

DOG CRP SPARCL™ ASSAY

Life Diagnostics, Inc., Catalog Number: CRP-SP-4

INTRODUCTION

CRP (C-reactive protein) is an acute phase protein that is elevated in dog serum as a result of injury, infection and disease. It is widely used as a biomarker of inflammation by veterinarians. Normal serum levels of CRP in dogs are 1 µg/ml or lower. Levels can increase to 200 µg/ml or greater during the acute phase response (refs 1&2).

PRINCIPLE OF THE ASSAY

The dog CRP SPARCL™¹ (Spatial Proximity Analyte Reagent Capture Luminescence, ref 3) assay uses two different affinity purified CRP-specific antibodies. One is conjugated to horseradish peroxidase (HRP) and the other is conjugated to acridan, a chemiluminescent substrate. When the HRP and acridan conjugated antibodies bind to CRP they are brought into close proximity. With the addition of hydrogen peroxide, HRP catalyzes oxidation of proximal acridan molecules causing a flash of chemiluminescence. Acridan conjugated antibodies distant from HRP produce no signal. This principle allows the development of a homogeneous assay that allows rapid measurement of CRP concentrations.

The HRP and acridan conjugated antibodies provided with the kit are mixed with standards and diluted samples in wells of the 96-well SPARCL™ plate provided with the kit². After incubation for 30 minutes on a shaker at 25°C and 150 rpm, the plate is placed into a luminometer. Trigger solution containing hydrogen peroxide is injected into each well and luminescence is immediately measured. The concentration of CRP is proportional to luminescence and is derived from a standard curve.

MATERIALS AND COMPONENTS

Materials provided with the kit:

- Anti-dog CRP HRP conjugate stock. **Store ≤ -70°C**
- Anti-dog CRP acridan conjugate stock. **Store ≤ -70°C**
- Dog CRP stock (2 vials). **Store ≤ -70°C**
- Diluent (CSD50-1), 50 ml
- Trigger solution, 7 ml
- White SPARCL™ plate (12 x 8-well)
- Clear untreated 96-well plate

Materials required but not provided:

- Precision pipettes and tips
- Polypropylene tubes
- Vortex mixer
- Micro-Plate incubator/shaker
- Luminometer capable of simultaneous injection & measurement
- PC graphing software

STORAGE

Store the HRP conjugate, acridan conjugate and CRP stock at -70°C (they may be stored at -20°C for one week). The remainder of the kit should be stored at 2-8°C. The SPARCL™ plate should be kept in a sealed bag with desiccant and antioxidant. The kit will remain stable

for at least six months from the date of purchase, provided that the components are stored as described above.

GENERAL INSTRUCTIONS

The dilution buffer and 8-well strips used in the assay should be allowed to reach room temperature (25°C) before use.

STANDARD PREPARATION

The dog CRP stock is comprised of purified dog CRP lyophilized in a carrier protein matrix. The CRP content was determined by reference to purified dog CRP (catalog no. 8101) prepared at Life Diagnostics, Inc.

1. Reconstitute the lyophilized stock as described on the vial label. Mix gently until dissolved.
2. Label 8 polypropylene tubes³ as 50, 25, 12.5, 6.25, 3.13, 1.56, 0.78 and 0.39 ng/ml.
3. Into the tube labeled 50 ng/ml, pipette the volume of diluent detailed on the stock vial label. Then add the indicated volume of stock and mix gently. This provides the 50 ng/ml standard.
4. Dispense 150 µl of diluent into the tubes labeled 25, 12.5, 6.25, 3.13, 1.56, 0.78 and 0.39 ng/ml.
5. Pipette 150 µl of the 50 ng/ml CRP standard into the tube labeled 25 ng/ml and mix. This provides the 25 ng/ml CRP standard.
6. Similarly prepare the remaining standards by two-fold serial dilution.

Please Note: Use the standards within one hour of preparation.

SAMPLE PREPARATION

Serum or plasma should be prepared as quickly as possible after blood collection. All samples should be similarly processed (i.e., storage times and temperatures should be the same). If samples cannot be assayed immediately they should be frozen at or below -20°C. Avoid repeated freeze-thaws.

We found that CRP is present in serum from healthy dogs at a concentration of ~1 µg/ml. In serum from sick dogs we found levels as high as 220 µg/ml. Because CRP levels depend on the magnitude of the acute phase response and the timing of serum collection, optimal dilutions must be determined empirically. However, we found that if samples were tested at dilutions of both 400-fold and 10,000-fold, all serum samples gave one set of RLU values within range of the standard curve.

Because the dog CRP SPARCL assay uses a homogeneous format, it is susceptible to a prozone or "hook effect" at high CRP concentrations. We found that if samples were tested at dilutions of 400-fold or greater the prozone effect was avoided.

Dilutions of 400 and 10,000-fold can be achieved as follows:

1. For each sample to be tested dispense 90 µl, 234 µl and 192 µl of diluent into separate microcentrifuge tubes.

¹ The SPARCL technology was developed by Lumigen Corp.

² The plate provided with the kit has been treated with a reagent that reduces background chemiluminescence. Untreated plates cannot be used.

³ Dilutions of standards can be performed in wells A1-A8 of the clear untreated 96-well plate provided with the kit. This allows rapid transfer of standards to the white SPARCL™ plate using a multipipettor. Diluted samples can also be first aliquoted into

appropriate wells of the clear polystyrene plate and subsequently transferred to the SPARCL™ plate with a multipipettor. If using this method, ensure that an excess volume is aliquoted into the clear plate in order to ensure transfer of 25 µl aliquots to the SPARCL™ plate.

- Mix 10.0 μl of serum or plasma with 90 μl of diluent in the first tube to give a 10-fold dilution.
- Mix 6.0 μl of the 10-fold diluted sample with 234 μl of diluent in the second tube to give a 400-fold dilution.
- Mix 8.0 μl of the 400-fold diluted sample with 192 μl of diluent in the third tube to give a 10,000-fold dilution.

CONJUGATE MIX PREPARATION

Instructions for preparation of the conjugate mix are detailed on the box that contains the HRP and acridan conjugates. If necessary, after thawing, briefly centrifuge to ensure that the contents are at the bottom of the tubes. Prepare the mix shortly before use using the diluent provided with the kit.

LUMINOMETER SETUP

- The luminometer must be capable of injection and simultaneous measurement of luminescence without any delay.
- Prime the luminometer injection port with 1 ml of trigger solution.
- Place the injection needle into the injection port as needed for BMG luminometers.
- Program the luminometer to inject 37.5 μl of trigger solution per well and to measure from time zero for 1 second (50 x 0.02 second intervals).
- Define the format of the assay using the luminometer software.
- Because the white SPARCL™ plate is provided as a 12 x 8-well strips, allowing use of fewer than 96-wells, make sure that the luminometer is programmed to inject trigger solution only into the wells being used.
- We use a BMG LUMIstar Omega set at a gain of 3600. Optimal gain should be determined by the end user.
- There are a number of manufacturers of luminometers that are equipped to run a SPARCL™ assay. Please contact Life Diagnostics or Lumigen (www.lumigen.com) to discuss your luminometer.

PROCEDURE

- Before starting the assay ensure that the luminometer is primed with trigger solution and that the injection needle is positioned in the injection port.
- Secure the desired number of SPARCL™ 8-well strips in the holder. Immediately seal unused strips in the resealable bag with desiccant and antioxidant. Store unused strips at 2-8°C.
- Aliquot 25.0 μl of conjugate mix into each well.
- Dispense 50.0 μl of standards and diluted samples into the wells (we recommend that standards and samples be tested in duplicate).
- Incubate on an orbital micro-plate shaker at 150 rpm 25°C for 30 minutes.
- After the 30-minute incubation, place the plate in the luminometer and measure luminescence after injection of trigger solution (37.5 μl).
- Remove the plate from the luminometer and discard the used strips. Keep the plate frame if future use is intended.

CALCULATION OF RESULTS

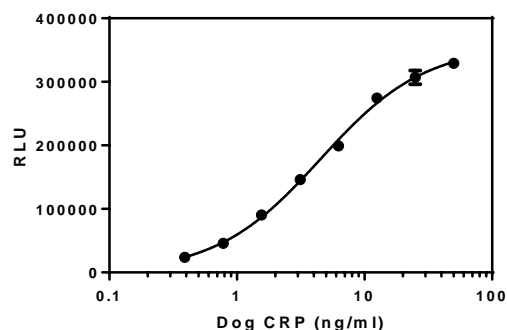
- Before calculating results, review the raw data. If artefacts (RLU spikes) are apparent immediately after injection of trigger solution, eliminate that portion of the luminescence profile from analysis for all wells.
- Using graphing software, construct a standard curve by plotting the luminescence (RLU) for the standards versus the \log_{10} of the CRP concentration.

- Fit the standard curve to a sigmoidal 4PL equation (x axis = \log_{10} CRP concentration)
- Derive the corresponding concentration of CRP in the samples from the standard curve (remember to derive the concentration from the antilog).
- Multiply the derived concentration by the dilution factor to determine the actual concentration of CRP in the serum or plasma sample.
- If the RLU values of diluted samples fall outside the standard curve, samples should be diluted appropriately and re-tested.

TYPICAL STANDARD CURVE

A typical standard curve with RLU plotted on the Y-axis versus CRP concentrations on the X-axis is shown below. This curve is for the purpose of illustration only and should not be used to calculate unknowns. Each user should obtain his or her data and standard curve in each experiment.

CRP (ng/ml)	RLU
50	329232
25	307100
12.5	274639
6.25	199317
3.13	146117
1.56	90593
0.78	45763
0.39	23677



REFERENCES

- Hillstrom A. et al. Validation of a commercially available automated canine-specific immunoturbidometric method for measuring canine C-reactive protein. *Vet Clin Pathol* 43(2):235-243 (2014)
- Plickert HD. et al. Evaluation of a point-of-care test for canine C-reactive protein, *Vet Clin Pathol* 40(3):384-388 (2011)
- Akhavan-Tafti H. et al. A homogeneous chemiluminescent immunoassay method. *J Am Chem Soc.* 20;135(11):4191-4 (2013)

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For technical assistance please email us at techsupport@lifediagnostics.com