Description: Anticoagulants are used to keep blood in a fluid state. They maintain the integrity of collected blood by preventing clotting and allow the production and storage of whole blood and/or blood components. Anticoagulants fall into 2 basic categories, a). anticoagulants without additives and, b). anticoagulants with red cell preservatives.

ANTICOAGULANTS WITHOUT ADDITIVES:
Anticoagulants without additives prevent clotting but provide no storage capabilities for the red cells. They are sodium citrate, EDTA, and heparin.
Sodium Citrate: Sodium citrate blocks coagulation by chelating calcium. It is very safe, readily metabolized, and the foundation for all anticoagulants used in blood banking. Sodium citrate can be used alone when storage of blood or red cells will not be required or when the plasma will be removed shortly after collection and the red cells either returned to the donor or discarded. Citrate based anticoagulants that are used in blood banking are CPDA-1, CPD, and ACD. The ratio normally used for citrate product anticoagulation is 1 ml sodium citrate per 7 or 8 ml of blood.
Heparin: Heparin prevents coagulation by inactivating the proteolytic activity of thrombin. Heparin has no preservative qualities, so blood collected in heparin must be used within 24 hours. It is not recommended for blood collection and, in most cases, it's use as an anticoagulant in transfusions is contraindicated. It is most often used as an anticoagulant for specific diagnostics.
EDTA: EDTA is not used for collection of blood for transfusion.

ANTICOAGULANTS WITH RED CELL PRESERVATIVES:
Anticoagulants with red cell preservatives prevent coagulation and preserve the life and function of the red cell. They are ACD, CPD, and CPDA-1. The choice of anticoagulant is the most important factor influencing red cell recovery in storage. Although sodium citrate is the base for present day anticoagulants, red cell viability is greatly improved by the addition of glucose (dextrose) as an energy source. Other additives used to increase viability and extend the shelf life of RBCs are adenine, phosphate, and mannitol. When determining storage capabilities for anticoagulants the following standard is used: At least 75% of the transfused red cells must be found in circulation 24 hours after transfusion. It is equally important that red cells maintain their ability to bind and release oxygen when transfused.
CPDA-1:
CPDA-1 is made up of citrate, phosphate, dextrose, and adenine. it is the most commonly used anticoagulant in human medicine for the collection and storage of whole blood. The advantages of CPDA-1 is it is well tolerated and provides the blood a longer shelf life than other anticoagulants. Whole blood collected in bags with CPDA-1 has a refrigerated shelf life of up to 35 days. CPDA-1 is used at a rate of 14 ml /100 ml of blood.
CPD:
CPD is made up of citrate, phosphate, and dextrose. It is used primarily for the collection of whole blood to be processed into components, with the red cells being stored in a red cell nutrient solution which is added back after the plasma is removed. It is also approved for the storage of whole blood.. The storage life of whole blood collected in bags with CPD is up to 21 days. It is used at a rate of 14ml/100ml of blood.
ACD:
ACD is made up of acid, citrate, and dextrose. It is the anticoagulant normally found in vacuum bottles and until 1990 was the anticoagulant most readily available to veterinarians. It is no longer used for the routine collection of blood in human medicine.
Red Cell Additive Solutions (RCAS):
Red cell additive solutions are not approved for the collection and/or storage of whole blood. They are added back to the red blood cells after the plasma is removed from the whole blood and extend the storage life of RBCs up to 42 days. A multiple bag system containing the RCAS is used to add back the solution. It is not generally considered practical for most veterinarians as it must be used in conjunction with a blood centrifuge.

General Note:
When using anticoagulants it is important to use the proper ratio of anticoagulant to whole blood for maximum storage life. The storage life given for each anticoagulant assumes the use of polyvinyl or newer blood grade bags. Storage life is greatly reduced if bottles are used no matter which anticoagulant is used. This is because red cell viability is maintained by the cells ability to "breath" through the bags. This is not possible with glass.

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