OVERVIEW OF CANINE TRANSFUSION MEDICINE

The interest in transfusion medicine has drastically increased in the last decade. The National Institute of Health gave "Transfusion Medicine Academic Awards" to 5 veterinary schools helping to spawn interest in transfusion medicine. This led to the establishment of several commercial animal blood banks, and recently to the publication of several important clinical studies plus three books on veterinary transfusion medicine. There has been a marked shift from whole blood administration to evolving blood component therapy.

BLOOD DONOR CONSIDERATIONS

Blood comprises about 8% of body weight. Dogs over 27kg can donate one full unit (450ml or 16ml kg) of blood every 3 weeks without any adverse effects. Donors should be blood typed and screened for general health and for endemic infectious diseases. The canine donor can be bled in two different positions. One position is lateral recumbency with the animal elevated up on a standard exam table. Placing the donor's head and neck on a small pillow will cause the jugular to protrude slightly from the muscles of the neck and the shoulder to retract slightly from the work area. Some dogs resist lateral recumbency but are content to lay sternally.

CANINE BLOOD TYPING

More than a dozen blood type groups have been described in the dog. The various systems are referred to as Dog Erythrocyte Anitigens with the abbreviations DEA followed by a number. The DEA 1 system seems to be the predominant blood type in North America. This group has three subgroups: DEA 1.1 (also known as A1); DEA 2.2 (A2); and rare type (A3). A dog's red blood cells can be DEA 1.1 positive or negative. DEA 1.1 negative cells are preferred over positive cells to help avoid future transfusion reactions.

Recently a blood typing card as a simple in-practice test kit has become available to classify dogs as DEA 1.1 + or - from DMS labs 1-800-567-4367.

CROSS MATCHING

In contrast to cats and humans, dogs do not appear to have any clinically important naturally occurring alloantibodies against other blood types. This is important clinically because:

1.) An initial transfusion between the two dogs is unlikely to cause an acute transfusion reaction.

2.) Blood cross match between two animals that have not received previous transfusions should be compatible and need not to be done.

3.) Alloantibodies can develop often 4-14 days after dogs of different blood types are transfused together. A second transfusion can result in a transfusion reaction at that time. Thus, it is suggested to cross match any dog that has been previously transfused.

4.) Since DEA 1.1 is most antigentic, it is recommended to use DEA 1.1 negative donors for untyped recipients in order to prevent sensitizing a DEA 1.1 negative patient.

PLASMA THERAPY

Different types of plasma can be prepared for use in a variety of disorders. The terminology and storage conditions for these types of plasma has been adopted from terms and conditions used in human blood banking. Fresh frozen plasma (FFP) is plasma which has been prepared and frozen within 8 hours of blood collection. FFP contains both labile and stable coagulation factors, as well as albumin and globulins. It can be stored at -18 degrees C or colder for up to 1 year from the collection date. Frozen plasma (FP), also known as single donor plasma or plasma, is the term used for plasma separated from whole blood at any time during its storage. Care should be taken when separating this plasma from stored whole blood after its maximum expiration period, as hemolysis does occur during the storage of the red blood cells and plasma removed at this time may contain unacceptable levels of hemoglobin and red cell

debris. Frozen plasma is also the term applied to FFP after one year of storage. Frozen plasma is deficient in the more labile clotting factors V and VIII, but contains other clotting factors, albumin, and globulins. It may also be deficient in von Willebrand factor (vWf) especially if it has been prepared from stored whole blood. It may be kept for up to 5 years at -18 degrees C or below. Cryoprecipitate poor plasma (CPP) also known as cryosupernatant plasma, is the plasma which remains following the preparation of cryoprecipitate. Cryoprecipitate poor plasma is deficient in those factors which make up cryoprecipitate i.e. factors VII, IX, and X. Cryoprecipitate poor plasma has an expiration date of 5 years from the collection date when kept at -18 degrees C or below.

Plasma should be thawed at temperatures between 30 and 37 C degrees. Thawing in a refrigerator only should be avoided as cryopreciate will form. Thawing at temperatures above 37 degrees C should also be avoided to prevent protein denaturation or alteration. The bag containing the plasma should be handled minimally until partial thawing has occurred, as the plastic can become brittle while frozen and can break if handled incorrectly. When a water bath or running warm water are used, the bag should be wrapped in a protective overwrap (plastic freezer bags work well) so that water cannot contaminate entry ports. Frozen plasma can be microwaved if metal clamps on the tubing are not present, but extreme care must be taken to aggitate the bag and use a short time setting. This procedure is not recommended for routine thawing of plasma, as microwave ovens may vary and nonuniform heating of the plasma, with resultant protein denaturation can occur. Once thawed the plasma should be used immediately or it may be stored at refrigeration temperatures for no more than 24 hours if being used to correct a labile coagulation factor deficient. Blood administration sets should be used. In order to avoid accidental clot formation the plasma must not be mixed with or delivered in the same intravenous lines as lactated Ringers solution or other calcium containing solutions. A drip rate of 5-10 ml/kg/hour is used. The rate is increased in cases of hemorrhage and hypovolemia and decreased if the patient is predisposed to cardiac overload. Cross matching can be performed prior to the use of plasma in a patient, however, the likelihood of red cell reactions is generally low due to the dilution of any antibody contained in the plasma product following infusion into the patient.

The most appropriate use of plasma is as a provider of coagulation factors for those animals with either inherited or acquired coagulation disorders. Plasma has also been used to provide volume support and as a source of albumin, however the use of alternative therapies such as synthetic colloids are encouraged in these situations.

PLASMA COLLECTION

The private practitioner also can make and store packed RBC's and plasma. To do this, a unit of whole blood is collected into a double collection system (JorVet J-520X). This is a system of two plastic bags joined by tubing to maintain a closed system. Once blood is drawn it is placed vertically in the refrigerator so the RBC's can settle.

Once settling has occurred (approximately 12 hours) the plasma is drawn off into the second bag of the system and placed into the freezer. This is considered stored plasma, not fresh plasma.

GLASS BLOOD COLLECTION BOTTLES

Glass vacuum bottles containing acid citrate dextrose (ACD) anticoagulant preservative solution have been used for many years in veterinary medicine despite their abandonment by human transfusion medicine. The ACD bottles are inferior because contact with glass inactivates platelets and other clotting factors. Glass bottles also require a blood collection set making them actually higher in cost. Ready access to standard plastic bag components will make ACD bottles obsolete.

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