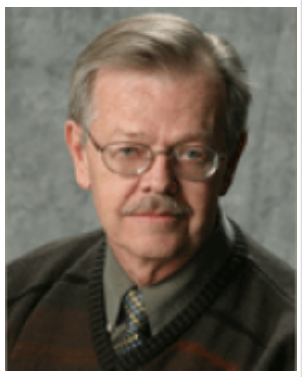

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CALCULATORS

QC Tools (/qctools.htm)
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Reportable Range Calculator: Quantifying Errors (/reportable-range-calculator-br-quantifying-errors.htm)

QUALITY REQUIREMENTS

Desirable Biological Variation Database specifications

The 2014 edition of Desirable Specifications for imprecision, inaccuracy, and total allowable error, calculated from data on within-subject and between-subject biologic variation. This database was updated and compiled by Dr. Carmen Ricos and colleagues, before the EFLM took the helm. As of May 2019, EFLM is managing the new biological variation database. We were honored to host this database for 15 years.

Desirable Specifications for Total Error, Imprecision, and Bias, derived from intra- and inter-individual biologic variation

This most recent and extensive listing of biologic goals has been provided by Ricos C, Alvarez V, Cava F, Garcia-Lario JV, Hernandez A, Jimenez CV, Minchinela J, Perich C, Simon M. "Current databases on biologic variation: pros, cons and progress." Scand J Clin Lab Invest 1999;59:491-500. This database was last updated in 2014. (/biodatabase-2014-update.htm)

PLEASE NOTE: The EFLM now hosts the latest database on biological variation! (https://biologicalvariation.eu/)

Annex I, Part I: Within-subject and between-subject CV values of analytes and Desirable Analytical Quality Specifications for imprecision, bias and total error

11-Desoxycortisol through a-Fetoprotein
Albumin through CA 549 antigen
Calcium through Cystine
Dehydroepiandrosterone sulfate through Hydroxlproline
Immunoglobulin A through Lycopenene
Magnesium through Oxalate, output
pCO2 through Rheumatoid factor
SCC antigen through Zinc

See The Reference List (/biodatabase3.htm)
See The References (/biodatabase2.htm)
See The original Guest Essay (/guest17.htm)

Note on abbreviations:
CV_I = within-subject biologic variation
CV_G = between-subject biologic variation

I = desirable specification for imprecision

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WHAT'S POPULAR (/whats-popular.htm)

WHAT'S NEW (/whats-new.htm)

Other Articles

- 1999 Stockholm Consensus Statement (/stockholm.htm)
- 2016 State of the Art Hematology Performance Specifications (/rcpa.htm)
- A selection of SEKK-DMax specifications (/sekk-dmax.htm)
- Belgium EQA performance specifications (/belgium-eqa-goals.htm)
- Biological Variation

Reportable Range Calculator: Recording Results (/reportable-range-calculator-br-recording-results.htm)

Dispersion Calculator and Critical Number of Test Samples (/dispersion-calculator-and-critical-number-of-test-samples.htm)

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B = desirable specification for inaccuracy
TE = desirable specification for allowable total error

	Analyte	Number of Papers	Biological Variation		Desirable specification		
			CV_I	CVg	I(%)	B(%)	TE(%)
S-	11-Desoxycortisol	2	21.3	31.5	10.7	9.5	27.1
S-	17-Hydroxyprogesterone	2	19.6	50.4	9.8	13.5	29.7
U-	4-hydroxy-3-methoximandelate (VMA)	1	22.2	47.0	11.1	13.0	31.3
S-	5' Nucleotidase	2	23.2	19.9	11.6	7.6	26.8
U-	5'-Hydroxyindolacetate, concentration	1	20.3	33.2	10.2	9.7	26.5
S-	α1-Acid Glycoprotein	3	11.3	24.9	5.7	6.8	16.2
S-	α1-Antichymotrypsin	1	13.5	18.3	6.8	5.7	16.8
S-	α1-Antitrypsin	3	5.9	16.3	3.0	4.3	9.2
S-	α1-Globulins	2	11.4	22.6	5.7	6.3	15.7
U-	α1-Microglobulin, concentration, first morning	1	33.0	58.0	16.5	16.7	43.9
P-	α2-Antiplasmin	1	6.2	---	3.1	---	---
S-	α2-Globulins	2	10.3	12.7	5.2	4.1	12.6
S-	α2-Macroglobulin	4	3.4	18.7	1.7	4.75	7.56
U-	α2-Microglobulin output, first morning	1	29.0	32.0	14.5	10.8	34.7
P-	α-aminobutryic acid	1	24.7	32.3	12.4	10.2	30.5
S-	α-Amylase	7	8.7	28.3	4.4	7.4	14.6
S-	α-Amylase (pancreatic)	2	11.7	29.9	5.9	8.0	17.7
U-	α-Amylase (pancreatic)	2	69.5	105.0	34.75	31.48	88.82
U-	α-Amylase concentration, random	1	94.0	46.0	47.0	26.2	103.7
P-	α-Carotene	1	24.0	65.0	12.0	17.3	37.1
S-	α-Carotene	1	48.0	65.0	24.0	20.2	59.8
S-	α-Fetoprotein(non hepatic carcinoma)	2	12.2	45.6	6.1	11.8	21.9
S-	α-Tocopherol	3	13.8	15.0	6.9	5.1	16.5
S-	Acid phosphatase	2	8.9	8.0	4.5	3.0	10.3
S-	Acid phosphatase tartrate-resistant (TR-ACP)	2	8.0	13.3	4.0	3.9	10.5
S-	Acid phosphatase prostatic activity (PAP)	1	33.8	---	16.9	---	---
P-	Activated partial thromboplastine time	3	2.7	8.6	1.4	2.3	4.5
S-	Adiponectin	1	18.8	51.2	9.4	13.6	29.1
S-	Adenosine deaminase (ADA)	1	11.7	25.5	5.9	7.0	16.7
S-	Alanine	1	14.7	55.8	7.4	14.4	26.6
S-	Alanine aminopeptidase	1	4.1	---	2.1	---	---
S-	Alanine aminotransferase (ALT)	9	19.40	41.6	9.7	11.48	27.48

	Analyte	Number of papers	Biological Variation		Desirable specification		
			CV_I	CVg	I(%)	B(%)	TE(%)
S-	Albumin	24	3.2	4.75	1.6	1.43	4.07
U-	Albumin, concentration, first morning	3	36.0	55.0	18.0	16.4	46.1
U-	Albumin, output, night urine	3	29.5	58.0	14.8	16.3	40.6
S-	Albumin, glycated	1	5.2	10.3	2.6	2.9	7.2
S-	Aldosterone	2	29.4	40.1	14.7	12.4	36.7
U-	Aldosterone	1	39.4	40.1	19.7	14.05	46.56
S-	Alkaline phosphatase	22	6.45	26.1	3.23	6.72	12.04
S-	Alkaline phosphatase, bone	4	6.2	37.4	3.1	9.5	14.6

Database reference list (/biodatabase3.htm)
- Biological Variation Database references (/biodatabase2.htm)
- Biological Variation in Patients with Disease (/biodatabasedisease.htm)
- CLIA Requirements for Analytical Quality (/clia.htm)
- Clinical Quality Requirements (/clinical.htm)
- Consolidated Comparison of Chemistry Performance Specifications (/consolidated-goals-chemistry.htm)
- Consolidated Comparison of Hematology Performance Specifications (/hematology-goals.htm)
- Desirable Biological Variation Database specifications (/biodatabase1.htm)
- European Biologic Goals (/europe.htm)
- Final Milan Hierarchy (/milan-mandate.htm)
- French EQA performance specifications (/french-eqa-goals.htm)
- Milan 2014 Consensus Draft on Quality Specifications (/milan-2014-draft1.htm)
- Minimum analytical quality requirements (/minimum-requirements.htm)
- Minimum Specifications from Biological Variation database (/minimum-biodatabase1.htm)
- Optimal Biological

S-	Alkaline phosphatase, bone	4	6.2	37.4	5.1	9.5	14.0
S-	Alkaline phosphatase, liver	1	10.0	27.0	5.0	7.2	15.4
S-	Alkaline phosphatase, placental	1	19.1	---	9.6	---	---
U-	Ammonia, output, 24h	1	24.7	27.3	12.4	9.2	29.6
S-	Amyloid A	1	25.0	61.0	12.5	16.5	37.1
S-	Androstendione	2	15.8	38.8	7.9	10.47	23.51
S-	Anion gap		9.5	10.1	4.8	3.5	11.3
P-	Antithrombin III	4	5.2	15.3	2.6	4.0	8.3
S-	Apolipoprotein A1	11	6.5	13.4	3.3	3.7	9.1
S-	Apolipoprotein B	9	6.9	22.8	3.5	6.0	11.6
P-	Arginine	1	19.3	34.1	9.7	9.8	25.7
S-	Arilestearase activity, non inhibited	1	3.8	37.2	1.9	9.3	12.5
P-	Ascorbate (Vitamin C)	1	20.0	21.0	10.0	7.3	23.8
S-	Ascorbate (Vitamin C)	3	26.0	31.0	13.0	10.1	31.6
P-	Asparagine	1	12.3	28.0	6.2	7.6	17.8
S-	Aspartate aminotransferase (AST)	13	12.3	23.1	6.15	6.54	16.69
P-	Aspartic acid	1	31.2	55.1	15.6	15.8	41.6
S-	β–2-Microglobulin	1	5.9	15.5	3.0	4.1	9.0
P-	β-Carotene	1	18.0	48.0	9.0	12.8	27.7
S-	β-Carotene	4	36.0	39.7	18.0	13.4	43.1
S-	β-Cryptoxantin	1	36.7	---	18.4	---	---
S-	β-Globulins	2	10.1	9.1	5.1	3.4	11.7
B-	Base excess	1	76.4	43.2	38.2	21.9	85.0
B-	Basophile, count	3	28.0	54.8	14.0	15.4	38.5
S-	Bilirubin total	11	21.8	28.4	10.90	8.95	26.94
S-	Bilirubin conjugated	2	36.8	43.2	18.4	14.2	44.5
P-	C Protein	1	5.6	55.2	2.9	13.9	18.7
S-	C reactive protein	3	42.2	76.3	21.1	21.8	56.6
S-	C reactive protein - high sensitivity	1	49.70	89.23	24.85	25.53	66.54
S-	C3 Complement	2	5.2	15.6	2.6	4.1	8.4
S-	C4 Complement	2	8.9	33.4	4.5	8.6	16.0
S-	CA 125 antigen	4	24.7	54.6	12.4	15.0	35.4
S-	CA 15.3 antigen	5	6.1	62.9	3.1	15.8	20.8
S-	CA 19.9 antigen	2	16.0	130.5	7.98	32.87	46.03
S-	CA 549 antigen	1	9.1	33.4	4.6	8.7	16.2

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	Analyte	Number of papers	Biological Variation		Desirable specification		
			CV_I	CVg	I(%)	B(%)	TE(%)
S-	Calcium	24	2.1	2.5	1.05	0.82	2.55
S-	Calcium, complexed	1	5.3	4.5	2.7	1.7	6.1
U-	Calcium, concentration, 24h	4	27.5	36.6	13.8	11.4	34.1
S-	Calcium, ionized	2	1.7	1.9	0.9	0.6	2.0
S-	Calcium, protein bound	1	4.1	6.1	2.1	1.8	5.2
S-	Calcium, ultrafiltrable	1	2.2	2.7	1.1	0.9	2.7
S-	Carbohydrate deficient transferrin	1	7.1	38.7	3.6	9.8	15.7
B-	CO2, total	1	4.0	4.8	2.0	1.56	4.86
S-	Carcinoembryonic antigen (CEA)	10	12.7	55.6	6.4	14.3	24.7
S-	Carnitine, Acyl-free	1	11.35	24.3	5.68	6.71	16.07
S-	Carnitine, free	1	8.05	16.65	4.03	4.62	11.26
S-	Carnitine, total	1	8.85	11.80	4.43	3.69	10.99
S-	Ceruloplasmin (ferroxidase)	2	5.8	11.1	2.9	3.1	7.9
S-	Chloride	19	1.2	1.5	0.6	0.5	1.5
S-	Cholesterol	46	5.95	15.3	2.98	4.1	9.01
S-	Cholinesterase, concentration	2	7.1	---	3.6	---	---

Variation database specifications (/optimal-biodatabase1htm.htm)
- Quality Requirements for Dogs, Cats, and Horses? (/quality-requirements-for-dogs-cats-and-horses.htm)
- RCPA Allowable Limits of Performance for Biochemistry (/rcpa-biochemistry.htm)
- Rilibak - German Guidelines for Quality (/rilibak.htm)
- Spanish Minimum Consensus Performance Specifications (/minimum-consensus-specifications.htm)
- The New Era of Biological Variation: EUBIVAS (/eubivas.htm)

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What's New

Plateau-ing on progress at the pre-analytical phase (/2019-preanalytical-quality.htm)

FV Hospital Sigma Verification of Performance (/sigma-vp-fv-hospital.htm)

Can hematology analyzers hit EFLM goals? (/eflm-hematology-failures.htm)

Establishing Appropriate Risk-Based QC Frequency (/appropriate-qc-frequency.htm)

2019 Comparison of TT4 methods (/tt4-comparison-methods.htm)

S-	Cholinesterase, activity	3	6.1	18.2	3.1	4.8	9.8
P-	Chromogranin A	1	12.8	26.3	6.4	7.3	17.9
P-	Citrulline	1	21.4	43.9	10.7	12.2	29.9
S-	Collagen type I C propeptide (PICP)	3	7.8	26.7	3.9	7.0	13.4
S-	Collagen type I N propeptide (PINP)	3	7.4	57.3	3.7	14.4	20.5
S-	Collagen type III N propeptide (PIIINP)	1	13.6	87.2	6.8	22.1	33.3
U-	Color, first morning	1	30.9	47.4	15.5	14.1	39.6
P-	Copper	3	8.0	19.0	4.0	5.2	11.8
S-	Copper	2	4.7	13.6	2.35	3.6	7.47
P-	Cortisol	1	21.7	46.2	10.85	12.76	30.66
S-	Cortisol	3	15.2	38.1	7.6	10.26	22.8
S-	C Peptide	3	16.6	23.2	8.3	7.1	20.8
S-	Creatine kinase (CK)	9	22.8	40.0	11.4	11.5	30.3
S-	Creatine kinase MB, %	1	6.9	48.2	3.5	10.8	16.5
S-	Creatine kinase MB, activity	4	19.7	24.3	9.9	7.8	24.1
S-	Creatine kinase MB, mass	1	18.4	61.2	9.2	14.88	30.06
S-	Creatinine	28	5.95	14.7	2.98	3.96	8.87
U-	Creatinine, concentration, 24h	8	24.0	24.5	12.0	8.6	28.4
U-	Creatinine, concentration, first morning	8	23.2	25.7	11.6	8.7	27.8
U-	Creatinine, concentration, random	8	36.3	32.4	18.2	12.2	42.1
U-	Creatinine, output, 24h	8	11.0	23.0	5.5	6.4	15.4
S-	C-Terminal telopeptide type I collagen (CTY I)	5	10.85	30.6	5.43	8.12	15.45
S-	Cyfra 21.1 Antigen	2	22.2	31.1	11.1	9.6	27.9
P-	Cystatin C	1	5.5	---	2.8	---	---
S-	Cystatin C	4	5.0	13.0	2.5	3.48	7.61
P-	Cysteine	1	5.9	12.3	3.0	3.4	8.3
P-	Cystine	1	38.3	48.5	19.2	15.4	47.0

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	Analyte	Number of Papers	Biological Variation		Desirable specification		
			CV_I	CVg	I(%)	B(%)	TE(%)
S-	D-Dimer (MoM)	1	23.3	26.5	11.65	8.82	28.04
S-	Dehydroepiandrosterone sulfate (DHEAS)	3	6.35	30.70	3.188	7.84	13.08
U-	Deoxypyridinoline/creatinine, 24h	2	16.0	30.7	8.0	8.7	21.9
U-	Deoxypyridinoline/creatinine, first morning	2	13.8	34.6	6.9	9.3	20.7
U-	Deoxipyridinoline/minute, first morning	2	15.4	30.3	7.7	8.5	21.2
P-	Dipeptidyl-peptidase IV (ACE)	2	8.2	14.5	4.1	4.2	10.9
S-	Dipeptidyl-peptidase IV (ACE)	1	12.5	27.7	6.3	7.6	17.9
P-	Elastase	1	12.4	15.1	6.2	4.88	15.11
B-	Eosinophils, count	3	21.0	76.4	10.5	19.8	37.1
(B)Plat-	Epinephrine	1	25.3	---	12.7	---	---
P-	Epinephrine	1	48.3	---	24.2	---	---
B-	Erythrocytes, count	7	3.2	6.3	1.6	1.7	4.4
B-	Erythrocyte distribution wide		3.5	5.7	1.8	1.7	4.6
U-	Estradiol	1	30.4	---	15.2	---	---
S-	Estradiol	5	22.5	24.4	11.25	8.3	26.86
S-	Estradiol, free	1	22.8	---	11.40	---	---
U-	Estradiol, free	1	38.6	---	19.3	---	---
P-	Factor V coagulation	1	3.6	---	1.8	---	---
P-	Factor VII coagulation	2	6.8	19.4	3.4	5.1	10.7

P-	Factor VIII coagulation	2	4.8	19.1	2.4	4.9	8.9
P-	Factor X coagulation	1	5.9	---	3.0	---	---
S-	Ferritin	6	14.2	15.0	7.1	5.2	16.9
P-	Fibrinogen	5	10.7	15.8	5.4	4.8	13.6
(B)Erthry-	Folate	1	12.0	66.0	6.0	16.8	26.7
S-	Folate	1	24.0	73.0	12.0	19.2	39.0
S-	Follicle stimulating hormone (FSH)	5	11.0	47.2	5.5	12.12	21.19
S-	Fructosamine	3	3.4	5.9	1.7	1.7	4.5
S-	Galactosyl hydroxylysine	1	11.8	25.8	5.9	7.1	16.8
P-	γ-Fibrinogen	1	14.1	27.25	7.05	7.67	19.3
S-	γ-Globulins	2	14.6	12.3	7.3	4.8	16.8
S-	γ-glutamyltransferase (GGT)	10	13.4	42.15	6.7	11.06	22.11
S-	Globulins, total	1	5.5	12.9	2.8	3.5	8.0
P-	Glucose	1	4.5	5.8	2.3	1.8	5.5
S-	Glucose	15	5.6	7.5	2.8	2.34	6.96
(B)Erythr-	Glucose-6-phosphate-1-dehydrogenase (G6PDH)	1	32.8	31.8	16.4	11.4	38.5
B - spot	Glucose-6-phosphate-1-dehydrogenase (G6PDH)	1	7.3	10.3	3.7	3.2	9.2
P-	Glutamic acid	1	46.4	79.9	23.2	23.1	61.4
P-	Glutamine	1	12.1	22.0	6.1	6.3	16.3
S-	Glutathion peroxidase	1	7.2	21.7	3.6	5.7	11.7
P-	Glycine	1	11.8	40.3	5.9	10.5	20.2
P-	Haptoglobin	1	20.0	27.9	10.0	8.6	25.1
S-	Haptoglobin	3	20.4	36.4	10.2	10.4	27.3
S-	HDL cholesterol	25	7.3	21.2	3.65	5.61	11.63
S-	HDL 1 cholesterol	1	5.5	27.2	2.8	6.9	11.5
S-	HDL 2 cholesterol	6	15.7	40.7	7.9	10.9	23.9
S-	HDL 3 cholesterol	6	7.0	14.3	3.5	4.0	9.8
B-	Hematocrit	11	2.7	6.41	1.35	1.74	3.97
B-	Hemoglobin	13	2.85	6.8	1.43	1.84	4.19
B-	Hemoglobin A1 C	8	1.9	5.7	0.9	1.5	3.0
B-	Hemoglobin A2	1	0.7	7.7	0.35	1.93	2.51
P-	Histidine	1	9.7	27.2	4.9	7.2	15.2
P-	Homocysteine	3	8.3	33.5	4.15	8.63	15.48
S-	Hyaluronic acid	1	62.00	---	31.00	---	---
S-	Hydroxybutyrate dehydrogenase	1	6.6	---	3.3	---	---
P-	Hydroxyproline	1	34.5	56.7	17.3	16.6	45.1
U-	Hydroxyproline/minute, first morning	1	36.1	38.8	18.1	13.2	43.0
U-	Hydroxyproline/minute, second void	1	40.5	32.9	20.3	13.0	46.5

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	Analyte	Number of papers	Biological Variation		Desirable specification		
			CV_I	CVg	I(%)	B(%)	TE(%)
S-	Immunoglobulin A	7	5.4	35.9	2.7	9.1	13.5
S-	Immunoglobulin G	6	4.5	16.5	2.3	4.3	8.0
S-	Immunoglobulin M	5	5.9	47.3	3.0	11.9	16.8
S-	Immunoglobulins κ chains	3	4.8	15.3	2.4	4.0	8.0
S-	Immunoglobulins λ chains	3	4.8	18.0	2.4	4.7	8.6
S-	Inhibin B	1	10.0	25.0	5	6.73	14.98
S-	Insulin	4	21.1	58.3	10.6	15.5	32.9
S-	Insulin-like growth factor (IGF-1)	2	14.6	45.4	7.3	11.9	24.0
S-	Insulin-like growth factor binding protein 3 (IGFBP-	1	10.1	63.9	5.1	16.2	24.5

	3)						
S-	Intercellular adhesion molecule-1 (ICAM-1)	1	1.9	21.0	1.0	5.3	6.8
(B)Leuc-	Interferon receptor	1	14.0	20.0	7.0	6.1	17.7
S-	Interleukin 1-β	1	30.0	36.0	15.0	11.7	36.5
S-	Interleukin-8	1	24.0	31.0	12.0	9.8	29.6
S-	Iron	11	26.5	23.2	13.3	8.8	30.7
P-	Isoleucine	1	15.5	45.5	7.8	12.0	24.8
S-	Kallicrein 6	1	11.80	27.6	5.9	7.5	17.24
B-	Lactate	1	27.2	16.7	13.6	8.0	30.4
S-	Lactate dehydrogenase (LDH)	11	8.6	14.7	4.3	4.3	11.4
S-	Lactate dehydrogenase 1 isoform (LDH1)	2	2.3	8.3	1.2	2.2	4.1
S-	Lactate dehydrogenase 2 isoform (LDH2)	1	3.3	2.4	1.7	1.0	3.7
S-	Lactate dehydrogenase 3 isoform (LDH3)	1	2.8	3.8	1.4	1.2	3.5
S-	Lactate dehydrogenase 4 isoform (LDH4)	1	5.9	5.3	3.0	2.0	6.9
S-	Lactate dehydrogenase 5 isoform (LDH5)	1	8.0	9.6	4.0	3.1	9.7
P-	Lactoferrin	1	11.8	23.7	5.9	6.6	16.4
S-	LDL Cholesterol	6	7.8	20.4	3.9	5.46	11.9
P-	LDL Cholesterol (oxidized)	1	21.0	50.0	10.5	13.6	30.9
S-	LDL Cholesterol, small dense	1	9.1	20.0	4.55	5.49	13.0
S-	LDL receptor mRNA	1	21.5	13.6	10.8	6.4	24.1
P-	Leucine	1	14.8	44.0	7.4	11.6	23.8
B-	Leukocytes count	8	11.4	21.3	5.73	6.05	15.49
S-	Lipase	3	32.2	31.8	16.1	11.31	37.88
S-	Lipoprotein (a)	3	20.8	18.1	10.4	6.9	24.1
P-	Lutein	1	13.0	21.0	6.5	6.2	16.9
S-	Lutein	1	23.7	---	11.9	---	---
S-	Luteinizing hormone (LH)	5	23.0	27.4	11.5	8.94	27.92
P-	Lycopene	1	22.0	33.0	11.0	9.9	28.1
S-	Lycopene	2	40.1	33.0	20.1	13.0	---
B-	Lymphocytes, count	1	10.2	35.3	5.1	9.19	17.6
B-	Lymphocytes CD4	5	25.0	---	12.5	---	---
P-	Lysine	1	11.5	38.2	5.8	10.0	19.5

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	Analyte	Number of Papers	Biological Variation		Desirable specification		
			CV_I	CVg	I(%)	B(%)	TE(%)
(B)Erythr-	Magnesium	2	5.6	11.3	2.8	3.2	7.8
(B)Leuc-	Magnesium	1	18.5	12.4	9.25	5.57	20.83
(B)Mon -	Magnesium	1	18.1	20.3	9.1	6.8	21.7
S-	Magnesium	9	3.6	6.4	1.8	1.8	4.8
U-	Magnesium, ionized	1	1.9	5.1	1.0	1.4	2.9
U-	Magnesium, output, 24h	2	38.3	37.6	19.2	13.4	45.0
(B)Erythr-	Mean corpuscular hemoglobin (MCH)	4	1.4	5.2	0.7	1.35	2.5
(B)Erythr-	Mean corpuscular hemoglobin concentration (MCHC)	5	1.06	1.2	0.53	0.4	1.27
(B)Erythr-	Mean corpuscular volume (MCV)	7	1.4	4.85	0.7	1.26	2.42
(B)Plat-	Mean platelet volume (MPV)	3	4.3	8.1	2.15	2.29	5.84
P-	Metionine	1	14.7	43.4	7.4	11.5	23.6
B-	Monocytes, count	3	17.8	49.8	8.9	13.2	27.9
S-	Myeloperoxidase	1	36.0	30.0	18.0	11.7	41.4
S-	Myoglobin	2	13.9	30.6	7.0	8.2	19.6

S-	Myoglobin	2	13.9	29.6	7.0	8.2	19.6
U-	N-Acetyl Glucosaminidase, concentration, first morning	2	52.9	22.0	26.5	14.3	58.0
U-	N-Acetyl Glucosaminidase/Creatinine	2	51.1	21.8	25.6	13.9	56.0
B-	Neutrophyles, count	5	17.1	32.8	8.55	9.25	23.35
U-	Nitrogen, output	1	13.9	24.2	7.0	7.0	18.4
B(Plat)-	Norepinephrine	1	9.5	---	4.8	---	---
P-	Norepinephrine	1	19.5	---	9.8	---	---
U-	N-Telopeptide type I collagen	3	15.5	37.6	7.75	10.17	22.95
S-	N-terminal (NT)-proBNP	2	10.0	16.0	5.0	4.7	13.0
P-	Ornithine	1	18.4	54.9	9.2	14.5	29.7
P-	Osmolality	1	1.3	1.5	0.7	0.5	1.6
Saliva-	Osmolality	1	9.5	35.8	4.8	9.3	17.1
S-	Osmolality	1	1.3	1.2	0.7	0.4	1.5
U-	Osmolality, first morning	1	28.3	57.9	14.2	16.1	39.5
S-	Osteocalcin	5	6.35	30.9	3.18	7.89	13.13
U-	Oxalate, concentration, 24h	1	44.0	18.0	22.0	11.9	48.2
U-	Oxalate, output, 24h	1	42.5	19.9	21.3	11.7	46.8

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	Analyte	Number of papers	Biological Variation		Desirable specification		
			CV_I	CVg	I(%)	B(%)	TE(%)
B-	pCO2	1	4.8	5.3	2.4	1.8	5.7
B-	pH [H+]	1	3.5	2.0	1.8	1.0	3.9
B-	pH (pH units)	1	0.2	---	0.1	---	---
S-	Paraoxonase 1	1	13.4	84.0	6.7	21.3	32.3
S-	Paraoxonase 1 substrate inhibition (PON 4SI)	1	3.9	80.1	1.9	20.0	23.2
S-	Paraoxonase, activity (salt stimulated)	1	8.0	86.4	4.0	21.7	28.3
P-	Parathyroid hormone (PTH)	1	25.3	43.4	12.65	12.56	33.43
S-	Parathyroid hormone (PTH)	1	25.9	23.8	13.0	8.8	30.2
S-	Phenylacetate	1	6.6	25.2	3.3	6.5	12.0
P-	Phenylalanine	1	9.5	40.6	4.8	10.4	18.3
S-	Phosphate	17	8.15	10.8	4.08	3.38	10.11
U-	Phosphate, output, 24h	5	18.0	22.6	9.0	7.2	22.1
Patient-	Phosphate tubular reabsorption	1	2.7	3.3	1.4	1.1	3.3
S-	Phospholipids	1	6.5	11.1	3.3	3.2	8.6
P-	Plasminogen	1	7.7	---	3.9	---	---
B-	Platelets, count	7	9.1	21.9	4.6	5.9	13.4
B-	Platelet distribution wide	2	2.8	---	1.4	---	---
B-	Plateletcrit	2	11.9	---	6.0	---	---
U-	Porphobilinogen	1	17.0	31.0	8.5	8.8	22.9
U-	Porphyrins (total)	1	40.0	---	20.0	---	---
(B)Leuc-	Potassium	1	13.6	13.4	6.8	4.8	16.0
S-	Potassium	20	4.6	5.6	2.3	1.81	5.61
U-	Potassium, output	4	24.4	22.2	12.2	8.2	28.4
S-	Prealbumin	1	10.9	19.1	5.5	5.5	14.5
S-	Pregnancy-associated plasma protein A (PAPP-A)	1	12.6	14.0	6.3	4.71	15.1
P-	Prolactin	1	39.2	65.1	19.6	19.0	51.34
S-	Prolactin	4	23.0	35.0	11.5	10.5	29.4
P-	Proline	1	17.0	104.4	8.5	26.4	40.5
P-	Prolyl endopeptidase	2	16.8	13.9	8.4	5.5	19.3
S-	Properdin factor B	1	9.5	11.2	4.7	3.7	11.5
S-	Prostatic specific antigen (PSA)	3	18.1	72.4	9.1	18.7	33.6
S-	Protein	18	2.75	4.7	1.38	1.36	3.63

S-	Protein, glycated	1	0.9	11.6	0.5	2.9	3.7
U-	Protein, output, 24h	2	35.5	23.7	17.8	10.7	40.0
P-	Prothrombin time	2	4.0	6.8	2.0	2.0	5.3
U-	Pyridinoline	1	19.4	23.6	9.7	7.6	23.6
B-	Pyruvate	1	15.2	13.0	7.6	5.0	17.5
S-	Receptor for advanced glycation end-products (RAGE)	1	14.6	56.5	7.3	14.59	26.63
B-	Red cell distribution wide (RDW)	4	3.5	5.7	1.8	1.7	4.6
B-	Reticulocyte highly fluorescent, count	1	10.0	62.0	5.0	15.7	24.0
B-	Reticulocyte low fluorescent, count	1	1.6	4.9	0.8	1.3	2.6
B-	Reticulocyte medium fluorescent, count	1	13.0	33.0	6.5	8.9	19.6
B-	Reticulocyte, count	1	11.0	29.0	5.5	7.8	16.8
P-	Retinol	1	6.2	21.0	3.1	5.5	10.6
S-	Retinol	2	13.6	19.0	6.8	5.8	17.1
S-	Rheumatoid factor	1	8.5	24.5	4.3	6.5	13.5

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	Analyte	Number of papers	Biological Variation		Desirable specification		
			CV_I	CVg	I(%)	B(%)	TE(%)
S-	SCC antigen	1	39.4	35.7	19.7	13.3	45.8
P-	S Protein	1	5.8	63.4	2.9	15.9	20.7
P-	Selenium	1	12.0	14.0	6.0	4.6	14.5
B-	Selenium	1	12.0	12.0	6.0	4.2	14.1
P-	Serine	1	12.8	42.8	6.4	11.2	21.7
S-	Sex hormone binding globulin (SHBG)	2	13.05	36.35	6.53	9.66	20.42
(B)Erythr-	Sodium	1	1.8	12.4	0.9	3.1	4.6
(B)Leuc-	Sodium	1	51.0	36.4	25.5	15.7	57.7
S-	Sodium	21	0.6	0.7	0.3	0.23	0.73
B-	Sodium Bicarbonate	1	4.0	4.8	2.0	1.6	4.9
S-	Sodium Bicarbonate	7	4.8	4.7	2.4	1.7	5.6
Sweat-	Sodium Chloride	1	15.0	25.0	7.5	7.3	19.7
U-	Sodium, output, 24 h.	4	28.7	16.7	14.4	8.3	32.0
P-	Soluble CD163	1	9.0	35.9	4.5	9.3	16.7
U-	Specific gravity	1	0.4	1.0	0.2	0.27	0.60
Semen-	Spermatozoa, concentration	1	26.8	56.4	13.4	15.6	37.7
Semen-	Spermatozoa, morphology	1	19.6	44.0	9.8	12.0	28.2
Semen-	Spermatozoa, progressive motility	1	15.2	32.8	7.6	9.0	21.6
Semen-	Spermatozoa, fast progressive motility	1	18.8	51.8	9.4	13.8	29.3
Semen-	Spermatozoa, total motility	1	18.4	29.8	9.2	8.8	23.9
Semen-	Spermatozoa, vitality	1	10.3	25.8	5.2	6.9	15.4
S-	Superoxide dismutase	1	17.1	10.5	8.6	5.0	19.1
(B)Erythr-	Superoxide dismutase	1	12.3	4.9	6.2	3.3	13.5
P-	Taurine	1	30.6	44.0	15.3	13.4	38.6
P-	Testosterone	1	12.6	40.80	6.3	10.68	21.07
S-	Testosterone	7	9.25	22.05	4.63	5.98	13.61
Saliva-	Testosterone	1	17.3	28.8	8.7	8.4	22.7
U-	Testosterone	1	25.0	---	12.5	---	---
S-	Testosterone, free	3	9.3	---	4.7	---	---
U-	Testosterone, free	1	51.7	---	25.9	---	---
S-	Thyroglobulin	2	14.0	39.0	7.0	10.4	21.9
S-	Thyroglobulin antibody	1	8.5	82.0	4.3	20.6	27.6

S-	Thyroid peroxidase antibody	1	11.3	147.0	5.7	36.9	46.2
P-	Thyroid stimulating hormone (TSH)	1	29.30	48.4	14.65	14.14	38.2
S-	Thyroid stimulating hormone (TSH)	9	19.3	24.6	9.7	7.8	23.7
S-	Thyrotropin receptor antibody	1	4.8	---	2.4	---	---
S-	Thyroxine (T4)	11	4.9	10.9	2.5	3.0	7.0
P-	Thyroxine, free (FT4)	1	7.1	9.1	3.55	2.89	8.74
S-	Thyroxine, free (FT4)	5	5.7	12.1	2.9	3.3	8.0
S-	Thyroxine binding globulin (TBG)	2	0.09	0.06	0.0	0.0	0.1
P-	Tirosine	1	10.5	61.0	5.3	15.5	24.1
S-	Tissue polypeptide antigen (TPA)	1	31.1	63.7	15.6	17.7	43.4
S-	Tissue polypeptide specific antigen (TPS)	1	36.1	108.0	18.1	28.5	58.3
U-	Total catecolamines, concentration, 24h	1	24.0	32.0	12.0	10.0	29.8
S-	Transferrin	5	3.0	4.3	1.5	1.3	3.8
P-	Treonine	1	17.9	33.1	9.0	9.4	24.2
S-	Triglyceride	31	19.9	32.7	9.95	9.57	25.99
P-	Triiodothyronine (T3)	1	9.4	18.5	4.7	5.19	12.94
S-	Triiodothyronine (T3)	10	6.9	12.3	3.45	3.53	9.22
S-	Triiodothyronine, free (FT3)	4	7.9	17.6	4.0	4.8	11.3
P-	Troponin I	1	37.1	179.2	18.55	45.75	76.36
S-	Troponin I	5	14.05	63.75	7.03	16.32	27.91
S-	Troponin T	1	30.5	90.0	15.3	23.7	48.9
P-	Tryptophan	1	22.7	152.6	11.4	38.6	57.3
S-	Tumor Necrosis Factor-α (TNΦ–α)	1	43.0	29.0	21.5	13.0	48.4
S-	Urate	16	8.6	17.5	4.3	4.87	11.97
U-	Urate, output, 24h	2	16.8	14.4	8.4	5.53	19.39
S-	Urea	20	12.1	18.7	6.05	5.57	15.55
U-	Urea, output, 24h	4	17.4	25.4	8.7	7.7	22.1
P-	Valine	1	10.6	40.1	5.3	10.4	19.1
U-	Vanilmandelic Acid concentration, 24h	1	22.2	47.0	11.1	13.0	31.3
S-	Vascular cell adhesion molecule-1 (VCAM-1)	1	5.2	16.0	2.6	4.2	8.5
P-	Vascular endotelial growth factor	1	14.1	18.1	7.1	5.7	17.4
B-	Vascular endotelial growth factor	1	14.3	28.8	7.2	8.0	19.8
S-	Vascular endotelial growth factor	1	10.7	47.6	5.4	12.2	21.0
P-	Vitamin B1	1	4.8	12.0	2.4	3.2	7.2
B-	Vitamin B2 (Riboflavin)	1	5.8	10.0	2.9	2.9	7.7
(B)Eryth-	Vitamin B2 (Riboflavin)	1	6.4	11.0	3.2	3.2	8.5
(B)Eryth-	Vitamin B2 status (gluthation reductase activation)	1	5.2	40.0	2.6	10.1	14.4
(B)Eryth-	Vitamin B12	1	15.0	69.0	7.5	17.7	30.0
(B)Eryth-	Vitamin B6	1	14.0	24.0	7.0	6.9	18.5
B-	Vitamin B6	1	20.0	34.0	10.0	9.9	26.4
(B)Eryth-	Vitamin E (Tocopherol)	1	7.6	21.0	3.8	5.6	11.9
(B)Eryth-	Vitamin K (Phylloquinone)	1	38.0	44.0	19.0	14.5	45.9
S-	VLDL Cholesterol	2	27.6	---	13.8	---	---
P-	Von Willebrand factor	3	2.5	27.3	1.3	6.9	8.9
S-	Water	1	3.1	0.1	1.6	0.8	3.3
S-	Zeaxanthine	1	34.7	---	17.4	---	---

S-	Zinc	1	9.3	9.4	4.7	3.3	11.0
P-	Zinc	3	11.0	14.0	5.5	4.5	13.5

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