

Measurand	Sample Type	Reference	Health Status	Breed(s)	Subjects (n)	CV _I (%)	CV _G (%)	CV _A (%)	II	RCV (95%)	Comments
					Samples Frequency			Source	Category	RCV (99%)	
Albumin	Serum	1	Healthy	Beagles	14 10 approximately weekly	3.5	3.5	3.2 QCM	0.7 Intermediate	13.3 17.5	SMA 12/60 Technicon biochemistry analyser
Albumin	Plasma (heparin)	7	Healthy	Beagles	20 5 weekly	1.93	3.13	0.92 duplicate	1.46 Intermediate	5.9 7.8	Cobas Ferra (Roche) analyser, evaluated for normality using Shapiro-Wilk, nested ANOVA , frozen and analysed as single batch.
Albumin	Serum	19	Healthy	Various	20 8 weekly	0.32	Not reported	0.39 QCM	cannot calculate	1.4 1.8	Merck Selectra 2, no CVg reported, does not say how variance determined
Albumin	Serum	24	Healthy	Various	11 14 various	5.8	17	4.5 duplicate	2.32 High	20.3 26.8	Sirrus Chemistry System analyser, tested daily for 7 days then weekly for 6 weeks, then 3 months
Alkaline phosphatase (ALP)	Serum	1	Healthy	Beagles	14 10 approximately weekly	43.1	44.6	4.6 QCM	1	120 158.1	SMA 12/60 Technicon biochemistry analyser, Beagle colony,restricted age range (1-3 years) , outdated instruments and methods.
Alkaline phosphatase (ALP)	Plasma (heparin)	7	Healthy	Beagles	20 5 weekly	1.02	16.28	0.04 duplicate	15.92 High	2.8 3.7	Cobas Ferra (Roche) analyser, evaluated for normality using Shapiro-Wilk, nested ANOVA , frozen and analysed as single batch.
Alkaline phosphatase (ALP)	Serum	24	Healthy	Various	11 14 various	13.4	42	7.6 duplicate	2.73	42.7 56.2	Sirrus Chemistry System analyser, tested daily for 7 days then weekly for 6 weeks, then 3 months
Alanine aminotransferase (ALT)	Serum	1	Healthy	Beagles	14 10 approximately weekly	20	11.7	22.2 QCM	0.4 Low	82.8 109.1	Gilford Instrument Model 3500, Beagle colony,restricted age range (1-3 years) , outdated instruments and methods
Alanine aminotransferase	Plasma (heparin)	7	Healthy	Beagles	20 5	0.71	4.26	0.08 duplicate	5.96	2 2.6	Cobas Ferra (Roche) analyser, evaluated for normality using

(ALT)					weekly						Shapiro-Wilk, nested ANOVA ,
Alanine aminotransferase (ALT)	Serum	24	Healthy	Various	11 14 various	19.5	70	5.8 duplicate	3.44 High	56.4 74.3	Sirrus Chemistry System analyser, tested daily for 7 days then weekly for 6 weeks, then 3 months
Aspartate aminotransferase (AST)	Serum	1	Healthy	Beagles	14 10 approximately weekly	0.0	1.0	4.1 QCM	0.3	11.5 15.1	SMA 12/60 Technicon biochemistry analyser, Beagle colony,restricted age range (1-3 years) , outdated instruments and methods.
Aspartate aminotransferase (AST)	Plasma (heparin)	7	Healthy	Beagles	20 5 weekly	0.78	0.72	0.07 duplicate	0.91	2.2 2.9	Cobas Ferra (Roche) analyser, evaluated for normality using Shapiro-Wilk, nested ANOVA , frozen and analysed as single batch.
Aspartate aminotransferase (AST)	Serum	24	Healthy	Various	11 14 various	16.3	39	8.9 duplicate	2.1	51.4 67.8	Sirrus Chemistry System analyser, tested daily for 7 days then weekly for 6 weeks, then 3 months
Calcium	Serum	1	Healthy	Beagles	14 10 approximately weekly	3.0	2.0	1.0 QCM	0.6 Low	8.7 11.4	SMA 12/60 Technicon biochemistry analyser, Beagle colony,restricted age range (1-3 years) , outdated instruments and methods.
Calcium	Serum	24	Healthy	Various	11 14 various	1.2	9.0	3.9 duplicate	2.21	11.3 14.9	Sirrus Chemistry System analyser, tested daily for 7 days then weekly for 6 weeks, then 3 months
Ceruloplasmnin	Serum	18	Healthy	German-Braco	11 5 weekly	0.06	0.12	0.06 duplicate	1.41 High	0.2 0.3	Cobas Mira Plus analyser, Kolmogorov-Smornov test showed normal distribution
Chloride	Serum	1	Healthy	Beagles	14 10 approximately weekly	1.7	1.1	0.9 QCM	0.6	5.5 7.2	Model 920 Chioridometer, Corning Medical, Beagle colony,restricted age range (1-3 years) , outdated instruments and methods.
Cholesterol	Serum	1	Healthy	Beagles	14 10 approximately weekly	19.7	17.9	2.2 QCM	0.9 Intermediate	54.8 72.2	SMA 12/60 Technicon biochemistry analyser, Beagle colony,restricted age range (1-3 years) , outdated instruments and methods.
Cholesterol	Plasma (heparin)	7	Healthy	Beagles	20 5 weekly	2.01	8.46	0.34 duplicate	4.15	5.6 7.4	Cobas Ferra (Roche) analyser, evaluated for normality using Shapiro-Wilk, nested ANOVA , frozen and analysed as single batch.
Cholesterol	<u>Serum</u>	24	Healthy	Various	11	5.7	23	4.3	3.22	19.8	Sirrus Chemistry System analyser,

					14 various			duplicate	High	26.1	tested daily for 7 days then weekly for 6 weeks, then 3 months
C-reactive protein	Serum	17	Healthy	Beagles	8 5 weekly	24.3	29.2	7.2 duplicate	1.15	70.2 92.5	Tridelta canine CRP ELISA
C-reactive protein	Serum	18	Healthy	German-Braco	11 5 weekly	270.64	213.29	91.11 duplicate	0.75	791.0 1042.3	Tridelta canine CRP ELISA, Kolmogorov-Smornov test showed normal distribution
C-reactive protein	Serum	23	Healthy	Various	12	115.5	90.8	6.3	0.78	320.4	Cochran test for outliers (three levels), normal distribution by D'Agostino-Pearson test, tested daily for 7 days then weekly for 6 weeks, then 3 months.
					14 various			duplicate		422.2	
Creatine Kinase	Serum	1	Healthy	Beagles	14 10 approximately weekly	32.1	16.1	19.6 QCM	0.4 Low	104.3 137.5	Gilford Instrument Model 3500, Beagle colony,restricted age range (1-3 years) , outdated instruments and methods
Creatinine	Serum	1	Healthy	Beagles	14 10 approximately weekly	7.3	7.3	9.1 QCM	0.6	32.2 42.5	Gilford Instrument Model 3500, Beagle colony,restricted age range (1-3 years) , outdated instruments and methods.
Creatinine	Plasma (heparin)	7	Healthy	Beagles	20 5 weekly	176.15	137.13	6.84 duplicate	0.78	488.3 643.4	Cobas Ferra (Roche) analyser, evaluated for normality using Shapiro-Wilk, nested ANOVA , frozen and analysed as single batch.
Creatinine	Serum	19	Healthy	Various	20 8 weekly	2.44	not reported	2.05 QCM	cannot calculate	8.8 11.6	Merck Selectra 2, no CVg reported, does not say how variance determined
Creatinine	Serum	24	Healthy	Various	11 14 various	6.6	31	7.5 duplicate	3.1	27.7 36.5	Sirrus Chemistry System analyser, tested daily for 7 days then weekly for 6 weeks, then 3 months
Free Fatty Acids	Serum	1	Healthy	Beagles	14 10 approximately weekly	23.9	4.8	15.0 QCM	0.2	78.1 102.9	Auto-analyzer II, Technicon, Beagle colony,restricted age range (1-3 years) , outdated instruments and methods.
γ glutamyl	Serum	1	Healthy	Beagles	14	80.0	60.0	100.0	0.5	354.7	Gilford Instrument Model 3500,

transferase (GGT)					10 approximately weekly			QCM	Low	467.4	Beagle colony,restricted age range (1-3 years) , outdated instruments and methods.
γ glutamyl transferase (GGT)	Serum	24	Healthy	Various	11 14 various	17.8	45	31.3 duplicate	1.25	99.7 131.4	Sirrus Chemistry System analyser, tested daily for 7 days then weekly for 6 weeks, then 3 months
Glucose	Serum	1	Healthy	Beagles	14 10 approximately weekly	6.2	8.4	4.6 QCM	1.1 Intermediate	21.5 28.3	SMA 12/60 Technicon biochemistry analyser, Beagle colony,restricted age range (1-3 years) , outdated instruments and methods.
Glucose	Plasma (sodium fluoride)	7	Healthy	Beagles	20 3 weekly	5.53	6.67	0.11 duplicate	1.21	15.3 20.2	Cobas Ferra (Roche) analyser, evaluated for normality using Shapiro-Wilk, nested ANOVA , frozen and analysed as single batch. NB less analyses than others in study since last 2 weeks excluded for glucose.
Glucose	Plasma (sodium fluoride)	13	Healthy	Beagles	23 9 monthly	9.5	3.8	3.7 duplicate	0.37 Low	28.2 37.2	Long term variability study
Glucose	Serum	19	Healthy	Various	20 8 weekly	60.36	not reported	5.72 QCM	cannot calculate	167.9 221.3	Merck Selectra 2, does not say how variance determined, results don't correlate with published results.
Glucose	Serum	24	Healthy	Various	11 14 various	10.7	10.0	3.8 duplicate	0.88 Intermediate	31.5 41.4	Sirrus Chemistry System analyser, tested daily for 7 days then weekly for 6 weeks, then 3 months
Haptoglobin	Serum	17	Healthy	Beagles	8 5 weekly	17.0	20.2	4.9 duplicate	1.14	49 64.6	Ecos Institute single radial immunodiffusion test kits
Haptoglobin	Serum	18	Healthy	German-Braco	11 5 weekly	38.7	112.4	24.0 duplicate	2.47 High	126.1 166.1	Tridelta phase Haptoglobin Assay, Kolmogorov-Smornov test showed normal distribution
Iron	Serum	17	Healthy	Beagles	8 5 weekly	17.8	17.2	0.7 duplicate	0.97	49.3 65.0	Bayer Advia 1650 analyser
Lactate	Serum	1	Healthy	Beagles	14	36.7	30.6	7.1	0.8	103.7	SMA 12/60 Technicon biochemistry

dehydrogenase (LDH)					10 approximately weekly			QCM	Intermediate	136.6	analyser, Beagle colony,restricted age range (1-3 years) , outdated instruments and methods.
Magnesium	Serum	1	Healthy	Beagles	14 10 approximately weekly	5.3	4.1	5.9 QCM	0.5	21.9 28.9	Gilford Instrument Model 3500, Beagle colony,restricted age range (1-3 years) , outdated instruments and methods.
NT-pro-BNP	EDTA plasma	31	Healthy	Various	12 7 weekly	33.9	53.7	11.8 not reported	1.5 Intermediate	99.4 252.7	NT-pro-BNP may have significant variations for some breeds - Labradors and Newfoundlands reported to have highest median concentrations. Nested ANOVA with confidence intervals - helps determine if overlap between health and diseased subjects.
NT-pro-BNP	EDTA plasma	31	Mitral regurgitation grades IB and II	Various	9 5 to 7 weekly	16.9	51.5	8.4 not reported	2.73	52.3 68.9	NT-pro-BNP may have significant variations for some breeds - Labradors and Newfoundlands reported to have highest median concentrations. ISHCAC guidelines used for determination of mitral regurgitation classification. Nested ANOVA with confidence intervals - helps determine if overlap between health and diseased subjects.
Pancreatic Lipase	Serum	23	Healthy	Various	12 14 various	193.8	49.5	8.4 duplicate	0.26 Low	537.3 708	Cochran test for outliers (three levels) led to 2 exclusions due to intra-assay variance, normal distribution by D'Agostino-Pearson test, tested daily for 7 days then weekly for 6 weeks, then 3 months.
Phospholipids	Serum	1	Healthy	Beagles	14 10 approximately weekly	9.3	12.7	6.6 QCM	1.1	31.7 41.8	Manual method, not specified , Beagle colony,restricted age range (1-3 years) , outdated instruments and methods.
Phosphorus	Serum	1	Healthy	Beagles	14 10 approximately weekly	10.0	5.0	2.5 QCM	0.5 Low	28.6 37.6	SMA 12/60 Technicon biochemistry analyser, Beagle colony,restricted age range (1-3 years) , outdated instruments and methods.
Phosphorus	Serum	24	Healthy	Various	11 14	12.7	15.0	4.4 duplicate	1.12	37.2 49.1	Sirrus Chemistry System analyser, tested daily for 7 days then weekly

					various						for 6 weeks, then 3 months
Plasma Fibrinogen	Plasma (sodium citrate)	17	Healthy	Beagles	8 5 weekly	17.1	19	2.8 duplicate	1.1 Intermediate	48.0 63.2	ACL 9000 Analyser
Potassium	Serum	1	Healthy	Beagles	14 10 approximately weekly	4.3	4.3	2.1 QCM	0.9	13.2 17.4	1L343 flame photometer Instrumentation Laboratory, Beagle colony, restricted age range (1-3 years), outdated instruments and methods.
Potassium	Plasma (heparin)	9	Healthy	Beagle	20 5 weekly	0.56	0.68	0.0 duplicate	1.21 Intermediate	1.5 2.0	Roche Cobas-Fara, Gaussian distribution
Sodium	Serum	1	Healthy	Beagles	14 10 approximately weekly	0.8	0.5	0.7 QCM	0.5	3.0 3.9	1L343 flame photometer Instrumentation Laboratory, Beagle colony, restricted age range (1-3 years), outdated instruments and methods.
Total Bilirubin	Serum	1	Healthy	Beagles	14 10 approximately weekly	0.0	30.0	60.0 QCM	0.5 Low	166.2 219.0	SMA 12/60 Technicon biochemistry analyser, Beagle colony, restricted age range (1-3 years), outdated instruments and methods.
Total Bilirubin	Serum	24	Healthy	Various	11 14 various	27.5	90	27.5 duplicate	2.31	107.7 142.0	Sirrus Chemistry System analyser, tested daily for 7 days then weekly for 6 weeks, then 3 months
Total Lipids	Serum	1	Healthy	Beagles	14 10 approximately weekly	14.0	9.7	8.5 QCM	0.6 Low	45.3 59.7	Manual method, not specified, Beagle colony, restricted age range (1-3 years), outdated instruments and methods.
Total Protein	Serum	1	Healthy	Beagles	14 10 approximately weekly	3.6	2.6	2.5 QCM	0.6	12.1 15.9	SMA 12/60 Technicon biochemistry analyser, Beagle colony, restricted age range (1-3 years), outdated instruments and methods.
Total Protein	Plasma (heparin)	7	Healthy	Beagles	20 5 weekly	5.22	7.78	0.96 duplicate	1.47 Intermediate	14.7 19.4	Cobas Ferra (Roche) analyser, evaluated for normality using Shapiro-Wilk, nested ANOVA, frozen and analysed as single batch.
Total Protein	Serum	19	Healthy	Various	20 8 weekly	1.71	not reported	0.48 QCM	cannot calculate	4.9 6.5	Merck Selectra 2, does not say how variance determined

Total Protein	Serum	24	Healthy	Various	11 14 various	5.3	12.0	4.0 duplicate	1.81 High	18.4 24.2	Sirrus Chemistry System analyser, tested daily for 7 days then weekly for 6 weeks, then 3 months
Triglycerides	Serum	1	Healthy	Beagles	14 10 approximately weekly	23.3	15.9	22.3 QCM	0.5	89.4 117.9	Auto-analyzer II, Technicon, Beagle colony,restricted age range (1-3 years) , outdated instruments and methods.
Triglycerides	Serum	24	Healthy	Various	11 14 various	35.8	34.0	4.0 duplicate	0.94 Intermediate	99.8 131.5	Sirrus Chemistry System analyser, tested daily for 7 days then weekly for 6 weeks, then 3 months
Troponin I	Serum	31	Healthy	Various	12 7 weekly	38.3	66.0	12.8 duplicate	1.63	111.9 147.4	Nested ANOVA with confidence intervals - helps determine if overlap between health and diseased subjects
Troponin I	Serum	31	Mitral regurgitation grades IB and II	Various	9 5 to 7 weekly	26.3	58.5	12.8 duplicate	2 High	81 106.8	Nested ANOVA with confidence intervals - helps determine if overlap between health and diseased subjects
Urea	Serum	1	Healthy	Beagles	14 10 approximately weekly	14.1	15.3	3.7 QCM	1.1	40.4 53.2	SMA 12/60 Technicon biochemistry analyser, Beagle colony,restricted age range (1-3 years) , outdated instruments and methods.
Urea	Plasma (heparin)	7	Healthy	Beagles	20 5 weekly	13.1	62.2	0.7 duplicate	3.37 High	36.2 47.7	Cobas Ferra (Roche) analyser, evaluated for normality using Shapiro-Wilk, nested ANOVA , frozen and analysed as single batch.
Urea	Serum	19	Healthy	Various	20 8 weekly	59.64	not reported	2.88 QCM	cannot calculate	165.4 218	Merck Selectra 2, does not say how variance determined, results don't correlate with published results.
Urea	Serum	24	Healthy	Various	11 14 various	13.1	25	5.8 duplicate	1.75 High	39.7 52.3	Sirrus Chemistry System analyser, tested daily for 7 days then weekly for 6 weeks, then 3 months
Uric Acid	Serum	1	Healthy	Beagles	14 10 approximately weekly	16.0	8.0	12.0 QCM	0.4	55.4 73.0	SMA 12/60 Technicon biochemistry analyser, Beagle colony,restricted age range (1-3 years) , outdated instruments and methods.
α 1-acid glycoprotein	Serum	17	Healthy	Beagles	8 5 weekly	9.6	67	8.1 duplicate	5.33 High	34.8 45.8	Ecos Institute single radial immunodiffusion test kits

