v02-Jan2014

Gentian Canine CRP Immunoassay

Application Note for Beckman Coulter AU400*

Intended Use

The canine CRP immunoassay on Beckman Coulter's AU400 is an *in vitro* diagnostic test for quantitative determination of canine CRP in dog serum and plasma. The measurement of canine CRP is used in the diagnosis and treatment of inflammatory diseases in dogs [1,2,3,4,5].

Measuring Range

The measuring range of the Gentian canine CRP immunoassay on AU400 is 10 - 300 mg/L, with a security zone up to 1000 mg/L.

Normal Values

Healthy dogs have CRP concentrations <10 mg/L with the Gentian canine CRP method. An exact reference range cannot be determined as CRP concentrations in healthy dogs are below the LoQ of the Gentian canine CRP assay.

Clinical Decision Limits

The diagnostic specificity of canine CRP can be enhanced without seriously impairing diagnostic sensitivity by using a cut-off limit somewhere above the normal range [2]. Each laboratory should establish its own cut-off.

Assay Reagents

Materials Provided by Gentian	
Gentian Canine CRP Reagent Kit • R1 Reaction buffer (45 ml) • R2 Immunoparticles (10,5 ml)	REF 1501 REF 1507* REF 1514*
Gentian Canine CRP Calibrator Kit (6 levels, 0,5 ml per level)	REF 1551
Gentian Canine CRP Control Kit • Control low (0,5 ml) • Control high (0,5 ml)	REF 1519 REF 1520* REF 1521*

All materials are ready for use.
**Not available for individual sale.*

Calibrator Standardization

Gentian canine CRP calibrator values are established on the basis of internal canine CRP reference material. No international standard is available for canine CRP.

Calibration Stability

The calibration curve is stable for more than 4 weeks on AU400. Yet, recalibration every 4th week is recommended.

Material Storage and Stability

All materials provided for the Gentian canine CRP test must be stored at 2-8°C. The expiry date is printed on the labels. Using an Abbott Architect c4000, the on board stability of the Gentian canine CRP reagents was found to be at least eight weeks.

Sample Material

Recommended sample material is canine serum, canine heparinized plasma or canine EDTA plasma. Analyze the samples as fresh as possible, and mix them well in advance. Sample stability testing showed that canine CRP (in serum) was stable for 14 days at 4-22°C [6]. The samples can be shipped without any special cooling and must then be analyzed within 14 days after shipment. Samples have been tested and shown to withstand up to four freeze and thaw cycles [6].

Assay Procedure

Assay Principle

The canine serum or plasma sample is mixed with canine CRP immunoparticles. Canine CRP from the sample and the immunoparticles' anti-canine CRP aggregate. The complex particles created absorb light, and turbidimetric measurements of absorption are related to canine CRP concentration via interpolation on an established standard calibration curve. Results are automatically calculated by AU400.

Application Parameter Setup

The application must be installed with the instrument settings provided for the Gentian canine CRP method. For instructions on how to install a new application, consult the instrument manual.

Reagent Preparation

The reagents provided are ready for use. Mix the reagents gently before placing them into the assigned reagents positions. The bottles provided can be used directly on Beckman Coulter AU400.

Calibration Curve Establishment

Use the Gentian canine CRP calibrator kit to establish a calibration curve as described in the instrument manual. A recalibration must be performed when a new calibrator lot and/or a new reagent kit lot is to be used. The assigned concentration values of the calibrators are lot dependent. The relevant values are stated in the Analytical Value Sheet provided with the calibrator kit.

QC Controls

The Gentian canine CRP control samples should be assayed every day the method is in use, to validate the calibration curve. Each control has an assigned concentration value range that must be met before measuring regular samples. The relevant concentration ranges are given in the Analytical Value Sheet provided with the control kit. If the measured concentrations are outside the valid range, repeat the control measurements. Recalibrate if necessary. If the calibration cannot be performed without error, or valid control values cannot be reproduced, contact the local distributor for support.

Measuring Patient Samples

When a satisfactory calibration curve has been established and the control values are within the valid concentration range, canine serum or plasma samples may be measured. Check that minimum sample volume is present in sample cups/tubes and assay the samples according to the instructions given in the instrument manual.

Results

The sample concentration of canine CRP is calculated automatically by the analyzer and presented in mg/L.

Performance Characteristics Beckman Coulter AU400

Security Zone

Samples with a canine CRP content up to 1000 mg/L return a value above 300 mg/L (upper limit of linearity range), and can be sent to automatic diluted rerun.

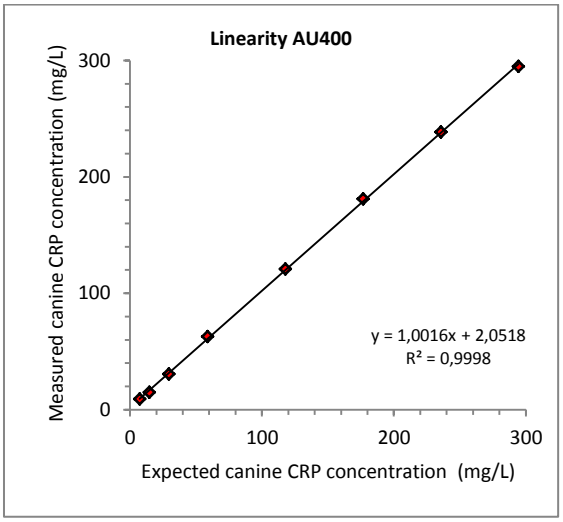
Lower Quantification Limit

The lower quantification limit (LoQ) of canine CRP is defined as the lowest sample concentration that can be measured with a total error (TE) < 29,6 % [7]. Total error is calculated from the pooled standard deviation of the sample's measured concentration and the bias between the sample's mean and theoretical concentration value. A sample of 7,0 mg/L had a total error of 13 % with the Gentian canine CRP method, while the total error was 36 % for a sample of 5,0 mg/l. The LoQ of the Gentian canine CRP immunoassay on AU400 is set to 7 mg/L.

Linearity

Dilution of a high canine CRP serum was performed, and the concentration of the resulting samples was measured. Recovery from expected concentrations was calculated. Based on interpolation, the assay is considered satisfactory linear in the range 10 - 300 mg/L.

Dilution factor	Expected concentration (mg/L)	Measured concentration (mg/L)	Recovery (%)
100 %	294,5	294,9	100,1
80 %	235,6	238,5	101,2
60 %	176,7	181,2	102,5
40 %	117,8	120,7	102,5
20 %	58,9	62,9	106,8
10 %	29,5	30,7	104,4
5 %	14,7	14,9	101,2
2,5 %	7,4	9,1	123,6



Imprecision

Five samples were assayed in duplicate, twice a day, in ten days. Two reagent lots and two calibrator lots were used. Recalibration was performed on day 6.

Sample ID	Mean (mg/L)	Within run CV (%)	Between run CV (%)	Between day CV (%)	Total CV (%)
1	28,6	1,52	3,72	0[1]	4,02
2	67,2	0,84	0,81	1,06	1,57
3	231,0	3,02	1,74	0[1]	3,49
M	43,8	0,81	1,54	0,99	2,00
H	125,0	0,81	1,65	0,62	1,94

1: According to statistical convention and EP5-A2, vol 24, No 25, the CV is set to zero if a negative value is returned.

Interference

Canine CRP samples of ~29 mg/L were spiked with 5 g/L hemoglobin, 10 g/L Intralipid or 800 mg/L bilirubin. The samples were compared to corresponding control samples. None of the spiked samples demonstrated clinically significant interference – defined as more than 10 % difference between test sample and control sample.

	Control sample (mg/L)	Test sample (mg/L)	Recovery (%)
Hemoglobin (5 g/L)	28,8	29,2	101,4
Intralipid (10 g/L)	28,9	28,4	98,3
Bilirubin (800 mg/L)	28,3	28,1	99,3

Analytical Recovery

The analytical recovery of the canine CRP assay was determined by adding fixed amounts of canine CRP to samples and calculating the recovery from theoretical concentrations.

Sample ID	Expected concentration (mg/L)	Measured concentration (mg/L)	Recovery (%)
1	73,4	77,67	105,8
2	123,4	133,07	107,8
3	173,4	185,40	106,9
4	223,4	239,47	107,2

Instrument Variation

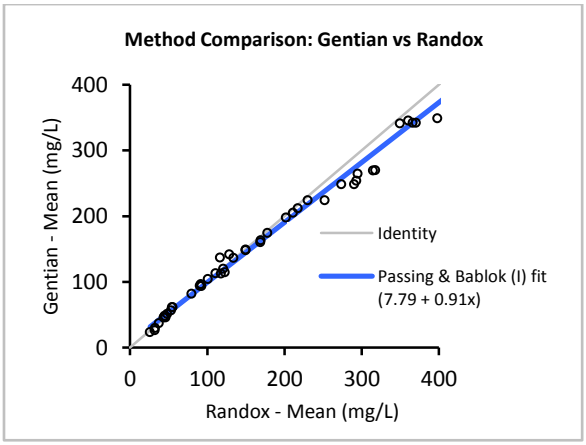
A total of 33 samples was assayed on both Beckman Coulter AU400 and Abbott Architect c4000 with the Gentian canine CRP immunoassay. A statistical analysis of the measured instrument variation was performed.

Instrument Variation - AU400 vs. Architect c4000	
Bland Altman bias	5,10 %
Bland Altman 95 % limits of agreement	1,4 % to 8,7 %
Passing Bablok slope	1,05
Passing Bablok intercept (mg/L)	0,56

Method Comparison

The Gentian canine CRP test was compared to the Randox human CRP immunoassay, used for canine CRP applications (with canine CRP calibrators). A set of 45 serum samples was assayed on both methods at the Swedish University of Agriculture Sciences Animal Hospital, using an Abbott Architect c4000. Results were subjected to statistical analysis.

Method Comparison	N = 45
Bland Altman bias	-3,0 %
Bland Altman limits of agreement	-19,4 to 13,4 %
Passing Bablok slope	0,91
Passing Bablok intercept (mg/L)	7,79



Shipping Damage

Please notify your distributor if the product received is damaged.

Symbols Key

LOT	Lot number
	Temperature limitations
	Expiration date
	Consult instructions for use
	Manufacturer
REF	Catalogue number

Manufacturer

Gentian AS,
Bjornasveien 5
N-1509 Moss, Norway
TEL: +47 99 33 99 05
FAX: +47 69 24 09 62
http://www.gentian.no

Distributor

scil animal care company GmbH
Dina-Weissmann-Allee 6
68519 Viernheim, Deutschland
Tel: +49 (0) 6204 7890 0
Fax: +49 (0) 6204 7890 200
E-Mail: info-de@scilvet.com

References

[1] Ceron *et al.* Vet Clin Pathol. 2005; 34: 85-99
[2] Kjelgaard-Hansen; PhD Thesis. 2004
[3] Kjelgaard-Hansen *et al.* Vet Clin Pathol. 2003; 32: 81-87
[4] Yamamoto *et al.* Vet Res Comun. 1993; 17: 259-266
[5] Eckersall *et al.* Vet J. 2010; 185 (1): 23-27
[6] Hillström *et al.* Vet Clin Pathol. 2014; *in press*.
[7] Kjelgaard-Hansen *et al.* Comp Clin Path. 2003; 12: 69-74

Instrument Settings Canine CRP AU400

Test Name:	CCRP*	**Type:**	Serum	**Operation:**	Yes
SAMPLE:					
Sample volume:	2 µl	Dilution:	0 µl	Pre-dilution rate:	1
REAGENTS:					
R1 volume:	300 µl	Dilution:	0 µl	**Minimum OD:**	**Maximum OD:**
R2 volume:	70 µl	Dilution:	0 µl	L:	H:
WAVELENGTH:					
Primary:	600 nm	**Secondary:**	---	**Reagent OD Limit:**	---
METHOD:					
End Point				First L: -2,0	First H: 2,0
				Last L:	Last H:
Reaction Slope:	+				
Measurement 1:	First: 12	Last: 27		**Dynamic Range:**	
Measurement 2:	---	---		L:	H:
Linearity:	10	300		**Correlation Factor:**	
				A: 1,00	B: 0,00
				On Board Stability:	30
CALIBRATION:					
Type:	6AB	**Algorithm:**	Spline	**Counts:**	2
	Cal. No:	**OD:**	**Conc.:**	**Factor/OD-L:**	**Factor/OD-H:**
Point 1:	*		0,0**	-2.000	2.500
Point 2:	*		8,0**	-2.000	2.500
Point 3:	*		30,0**	-2.000	2.500
Point 4:	*		75,0**	-2.000	2.500
Point 5:	*		150,0**	-2.000	2.500
Point 6:	*		300,0**	-2.000	2.500
RERUN PARAMETERS:					
Diluted:		**Normal:**		**Condensed:**	
Sample volume:	2 µl	Sample volume:	2 µl	Sample volume:	---
Diluent:	0 µl	Diluent:	0 µl	Diluent:	---
Pre-dilution rate:	5	Pre-dilution rate:	1	Pre-dilution rate:	---
Repeat Decision Level:	L	10	H	300	

Defined by user.** ****Lot dependent. See enclosed Analytical Value Sheet for correct calibrator values.