Blood Group Determination Assay

For in vitro use

IMPORTANT NOTE: TEST CARD FORMAT HAS CHANGED
Please be sure to review and follow the procedure steps carefully.
Test Cards now contain individual Auto-Agglutination and Patient Test Well. Materials lyophilized in the Control and Patient Test wells are not the same. Test results are obtained using only the patient blood sample.

Description and Intended Use: As the practice of veterinary transfusion medicine has undergone tremendous growth in recent years, the importance of identifying blood types has increased.1,2 While it is broadly true that dogs do not possess isoaantibodies to incompatible blood groups and thus will generally tolerate well an initial incompatible transfusion, sound practice of veterinary medicine dictates that such transfections be avoided. The half-life of the transfused incompatible cells will be quite short and, thus, the intended therapeutic result may not be achieved. Also, the potential future needs of the canine patient must be considered. Antibodies resulting from a transfusion of incompatible blood3 may form in only 5 to 7 days and will have long-term viability. This eliminates the option of using incompatible blood in a future emergency situation. In addition, antibodies developed in bitches by sensitization resulting from transfusion of incompatible blood groups must be of special concern to breeders. Since antibodies are present in the colostrum, bitches with isoaantibodies to a given blood type should not be bred to a sire possessing that blood group if they are expected to nurse the resulting puppies.3 The nursing puppies will develop isoeoserythrolysis and may be susceptible to disease or even die due to hemolytic anemia.4-5

Eight specific antigens have been identified on the surface of the canine erythrocytes.6 The internationally accepted canine blood group system, the "DEA" (Dog Erythrocyte Antigen), is based on these antigens. It currently characterizes eight common blood groups, the antigens DEA 1.1, 1.2, 3, 4, 5, 6, 7, and 8. DEA 1.1 and 1.2 are the most significant blood factor in the dog. Both are highly antigenic but DEA 1.1 is the primary lytic factor in canine transfusion medicine.1,3,7,8,10 Although all of the blood group antigens are capable of stimulating formation of isoaantibodies, DEA 1.1 has the greatest stimulation potential. Thus most reactions resulting from the transfusion of incompatible cells occur when DEA 1.1 positive blood is given to a DEA 1.1 negative recipient.7 Clinically significant reactions to DEA 1.2 may occur but are less severe than reactions to DEA 1.1. DEA 1.7 may be a factor in transfusion reactions, but since it is a cold agglutin and a naturally occurring isoantibody, it is considered to have very little clinical significance. The remaining antigens are considered to cause clinically insignificant transfusion problems.9

Ideally, all transfused blood would be DEA 1.1 and DEA 1.2 negative. Certain breeds such as the Greyhounds are particularly suitable as blood donors because of a low frequency of DEA 1.1 and 1.2 and DEA 7 antigens. However, until the concept of the canine bank is widely accepted with blood readily available from commercial sources, transfusion from dogs that are present in the area at the time of need will remain the norm.

It is estimated that 40% of all dogs are DEA 1.1 positive.2 Because a number of dogs auto-agglutinate and because a very anemic dog may give equivocal results, typing prior to an urgent need for the information is indicated. Identifying a particular dog as DEA 1.1 positive or negative at birth greatly simplifies future decision making. A DEA 1.1 positive dog can receive both DEA 1.1 positive and negative blood. It is estimated that 40% of all dogs are DEA 1.1 positive.2 Because a number of dogs auto-agglutinate and because a very anemic dog may give equivocal results, typing prior to an urgent need for the information is indicated. Identifying a particular dog as DEA 1.1 positive or negative at birth greatly simplifies future decision making. A DEA 1.1 positive dog can receive both DEA 1.1 positive and negative blood. A dog that is DEA 1.1 negative should not receive DEA 1.1 positive blood.

RapidVet-H (Canine DEA 1.1) is intended for use to classify dogs as DEA 1.1 positive or negative.

Principle and Explanation of the Assay: The RapidVet-H (Canine DEA 1.1) assay is based on the agglutination reaction that occurs when an erythrocyte which contains a DEA 1.1 antigen on its surface membrane interacts with a murine monoclonal antibody proven to be specific to DEA 1.1 which is lyophilized on the Test Card. The monoclonal antibody is reconstituted with a diluent to form an antiserum, and is thoroughly mixed with whole blood from the patient. All DEA 1.1 positive erythrocytes react with the antiserum causing agglutination. The antiserum is completely nonreactive with all DEA 1.1 negative erythrocytes. The results are visually identified.

Caveat: A certain number of canine patients exhibit auto-agglutination of varying degrees due to serum factors that cause agglutination of the patient's own red cells. If a patient exhibits this under test conditions, it will not be possible to definitively type this patient without separating the serum and serially washing the remaining red cells before performing the test. RapidVet-H (Canine DEA 1.1) provides a valuable tool for use in such cases.

Reagents and Materials: This test kit contains the reagents and materials listed below. Store upright.

Agglutination Test Cards. Each card has 3 visually defined wells identified as "Auto-Agglutination Saline Screen", "DEA 1.1 Positive Control", and "Patient Test". The cards are packaged individually in sealed polyethylene sleeves each containing a desiccant bag. 1 Bottle Diluent. The clear plastic bottle contains 0.02 mol/L phosphate buffered saline (PBS) at pH 7.4. The dropping tip dispenses 40 µl. Pipettes and Stirrers. Each polyethylene bag contains 2 plastic pipettes and 3 stirrers.

Materials Required But Not Provided: None

Reagent Preparation: None

References:
15. Hohenhaus AE: Problems in Veterinary Medicine, Transfusion Medicine, Philadelphia, J.B. Lippencott Company, 1992
25. Manufactured under license from: Kansas State University
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Procedure:

1. **DRAW** blood from the patient into a syringe or lavender tube coated with or containing EDTA as an anticoagulant. The assay requires only 200 µl whole blood but the tube or syringe should be full so that there is a proper concentration of EDTA. If the blood type is not to be determined immediately, nutrients such as CPDA should not be added.

2. **REMOVE** the Test Card from its plastic sleeve. Save the plastic sleeve and set aside the desiccant bag.

3. **WRITE** the name/number of the dog and the testing date on the Card. Place the Test Card on a flat surface.

4. **DISPARETE** 1 drop of diluent (40 µl) from the dropping bottle into the well marked “Auto-Agglutination Saline Screen”.

5. **ASPIRATE** a small amount of patient sample into the pipette and release 1 drop (50 µl) into the well marked “Auto-Agglutination Saline Screen”. (See Note 1 for correct use of the pipette.) Using a stirrer and pressing downward with the flat portion of the stirrer, spread and mix the materials within the ENTIRETY of this well for about 10 seconds.

6. A small percentage of ill dogs and of healthy dogs auto-agglutinate. If agglutination is observed, STOP the test and perform normal cell washing procedures before proceeding. It may be possible to determine whether the dog is DEA 1.1 positive or negative despite the auto-agglutination if the auto-agglutination is light. However, due to the difficulty of differentiation between positive and negative results in such circumstances, this should be attempted only in emergency situations when the time and/or staff necessary to wash the cells is not available. If the user proceeds on this basis, the following criteria could be used: If the appearance in the patient well is the same as in the auto-agglutination well, the dog is likely DEA 1.1 negative. If the result in the patient well appears as substantially more agglutination than in the auto-agglutination well, the dog is likely DEA 1.1 positive.

If auto-agglutination does not occur, proceed to the next step.

7. **DISPARETE** 1 drop of diluent (40 µl) from the dropping bottle into each of the 2 remaining wells. The diluent assists in reconstitution of the lyophilized material in the control and patient well.

8. **ASPIRATE** a small amount of patient sample into a pipette and release 1 drop (50 µl) into the well marked “DEA 1.1 Positive Control”. Using a new stirrer and pressing downward with the flat portion of the stirrer, spread and mix the materials within the ENTIRETY of the well for about 10 seconds.

9. Again **ASPIRATE** a small amount of patient sample into a pipette and release 1 drop (50 µl) into the well marked “Patient Test”. Using a new stirrer and pressing downward with the flat portion of the stirrer, spread and mix the materials within the ENTIRETY of the well for about 10 seconds.

10. **ROCK** the card, using a transaxial motion, for no more than 1 minute; less if agglutination has occurred in the “Patient Test” well, being sure that the materials are mixed and “rotation” within each well. Be careful not to cross contaminate.

Agglutination is the electrostatic binding of cells and antibodies and thus is reversible. If agglutination seems to appear and then disappear, or if the user is not certain if what is seen is agglutination, this is likely due to a Prozone Effect. This can occur because, as a result of dogs having multiple blood types, there are insufficient DEA 1.1 antigens on the red cell in relation to the concentration of monoclonal antibody. In such instances, add a second drop of diluent and rock the card for an additional 30 seconds before reading the results. This will potentiate the reaction if, and only if, the animal is DEA 1.1 positive.

11. **READ** the results and note the wells where agglutination has occurred.

12. After the card has been read, take a digital photograph of it for a permanent record.

Alternatively, set the card at a 10° angle to allow excess blood to run to the bottom of the wells. Placing the top of the card on the desiccant bag will accomplish this. After the materials on the card have dried, replace the card in its plastic sleeve for a permanent record.

PROCEDURE NOTE 1: Use of the pipette: Hold the plastic tube between thumb and forefinger near the flat, sealed end, squeeze tightly and do not release pressure. Hold the specimen tube vertically and place the open end of the plastic tube below the surface of the specimen. Release finger pressure to draw up the sample.

Next, hold the pipette in a perpendicular position directly over the well to which the sample is to be delivered. Squeeze gently and allow one free drop to fall into the well (50 µl). The pipette is designed to expel slightly in excess of 50 µl to compensate for a small amount of specimen retained by the stirrer.

Use each pipette only once, then discard. Under no circumstance should the pipette be used more than once as cross-contamination can occur causing inaccurate test results.

Results: If the assay was run correctly, visible, gross agglutination should have occurred in the well marked “DEA 1.1 Positive Control”. If there is no agglutination in the positive control well, the test has not been run properly.

If the patient sample shows agglutination in the well marked “Patient Test” and there is no auto-agglutination, the patient is DEA 1.1 positive. If no agglutination is visible in the well marked “Patient Test”, the patient is DEA 1.1 negative.

Any fine, granular appearance developing after 1 minute should be disregarded in determining the results. The speed of agglutination and the size of the clumps of cells of a DEA 1.1 positive patient may differ from that of the positive control well. Unlike humans, an individual animal may possess more than one primary blood type. In such case, the red cells will carry antigens for each such type. Such an animal will carry less DEA 1.1 antigens than an animal that has only DEA 1.1 as a primary blood type.

If the patient is very anemic, the pattern of agglutination may be in the form of discrete, small aggregations each like the head of a large pin rather than gross agglutination.

Limitations of the Procedure:

1. To obtain accurate results it is essential that correct procedure be followed.

2. Always use a new dispensing pipette for each specimen and a new stirrer for each well. Reusing any device will cause cross-contamination and inaccurate results.

3. Always run the control wells on each Test Card even if testing several patients and using several Test Cards. The control wells are used as evidence that the assay has been performed correctly and to create a proper permanent record.

4. The stability of the individual components of the kit varies. Store the components as indicated on the labels. Do not use any component beyond the indicated expiration date. Use of expired materials may cause unreliable results.

5. The diluent is provided in a bottle with a screw cap to minimize inadvertent bacterial or other contamination. Diluent from other sources in the laboratory should not be utilized.

6. The physical integrity of the patient sample is critical to correct results.

7. Always draw a full syringe or lavender tube containing EDTA. Less blood will cause too high a concentration of EDTA in the specimen to be tested.

Known Interfering Substances: None

Performance Characteristics: A total of 145 canine erythrocyte samples, 127 of which were randomly chosen, were tested utilizing both a canine anti-DEA 1.1 antiserum and the RapidVet-H (Canine DEA 1.1) assay. The results were identical: 91 samples were DEA 1.1 positive and 54 were DEA 1.1 negative. Nine of these samples were tested multiple times (from 2 to 5) over a period of several days with consistent results thus proving the reproducibility of the assay.

Disposal: Dispose of all biological materials, pipettes and stirrers in a biohazard container.

Quality Control: All reagents and materials incorporated into this kit have been quality controlled by standard testing procedures using a routine quality control program during manufacture.