QuickVet®
Diagnostic System

Package insert for
QuickVet® Canine DEA 1 Blood Typing Test™
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Introduction

The QuickVet®/RapidVet® Canine DEA 1 Blood Typing Test Cartridge is used in conjunction with the QuickVet® Analyzer for in vitro blood group determination testing. The QuickVet®/RapidVet® Canine DEA 1 Blood Typing cartridge is intended for use in performing a rapid blood group determination for Canine DEA 1 from a drop of canine blood.

The practice of veterinary transfusion medicine has undergone tremendous growth in recent years, and as a result the understanding of the importance of identifying blood types has increased [1–4].

While it is broadly true that dogs do not possess alloantibodies to incompatible blood groups and thus will generally tolerate well an initial incompatible transfusion, sound practice of veterinary medicine dictates that such transfusions be avoided. The half life of the transfused incompatible cells will be quite short and, thus, the intended therapeutic result may not even be attained. Also, the potential future needs of the canine patient must be considered. Antibodies

resulting from a transfusion of incompatible blood may form in only 5 to 7 days and will have long-term viability [5–9]. 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 alloantibodies 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 [6]. The nursing puppies will develop isoerythrolysis and may be susceptible to disease or even die due to hemolytic anemia [6, 10–12].

Eight specific antigens have been identified on the surface of the canine erythrocytes [1, 5]. The internationally accepted canine blood group system, the Dog Erythrocyte Antigen (DEA), is based on these antigens. It currently characterizes eight common blood groups, the antigens DEA 1, 1.2, 3, 4, 5, 6, 7, and 8.

As occurred in human medicine, new antigens are now being discovered on the red cells of dogs. One, DAL, has been reported and is the subject of journal articles. These are often breed specific and thus can be considered rare [13].

The DEA 1 blood group is the most significant blood factor in the dog. The DEA 1 blood group is highly antigenic and is the primary lytic factor in canine transfusion medicine [1, 6, 14–21]. Although all of the blood group antigens are capable of stimulating formation of alloantibodies, DEA 1 has the greatest stimulation potential. Thus most reactions resulting from the transfusion of incompatible cells

occur when DEA 1 positive blood is given to a DEA 1 negative recipient [3, 4, 6]. Clinically significant reactions to DEA 1.2 may occur but are less severe. DEA 7 may be a factor in transfusion reactions, but since it is a cold agglutinin and a naturally occurring isoantibody, it is considered to have very low clinical significance. The remaining antigens are considered to cause clinically insignificant transfusion problems [6].

Ideally, all transfused blood would be DEA 1 negative. However, until the concept of using blood rapidly available from commercial sources is more widely accepted, 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 positive [5]. 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 positive or negative at birth greatly simplifies future decision making. A DEA 1 positive dog can receive both DEA 1 positive and negative blood. A dog that is DEA 1 negative should not receive DEA 1 positive blood.

The QuickVet®/RapidVet® Canine DEA 1 test cartridge used with the QuickVet® Analyzer is intended for use to classify dogs as DEA 1 positive or negative.

Principle and explanation of the assay

The QuickVet®/RapidVet® Canine DEA 1 assay is based on the agglutination reaction that occurs when an erythrocyte which contains

a DEA 1 antigen on its surface membrane interacts with a murine monoclonal antibody proven specific to DEA 1. The test cartridge has two fluidic channels. The monoclonal antibody is deposited in one of the fluidic channels and a control reagent in the other.

The monoclonal antibody is reconstituted during the test. The sample moves through the cartridge by capillary action and the QuickVet® Analyzer reads the status of the blood/antibody interaction or lack thereof. All DEA 1 positive erythrocytes react with the reconstituted antibody within the cartridge causing agglutination which is automatically examined by the QuickVet® Analyzer. The control channel is used to verify that the agglutination is DEA 1 specific and not caused by auto-agglutination.

No visual reading is needed or possible. The QuickVet® Analyzer determines if agglutination has occurred and displays the result. The antibodies are completely nonreactive with all DEA 1 negative erythrocytes.

Reagents and materials

Each test is individually packaged in a sealed pouch with a desiccant bag, and contains the following

- 1 QuickVet®/RapidVet® Canine DEA 1 test cartridge.
- 1 plastic pipette tip.

Provided separately in the kit for use with the test packages are the following items

- 1 dropper bottle pre-filled with diluent. The plastic bottle contains phosphate buffered saline (PBS) at pH 7.4. The dropper tip dispenses approximately 40 µL of fluid. The bottle contains enough fluid to perform all the tests in the kit.
- 1 tube for each cartridge for sample preparation.

Required but not provided with the test kit are the following items

- QuickVet® Analyzer. The QuickVet® Analyzer is designed for use for other hematology determinations in addition to this assay. Refer to the Operator's Manual for complete information concerning the Analyzer.
- A 100 µL fixed volume pipette.

Storage and stability

All components of the test kit are stable at refrigerated temperatures or room temperature (2 °C to 25 °C or 36 °F to 77 °F) for 24 months. It is recommended that storage of any kit components for more than a week should be at refrigerated temperatures (2 °C to 8 °C or 36 °F to 46 °F). The stability of the test components has been determined through the use of a routine accelerated aging protocol. Kits and components should not be exposed to direct sunlight.

Each Canine DEA 1 Blood Typing Test Cartridge contains a monoclonal antibody specific to the DEA 1 antigen on a red blood cell. Each test cartridge can only be used once. Each cartridge is individually packaged with a disposable plastic pipette tip in a sealed pouch

containing a desiccant bag to keep moisture out. A torn or otherwise damaged pouch may allow moisture to reach the test cartridge and adversely affect performance. Do not use a test cartridge from a damaged pouch. Open the pouch just prior to use. Once the pouch has been opened, the test cartridge should be used within one day.

The test cartridge is stable for 24 months from the date of manufacture if stored according to the instructions above. The expiration date of each cartridge is printed on the pouch label. Do not use the cartridge after the expiration date.

The diluent is stable for 24 months from the date of manufacture. Each bottle is labeled with an expiration date.

Operating instructions

Before performing any tests make sure that the analyzer software has been upgraded to a version capable of performing the QuickVet®/RapidVet® DEA 1 test according to the instructions in the QuickVet® Analyzer Operator's Guide.

The time it takes to perform a blood type determination with this system depends on factors such as type of test and test environment. At room temperature it takes about 90 seconds for the instrument to warm up the test cartridge to 37 °C (98.6 °F). Lower and higher room temperatures may change the warm up time. Once the procedure of the assay begins, an answer should be available within 5 minutes.

To complete a blood typing test follow the steps below

Step 1 Draw blood from the patient into a syringe or into a tube coated with or containing EDTA as an anticoagulant. The assay requires only 100 µL whole blood but the syringe or tube should be full to ensure the correct concentration of EDTA. If the blood type is not to be determined immediately, nutrients such as CPDA should *not* be added.

Step 2 Determine the hematocrit of the sample.

Step 3 Remove the cartridge and pipette tip from the foil package and the diluent bottle from the kit box.

Step 4 Touch the Analyze button on the Analyzer's main screen and follow the on-screen instructions.

Step 5 Insert the test cartridge when the message *Please insert new cartridge* is displayed on the screen. The insertion of a new cartridge into the slot on the front of the QuickVet® Analyzer will trigger the warming up of the cartridge to 37 °C (98.6 °F).

Step 6 When prompted to do so, enter the 7-digit cartridge code located on the pouch label and touch the Next button.

Step 7 When prompted to do so, enter Patient ID and Sample ID (optional) and touch the Next button.

Step 8 When prompted to do so, enter the hematocrit of the sample. Based on the specified hematocrit the QuickVet® Analyzer will calculate the required number of diluent drops needed for correct dilution of the sample.

Step 9 Dilute the sample following the on-screen instructions. First

dispense the number of drops of diluent stated on the screen into one of the supplied tubes. Then mix 100 µL of blood into the diluent using a fixed volume pipette and the supplied pipette tip. Ensure proper mixing by aspirating a minimum of 5 times using the pipette.

Step 10 When the message *Add 100 µL sample and wait* is displayed on the screen, use the pipette to dispense 100 µL diluted blood into the sample well on the cartridge. Avoid bubbles. The determination will start automatically once the blood is detected by the Analyzer.

Step 11 The QuickVet® Analyzer will determine whether or not agglutination has occurred and the test result will be displayed on the screen. If a printer is connected, the test result can be printed out by pressing the Print button. To obtain suggested advice about safe transfusion/donation with the tested sample touch the Advice button. To print a blood type certificate touch the Certificate button.

Step 12 Return to the Analyzer's main screen by touching the Done button and, when the message *Please remove cartridge* is displayed on the screen, remove the used test cartridge and dispose of it properly in accordance to policies and regulations in practice at the place of operation.

Important Make sure that the test sample has been collected and prepared according to the guidelines in this package insert.

Limitations of the procedure

- The accuracy of the test results is dependent on the quality of the blood sample. The quality of the blood sample is dependent upon the blood sample collection, the proper blood to EDTA ratio, and the proper introduction of the diluted sample into the sample well. Please observe all precautions cited in the QuickVet® Analyzer Operator's manual and use good blood sample collection techniques at all times.
- A very limited number of canine patients exhibit auto-agglutination of varying degrees due to serum factors that cause agglutination of the patient's own red cells. The test cartridge has two channels – a reference channel and a test channel. An auto-agglutinating patient should receive only DEA 1 negative blood. Donor blood exhibiting auto-agglutination should never be used for transfusion.

Performance characteristics

A total of ninety-four canine erythrocyte samples from ninety-three dogs arriving at an independent animal clinic and an independent university laboratory during the period of the trial were tested utilizing the DiaMed® DEA 1 Tube Test and the QuickVet®/RapidVet® Canine DEA 1 Blood Typing Test™.

Eight samples were from healthy blood donors, and eighty-six samples were submitted routinely to the laboratory, including blood from dogs with various known diseases, including immunemediated

anemia, blood loss anemia, neoplasia, diarrhea, liver disease, severe vasculitis, meningitis and inflammatory bowel disease. All samples were also run in parallel on the DiaMed® system.

Fifty-four (57 %) samples were DEA 1 positive and thirty-five (37 %) were DEA 1 negative. Six positive samples retested positive and six negative samples retested negative. No negative samples retested positive and no positive samples retested negative. No samples that were initially positive or negative were inconclusive on retest. Five samples were initially inconclusive. When retested, three were consistently inconclusive, one was negative in accordance with the DiaMed® result, and one yielded false positive compared to the DiaMed® system.

Definitive QuickVet® results exhibited an accuracy of 97 % with a sensitivity of 100 % and specificity of 92 % compared to DiaMed® results.

Trouble shooting guide

In most circumstances the instrument will interrupt the test and report an advisory message if a problem occurs during the sample analysis. If this happens, make a note of the advisory number and follow the instructions given in the advisory message. In most cases the problem can be resolved by obtaining a fresh blood sample and repeating the test. Make sure to follow the operating instructions given on-screen and in this package insert. Contact customer support if the problem persists and include the advisory number from the

original advisory message in your inquiry.

Special attention should be paid to the potential issues with the collected blood samples listed in Table 1.

Table 1: Potential sample quality issues and suggested corrective actions.

Problem	**Corrective action**
Agglutinates in the sample tube	Only use fresh blood properly collected in an EDTA tube. If a non-agglutinating sample cannot be obtained the blood should not be used for transfusion and the animal should only receive blood from DEA 1 negative donors.
Hematocrit below 10 %	Centrifuge the sample and remove plasma to obtain a hematocrit of 15 %.
Hemolysis	Only use fresh blood properly collected in an EDTA tube. The degree of hemolysis can be estimated by visual inspection of the blood plasma when measuring the hematocrit of the sample. If the plasma is clear and more yellow than red the sample is suitable for use with the QuickVet®/RapidVet® Canine DEA 1 Blood Typing Test™.

Quality control

All materials incorporated into the test package have been quality controlled by standard testing procedures using a routine quality control program during manufacture.

Disposal

Dispose of all biological materials, pipettes and cartridges in a bio-hazard container.

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Manufacturer information

The Monoclonal Antibody is licensed from Kansas State University.

The QuickVet®/RapidVet® Canine DEA 1 Test™ is a joint development of **dms**laboratories, inc. and Zoetis and is manufactured by Zoetis Denmark.

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