 103$℉$, PCV 36 and 40%, Hb 82 and 88 g/L, Total bilirubin 22.8 and 23.5 μmol/L, Creatinine 124 and 109 μmol/L respectively and Mucous membrane became pink.

 Fig-3: Graphical presentation of PCV value after Blood transfusion.

The administration of emetics and active charcoal suspension was recommended in the first 4hr of the intoxication (Murphy and M. Johan, 2002; Mount et al., Franco et al., 2004). But that was 2 days old case, so this treatment was not performed with that patient for life saving. When clinical signs was developed then using the antidote. In case of rodenticide toxicity the specific antidote is it-K1 (Hanslik et al., 2004; Franco et al., 2004). In case of rodenticide toxicity administration of specific antidote is very important and that's why we used vitamin K1, to detoxifying agent for the rodenticide for 14 days, because the rodenticide half live is varies from 12 hours to 14 days (Petterino et al., 2001; Woody et al., 1992), we did not know which rodenticide created toxicity to the dog, so we applied maximum days of this antidote. Vitamin K1 was created anaphylaxis occasionally (Mohan Tiwari and Malini Sinha, 2001). For control that, antihistamine solution (Pheneramine meleate) was used. Rodenticide toxicity was created a critical condition of patients and create severe anaemia. In this case the PCV level was decreased by 15%, which was very less from the normal range. we know that a blood transfusion was needed if the blood PCV level is below 20% (Pichler and Turnwald, 1985). So in this case we transfused blood for the live saving of dog and this applied 120 ml blood was transfused the patient to improve the condition. In case of anticoagulant rodenticide toxicity extensive hemorrhage is seen, (Lutze et al., 2003; Kohn et al., 2003), so blood level of the body decreases. Blood is the main connective compounds of the body, if the blood level dramatically decreases whole body mechanism is disrupted, so for saving of lives we supplied blood from outside, that is blood transfusion was done. After transfusion the PCV level increased by 33%, which was around normal range. In this case, we gave blood without cross-matching, in case of first time blood transfusion cross matching is not so important (Harrell and Kristensen, 1995). And the availability of suitable cross-match donor is also rare. So we gave blood without cross-matching. After blood transfusion the mucous membrane became pink, which indicated the condition of the patient was improved. In this case, for the control of hypersensitivity reaction we used antihistamines (Pheneramine meleate). Under medication period, the condition of patients was gradually improved and pulse rate, PCV, Hb were increase. After blood transfusion the PCV level was increased, on day 4, PCV was founded 36% and 8th days PCV was found 40% which was around normal level. The condition of the patient was also improved day by day.

**CHAPTER V**

**CONCLUSION:**

I think in rodenticide toxicity the application of vitamin K1 and blood transfusion is the best treatment for the patient. And the patient was fully recovered within 14 days. So, we can recommend that blood transfusion is a live saving procedure.

 Blood transfusion is a new idea in veterinary practice. It save life in critical condition, In Bangladesh this idea can be used in small animal practice and this is easy and affordable technique so blood transfusion procedure can be recommended in our country. As this is the easy and affordable technique so we can recommended blood transfusion in dog for Bangladesh perspective.

**CHAPTER VI**

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