

Biological Variation Goals ۲۰۱۹

Sample Type	Analyte / Test	CV _i	CV _g	Minimum Specification				Desirable Specification				Optimal Specification			
				%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%
Serum	11-Desoxycortisol	21.3	31.5	16.0	14.3	40.6	45.6	10.7	9.5	27.1	30.4	5.3	4.8	13.5	15.2
Serum	17-Hydroxyprogesterone	19.6	50.4	14.7	20.3	44.5	49.1	9.8	13.5	29.7	32.7	4.9	6.8	14.8	16.4
Urine	4-hydroxy-3-methoximandelate (VMA)	22.2	47	16.7	19.5	47.0	52.1	11.1	13.0	31.3	34.8	5.6	6.5	15.7	17.4
Serum	5' Nucleotidase	23.2	19.9	17.4	11.5	40.2	45.6	11.6	7.6	26.8	30.4	5.8	3.8	13.4	15.2
Urine	5'-Hydroxyindolacetate, concentration	20.3	33.2	15.2	14.6	39.7	44.4	10.2	9.7	26.5	29.6	5.1	4.9	13.2	14.8
Serum	Alpha 1-Acid Glycoprotein	11.3	24.9	8.5	10.3	24.2	26.9	5.7	6.8	16.2	17.9	2.8	3.4	8.1	9.0
Serum	Alpha 1-Antichymotrypsin	13.5	18.3	10.1	8.5	25.2	28.4	6.8	5.7	16.8	18.9	3.4	2.8	8.4	9.5
Serum	Alpha 1-Antitrypsin	5.9	16.3	4.4	6.5	13.8	15.2	3.0	4.3	9.2	10.1	1.5	2.2	4.6	5.1
Serum	Alpha 1-Globulins	11.4	22.6	8.6	9.5	23.6	26.3	5.7	6.3	15.7	17.5	2.9	3.2	7.9	8.8
Urine	Alpha 1-Microglobulin, concentration, first morning	33	58	24.8	25.0	65.9	73.5	16.5	16.7	43.9	49.0	8.3	8.3	22.0	24.5
Plasma	Alpha 2-Antiplasmin	6.2	---	4.7	---	7.7	9.1	3.1	---	5.1	6.1	1.6	---	2.6	3.0
Serum	Alpha 2-Globulins	10.3	12.7	7.7	6.1	18.9	21.3	5.2	4.1	12.6	14.2	2.6	2.0	6.3	7.1
Serum	Alpha 2-Macroglobulin	3.4	18.7	2.6	7.1	11.3	12.1	1.7	4.8	7.6	8.1	0.9	2.4	3.8	4.0
Urine	Alpha 2-Microglobulin output, first morning	29	32	21.8	16.2	52.1	58.8	14.5	10.8	34.7	39.2	7.3	5.4	17.4	19.6
Plasma	Alpha-aminobutyric acid	24.7	32.3	18.5	15.2	45.8	51.6	12.4	10.2	30.5	34.4	6.2	5.1	15.3	17.2
Serum	Alpha-Amylase	8.7	28.3	6.5	11.1	21.9	23.9	4.4	7.4	14.6	15.9	2.2	3.7	7.3	8.0
Serum	Alpha-Amylase (pancreatic)	11.7	29.9	8.8	12.0	26.5	29.2	5.9	8.0	17.7	19.5	2.9	4.0	8.8	9.7
Urine	Alpha-Amylase (pancreatic)	69.5	105	52.1	47.2	133.2	149.4	34.8	31.5	88.8	99.6	17.4	15.7	44.4	49.8
Urine	Alpha-Amylase concentration, random	94	46	70.5	39.2	155.6	177.4	47.0	26.2	103.7	118.3	23.5	13.1	51.9	59.1
Plasma	Alpha-Carotene	24	65	18.0	26.0	55.7	61.3	12.0	17.3	37.1	40.8	6.0	8.7	18.6	20.4
Serum	Alpha-Carotene	48	65	36.0	30.3	89.7	100.9	24.0	20.2	59.8	67.2	12.0	10.1	29.9	33.6
Serum	Alpha-Fetoprotein(non hepatic carcinoma)	12.2	45.6	9.2	17.7	32.8	35.6	6.1	11.8	21.9	23.8	3.1	5.9	10.9	11.9
Serum	Alpha-Tocopherol	13.8	15	10.4	7.6	24.7	27.9	6.9	5.1	16.5	18.6	3.5	2.5	8.2	9.3
Serum	Acid phosphatase	8.9	8	6.7	4.5	15.5	17.6	4.5	3.0	10.3	11.7	2.2	1.5	5.2	5.9
Serum	Acid phosphatase tartrate-resistant (TR-ACP)	8	13.3	6.0	5.8	15.7	17.6	4.0	3.9	10.5	11.7	2.0	1.9	5.2	5.9
Serum	Acid phosphatase prostatic activity (PAP)	33.8	---	25.4	---	41.8	49.7	16.9	---	27.9	33.1	8.5	---	13.9	16.6

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Plasma	Activated partial thromboplastine time	2.7	8.6	2.0	3.4	6.7	7.3	1.4	2.3	4.5	4.9	0.7	1.1	2.2	2.4
Plasma	Adiponectin	18.8	51.2	14.1	20.5	43.7	48.1	9.4	13.6	29.1	32.1	4.7	6.8	14.6	16.0
Serum	Adenosine deaminase (ADA)	11.7	25.5	8.8	10.5	25.0	27.7	5.9	7.0	16.7	18.5	2.9	3.5	8.3	9.2
Plasma	Alanine	14.7	55.8	11.0	21.6	39.8	43.2	7.4	14.4	26.6	28.8	3.7	7.2	13.3	14.4
Serum	Alanine aminopeptidase	4.1	---	3.1		5.1	6.0	2.1		3.4	4.0	1.0		1.7	2.0
Serum	Alanine aminotransferase (ALT)	19.4	41.6	14.6	17.2	41.2	45.7	9.7	11.5	27.5	30.5	4.9	5.7	13.7	15.2
Serum	Albumin	3.2	4.75	2.4	2.1	6.1	6.9	1.6	1.4	4.1	4.6	0.8	0.7	2.0	2.3
Urine	Albumin, concentration, first morning	36	55	27.0	24.7	69.2	77.6	18.0	16.4	46.1	51.7	9.0	8.2	23.1	25.9
Urine	Albumin, output, night urine	29.5	58	22.1	24.4	60.9	67.8	14.8	16.3	40.6	45.2	7.4	8.1	20.3	22.6
Serum	Albumin, glycated	5.2	10.3	3.9	4.3	10.8	12.0	2.6	2.9	7.2	8.0	1.3	1.4	3.6	4.0
Serum	Aldosterone	29.4	40.1	22.1	18.6	55.0	61.9	14.7	12.4	36.7	41.2	7.4	6.2	18.3	20.6
Urine	Aldosterone	39.4	40.1	29.6	21.1	69.8	79.0	19.7	14.1	46.6	52.7	9.9	7.0	23.3	26.3
Serum	Alkaline phosphatase	6.45	26.1	4.8	10.1	18.1	19.6	3.2	6.7	12.0	13.0	1.6	3.4	6.0	6.5
Serum	Alkaline phosphatase, bone	6.2	37.4	4.7	14.2	21.9	23.3	3.1	9.5	14.6	15.6	1.6	4.7	7.3	7.8
Serum	Alkaline phosphatase, liver	10	27	7.5	10.8	23.2	25.5	5.0	7.2	15.4	17.0	2.5	3.6	7.7	8.5
Serum	Alkaline phosphatase, placental	19.1	---	14.3		23.6	28.1	9.6		15.8	18.7	4.8		7.9	9.4
Urine	Ammonia, output, 24h	24.7	27.3	18.5	13.8	44.4	50.1	12.4	9.2	29.6	33.4	6.2	4.6	14.8	16.7
Serum	Amyloid A	25	61	18.8	24.7	55.7	61.5	12.5	16.5	37.1	41.0	6.3	8.2	18.6	20.5
Serum	Androstendione	15.8	38.8	11.9	15.7	35.3	38.9	7.9	10.5	23.5	26.0	4.0	5.2	11.8	13.0
Serum	Anion gap	9.5	10.1	7.1	5.2	17.0	19.2	4.8	3.5	11.3	12.8	2.4	1.7	5.7	6.4
Plasma	Antithrombin III	5.2	15.3	3.9	6.1	12.5	13.7	2.6	4.0	8.3	9.1	1.3	2.0	4.2	4.6
Serum	Apolipoprotein A1	6.5	13.4	4.9	5.6	13.6	15.1	3.3	3.7	9.1	10.1	1.6	1.9	4.5	5.0
Serum	Apolipoprotein B	6.9	22.8	5.2	8.9	17.5	19.1	3.5	6.0	11.6	12.7	1.7	3.0	5.8	6.4
Plasma	Arginine	19.3	34.1	14.5	14.7	38.6	43.1	9.7	9.8	25.7	28.7	4.8	4.9	12.9	14.4
Serum	Arilstease activity, non inhibited	3.8	37.2	2.9	14.0	18.7	19.6	1.9	9.3	12.5	13.1	1.0	4.7	6.2	6.5
Plasma	Ascorbate (Vitamin C)	20	21	15.0	10.9	35.6	40.3	10.0	7.3	23.8	26.9	5.0	3.6	11.9	13.4
Serum	Ascorbate (Vitamin C)	26	31	19.5	15.2	47.3	53.4	13.0	10.1	31.6	35.6	6.5	5.1	15.8	17.8
Plasma	Asparagine	12.3	28	9.2	11.5	26.7	29.5	6.2	7.6	17.8	19.7	3.1	3.8	8.9	9.8
Serum	Aspartate aminotransferase (AST)	12.3	23.1	9.2	9.8	25.0	27.9	6.2	6.5	16.7	18.6	3.1	3.3	8.3	9.3
Plasma	Aspartic acid	31.2	55.1	23.4	23.7	62.4	69.6	15.6	15.8	41.6	46.4	7.8	7.9	20.8	23.2

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Serum	Beta-2-Microglobulin	5.9	15.5	4.4	6.2	13.5	14.9	3.0	4.1	9.0	9.9	1.5	2.1	4.5	5.0
Plasma	Beta-Carotene	18	48	13.5	19.2	41.5	45.7	9.0	12.8	27.7	30.5	4.5	6.4	13.8	15.2
Serum	Beta-Carotene	36	39.7	27.0	20.1	64.6	73.0	18.0	13.4	43.1	48.7	9.0	6.7	21.5	24.3
Serum	Beta-Cryptoxantin	36.7	---	27.5		45.4	53.9	18.4		30.3	36.0	9.2		15.1	18.0
Serum	Beta-Globulins	10.1	9.1	7.6	5.1	17.6	19.9	5.1	3.4	11.7	13.3	2.5	1.7	5.9	6.6
Blood	Base excess	76.4	43.2	57.3	32.9	127.5	145.2	38.2	21.9	85.0	96.8	19.1	11.0	42.5	48.4
Blood	Basophile, count	28	54.8	21.0	23.1	57.7	64.2	14.0	15.4	38.5	42.8	7.0	7.7	19.2	21.4
Serum	Bilirubin total	21.8	28.4	16.4	13.4	40.4	45.5	10.9	9.0	26.9	30.3	5.5	4.5	13.5	15.2
Serum	Bilirubin conjugated	36.8	43.2	27.6	21.3	66.8	75.4	18.4	14.2	44.5	50.3	9.2	7.1	22.3	25.1
Plasma	C Protein	5.6	55.2	4.2	20.8	27.7	29.0	2.8	13.9	18.5	19.4	1.4	6.9	9.2	9.7
Serum	C reactive protein	42.2	76.3	31.7	32.7	84.9	94.7	21.1	21.8	56.6	63.2	10.6	10.9	28.3	31.6
Serum	C reactive protein - high sensitivity	49.7	89.23	37.3	38.3	99.8	111.4	24.9	25.5	66.5	74.2	12.4	12.8	33.3	37.1
Serum	C3 Complement	5.2	15.6	3.9	6.2	12.6	13.8	2.6	4.1	8.4	9.2	1.3	2.1	4.2	4.6
Serum	C4 Complement	8.9	33.4	6.7	13.0	24.0	26.0	4.5	8.6	16.0	17.4	2.2	4.3	8.0	8.7
Serum	CA 125 antigen	24.7	54.6	18.5	22.5	53.0	58.8	12.4	15.0	35.4	39.2	6.2	7.5	17.7	19.6
Serum	CA 15.3 antigen	6.1	62.9	4.6	23.7	31.2	32.7	3.1	15.8	20.8	21.8	1.5	7.9	10.4	10.9
Serum	CA 19.9 antigen	16	130.5	12.0	49.3	69.1	72.8	8.0	32.9	46.1	48.5	4.0	16.4	23.0	24.3
Serum	CA 549 antigen	9.1	33.4	6.8	13.0	24.2	26.4	4.6	8.7	16.2	17.6	2.3	4.3	8.1	8.8
Serum	Calcium	2.1	2.5	1.6	1.2	3.8	4.3	1.1	0.8	2.5	2.9	0.5	0.4	1.3	1.4
Serum	Calcium, complexed	5.3	4.5	4.0	2.6	9.2	10.4	2.7	1.7	6.1	6.9	1.3	0.9	3.1	3.5
Urine	Calcium, concentration, 24h	27.5	36.6	20.6	17.2	51.2	57.6	13.8	11.4	34.1	38.4	6.9	5.7	17.1	19.2
Serum	Calcium, ionized	1.7	1.9	1.3	1.0	3.1	3.5	0.9	0.6	2.0	2.3	0.4	0.3	1.0	1.2
Serum	Calcium, protein bound	4.1	6.1	3.1	2.8	7.8	8.8	2.1	1.8	5.2	5.9	1.0	0.9	2.6	2.9
Serum	Calcium, ultrafiltrable	2.2	2.7	1.7	1.3	4.0	4.5	1.1	0.9	2.7	3.0	0.6	0.4	1.3	1.5
Serum	Carbohydrate deficient transferrin	7.1	38.7	5.3	14.8	23.5	25.2	3.6	9.8	15.7	16.8	1.8	4.9	7.8	8.4
Blood	CO ₂ , total	4	4.8	3.0	2.3	7.3	8.2	2.0	1.6	4.9	5.5	1.0	0.8	2.4	2.7
Serum	Carcinoembryonic antigen (CEA)	12.7	55.6	9.5	21.4	37.1	40.1	6.4	14.3	24.7	26.7	3.2	7.1	12.4	13.4
Serum	Carnitine, Acyl-free	11.35	24.3	8.5	10.1	24.1	26.7	5.7	6.7	16.1	17.8	2.8	3.4	8.0	8.9
Serum	Carnitine, free	8.05	16.65	6.0	6.9	16.9	18.8	4.0	4.6	11.3	12.5	2.0	2.3	5.6	6.3
Serum	Carnitine, total	8.85	11.8	6.6	5.5	16.5	18.5	4.4	3.7	11.0	12.4	2.2	1.8	5.5	6.2

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Serum	Ceruloplasmin (ferroxidase)	5.8	11.1	4.4	4.7	11.9	13.2	2.9	3.1	7.9	8.8	1.5	1.6	4.0	4.4
Serum	Chloride	1.2	1.5	0.9	0.7	2.2	2.5	0.6	0.5	1.5	1.7	0.3	0.2	0.7	0.8
Serum	Cholesterol	5.95	15.3	4.5	6.2	13.5	14.9	3.0	4.1	9.0	9.9	1.5	2.1	4.5	5.0
Serum	Cholinesterase, concentration	7.1	---	5.3		8.8	10.4	3.6		5.9	7.0	1.8		2.9	3.5
Serum	Cholinesterase, activity	6.1	18.2	4.6	7.2	14.7	16.2	3.1	4.8	9.8	10.8	1.5	2.4	4.9	5.4
Plasma	Chromogranin A	12.8	26.3	9.6	11.0	26.8	29.8	6.4	7.3	17.9	19.9	3.2	3.7	8.9	9.9
Plasma	Citrulline	21.4	43.9	16.1	18.3	44.8	49.8	10.7	12.2	29.9	33.2	5.4	6.1	14.9	16.6
Serum	Collagen type I C propeptide (PICP)	7.8	26.7	5.9	10.4	20.1	21.9	3.9	7.0	13.4	14.6	2.0	3.5	6.7	7.3
Serum	Collagen type I N propeptide (PINP)	7.4	57.3	5.6	21.7	30.8	32.5	3.7	14.4	20.5	21.7	1.9	7.2	10.3	10.8
Serum	Collagen type III N propeptide (PIIINP)	13.6	87.2	10.2	33.1	49.9	53.1	6.8	22.1	33.3	35.4	3.4	11.0	16.6	17.7
Urine	Color, first morning	30.9	47.4	23.2	21.2	59.5	66.6	15.5	14.1	39.6	44.4	7.7	7.1	19.8	22.2
Plasma	Copper	8	19	6.0	7.7	17.6	19.5	4.0	5.2	11.8	13.0	2.0	2.6	5.9	6.5
Serum	Copper	4.7	13.6	3.5	5.4	11.2	12.3	2.4	3.6	7.5	8.2	1.2	1.8	3.7	4.1
Plasma	Cortisol	21.7	46.2	16.3	19.1	46.0	51.0	10.9	12.8	30.7	34.0	5.4	6.4	15.3	17.0
Serum	Cortisol	15.2	38.1	11.4	15.4	34.2	37.7	7.6	10.3	22.8	25.2	3.8	5.1	11.4	12.6
Serum	C Peptide	16.6	23.2	12.5	10.7	31.2	35.1	8.3	7.1	20.8	23.4	4.2	3.6	10.4	11.7
Serum	Creatine kinase (CK)	22.8	40	17.1	17.3	45.5	50.8	11.4	11.5	30.3	33.9	5.7	5.8	15.2	16.9
Serum	Creatine kinase MB, %	6.9	48.2	5.2	18.3	26.8	28.4	3.5	12.2	17.9	18.9	1.7	6.1	8.9	9.5
Serum	Creatine kinase MB, activity	19.7	24.3	14.8	11.7	36.1	40.7	9.9	7.8	24.1	27.1	4.9	3.9	12.0	13.6
Serum	Creatine kinase MB, mass	18.4	61.2	13.8	24.0	46.7	51.0	9.2	16.0	31.2	34.0	4.6	8.0	15.6	17.0
Serum	Creatinine	5.95	14.7	4.5	5.9	13.3	14.7	3.0	4.0	8.9	9.8	1.5	2.0	4.4	4.9
Urine	Creatinine, concentration, 24h	24	24.5	18.0	12.9	42.6	48.1	12.0	8.6	28.4	32.1	6.0	4.3	14.2	16.0
Urine	Creatinine, concentration, first morning	23.2	25.7	17.4	13.0	41.7	47.1	11.6	8.7	27.8	31.4	5.8	4.3	13.9	15.7
Urine	Creatinine, concentration, random	36.3	32.4	27.2	18.2	63.2	71.6	18.2	12.2	42.1	47.7	9.1	6.1	21.1	23.9
Urine	Creatinine, output, 24h	11	23	8.3	9.6	23.2	25.7	5.5	6.4	15.4	17.2	2.8	3.2	7.7	8.6
Serum	C-Terminal telopeptide type I collagen (CTY I)	10.85	30.6	8.1	12.2	25.6	28.1	5.4	8.1	17.1	18.7	2.7	4.1	8.5	9.4
Serum	Cyfra 21.1 Antigen	22.2	31.1	16.7	14.3	41.8	47.0	11.1	9.6	27.9	31.3	5.6	4.8	13.9	15.7
Plasma	Cystatin C	5.5	---	4.1		6.8	8.1	2.8		4.5	5.4	1.4		2.3	2.7

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Serum	Cystatin C	5	13	3.8	5.2	11.4	12.6	2.5	3.5	7.6	8.4	1.3	1.7	3.8	4.2
Plasma	Cysteine	5.9	12.3	4.4	5.1	12.4	13.8	3.0	3.4	8.3	9.2	1.5	1.7	4.1	4.6
Plasma	Cystine	38.3	48.5	28.7	23.2	70.6	79.5	19.2	15.4	47.0	53.0	9.6	7.7	23.5	26.5
Serum	D-Dimer (MoM)	23.3	26.5	17.5	13.2	42.1	47.5	11.7	8.8	28.0	31.7	5.8	4.4	14.0	15.8
Serum	Dehydroepiandrosterone sulfate (DHEAS)	6.35	30.7	4.8	11.8	19.6	21.1	3.2	7.8	13.1	14.1	1.6	3.9	6.5	7.0
Urine	Deoxypyridinoline/creatinine, 24h	16	30.7	12.0	13.0	32.8	36.5	8.0	8.7	21.9	24.3	4.0	4.3	10.9	12.2
Urine	Deoxypyridinoline/creatinine, first morning	13.8	34.6	10.4	14.0	31.0	34.3	6.9	9.3	20.7	22.8	3.5	4.7	10.3	11.4
Urine	Deoxypyridinoline/minute, first morning	15.4	30.3	11.6	12.7	31.8	35.4	7.7	8.5	21.2	23.6	3.9	4.2	10.6	11.8
Plasma	Dipeptidyl-peptidase IV (ACE)	8.2	14.5	6.2	6.2	16.4	18.3	4.1	4.2	10.9	12.2	2.1	2.1	5.5	6.1
Serum	Dipeptidyl-peptidase IV (ACE)	12.5	27.7	9.4	11.4	26.9	29.8	6.3	7.6	17.9	19.8	3.1	3.8	9.0	9.9
Plasma	Elastase	12.4	15.1	9.3	7.3	22.7	25.6	6.2	4.9	15.1	17.0	3.1	2.4	7.6	8.5
Blood	Eosinophils, count	21	76.4	15.8	29.7	55.7	60.6	10.5	19.8	37.1	40.4	5.3	9.9	18.6	20.2
Blood/Platelet	Epinephrine	25.3	---	19.0		31.3	37.2	12.7		20.9	24.8	6.3		10.4	12.4
Plasma	Epinephrine	48.3	---	36.2		59.8	71.0	24.2		39.8	47.3	12.1		19.9	23.7
Blood	Erythrocytes, count	3.2	6.3	2.4	2.6	6.6	7.4	1.6	1.8	4.4	4.9	0.8	0.9	2.2	2.5
Blood	Erythrocyte distribution wide	3.5	5.7	2.6	2.5	6.8	7.7	1.8	1.7	4.6	5.1	0.9	0.8	2.3	2.6
Urine	Estradiol	30.4	---	22.8		37.6	44.7	15.2		25.1	29.8	7.6		12.5	14.9
Serum	Estradiol	22.5	24.4	16.9	12.4	40.3	45.5	11.3	8.3	26.9	30.3	5.6	4.1	13.4	15.2
Serum	Estradiol, free	22.8	---	17.1		28.2	33.5	11.4		18.8	22.3	5.7		9.4	11.2
Urine	Estradiol, free	38.6	---	29.0		47.8	56.7	19.3		31.8	37.8	9.7		15.9	18.9
Plasma	Factor V coagulation	3.6	---	2.7		4.5	5.3	1.8		3.0	3.5	0.9		1.5	1.8
Plasma	Factor VII coagulation	6.8	19.4	5.1	7.7	16.1	17.7	3.4	5.1	10.7	11.8	1.7	2.6	5.4	5.9
Plasma	Factor VIII coagulation	4.8	19.1	3.6	7.4	13.3	14.4	2.4	4.9	8.9	9.6	1.2	2.5	4.4	4.8
Plasma	Factor X coagulation	5.9	---	4.4		7.3	8.7	3.0		4.9	5.8	1.5		2.4	2.9
Serum	Ferritin	14.2	15	10.7	7.7	25.3	28.6	7.1	5.2	16.9	19.1	3.6	2.6	8.4	9.5
Plasma	Fibrinogen	10.7	15.8	8.0	7.2	20.4	22.9	5.4	4.8	13.6	15.3	2.7	2.4	6.8	7.6
Blood/Erythrocyte	Folate	12	66	9.0	25.2	40.0	42.8	6.0	16.8	26.7	28.5	3.0	8.4	13.3	14.3
Serum	Folate	24	73	18.0	28.8	58.5	64.1	12.0	19.2	39.0	42.7	6.0	9.6	19.5	21.4

Biological Variation Goals ۲۰۱۹

Sample Type	Analyte / Test	CV _I	CV _g	Minimum Specification				Desirable Specification				Optimal Specification			
				%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%
Serum	Follicle stimulating hormone (FSH)	11	47.2	8.3	18.2	31.8	34.3	5.5	12.1	21.2	22.9	2.8	6.1	10.6	11.4
Serum	Fructosamine	3.4	5.9	2.6	2.6	6.8	7.6	1.7	1.7	4.5	5.0	0.9	0.9	2.3	2.5
Serum	Galactosyl hydroxylysine	11.8	25.8	8.9	10.6	25.2	28.0	5.9	7.1	16.8	18.7	3.0	3.5	8.4	9.3
Plasma	Fibrinogen	14.1	27.25	10.6	11.5	29.0	32.2	7.1	7.7	19.3	21.5	3.5	3.8	9.7	10.7
Serum	Gamma-Globulins	14.6	12.3	11.0	7.2	25.2	28.6	7.3	4.8	16.8	19.1	3.7	2.4	8.4	9.5
Serum	Gamma-glutamyltransferase (GGT)	13.4	42.15	10.1	16.6	33.2	36.3	6.7	11.1	22.1	24.2	3.4	5.5	11.1	12.1
Serum	Globulins, total	5.5	12.9	4.1	5.3	12.1	13.3	2.8	3.5	8.0	8.9	1.4	1.8	4.0	4.4
Plasma	Glucose	4.5	5.8	3.4	2.8	8.3	9.4	2.3	1.8	5.5	6.2	1.1	0.9	2.8	3.1
Serum	Glucose	5.6	7.5	4.2	3.5	10.4	11.7	2.8	2.3	7.0	7.8	1.4	1.2	3.5	3.9
Erythrocyte	Glucose-6-phosphate-1-dehydrogenase (G6PDH)	32.8	31.8	24.6	17.1	57.7	65.3	16.4	11.4	38.5	43.6	8.2	5.7	19.2	21.8
Blood spot	Glucose-6-phosphate-1-dehydrogenase (G6PDH)	7.3	10.3	5.5	4.7	13.8	15.5	3.7	3.2	9.2	10.3	1.8	1.6	4.6	5.2
Plasma	Glutamic acid	46.4	79.9	34.8	34.6	92.1	102.9	23.2	23.1	61.4	68.6	11.6	11.5	30.7	34.3
Plasma	Glutamine	12.1	22	9.1	9.4	24.4	27.2	6.1	6.3	16.3	18.1	3.0	3.1	8.1	9.1
Serum	Glutathion peroxidase	7.2	21.7	5.4	8.6	17.5	19.2	3.6	5.7	11.7	12.8	1.8	2.9	5.8	6.4
Plasma	Glycine	11.8	40.3	8.9	15.7	30.3	33.1	5.9	10.5	20.2	22.1	3.0	5.2	10.1	11.0
Plasma	Haptoglobin	20	27.9	15.0	12.9	37.6	42.3	10.0	8.6	25.1	28.2	5.0	4.3	12.5	14.1
Serum	Haptoglobin	20.4	36.4	15.3	15.6	40.9	45.6	10.2	10.4	27.3	30.4	5.1	5.2	13.6	15.2
Serum	HDL cholesterol	7.3	21.2	5.5	8.4	17.4	19.1	3.7	5.6	11.6	12.8	1.8	2.8	5.8	6.4
Serum	HDL 1 cholesterol	5.5	27.2	4.1	10.4	17.2	18.5	2.8	6.9	11.5	12.3	1.4	3.5	5.7	6.2
Serum	HDL 2 cholesterol	15.7	40.7	11.8	16.4	35.8	39.4	7.9	10.9	23.9	26.3	3.9	5.5	11.9	13.1
Serum	HDL 3 cholesterol	7	14.3	5.3	6.0	14.6	16.3	3.5	4.0	9.8	10.8	1.8	2.0	4.9	5.4
Blood	Hematocrit	2.7	6.41	2.0	2.6	5.9	6.6	1.4	1.7	4.0	4.4	0.7	0.9	2.0	2.2
Blood	Hemoglobin	2.85	6.8	2.1	2.8	6.3	7.0	1.4	1.8	4.2	4.6	0.7	0.9	2.1	2.3
Blood	Hemoglobin A1 C	1.9	5.7	1.4	2.3	4.6	5.0	1.0	1.5	3.1	3.4	0.5	0.8	1.5	1.7
Blood	Hemoglobin A2	0.7	7.7	0.5	2.9	3.8	3.9	0.4	1.9	2.5	2.6	0.2	1.0	1.3	1.3
Plasma	Histidine	9.7	27.2	7.3	10.8	22.8	25.1	4.9	7.2	15.2	16.7	2.4	3.6	7.6	8.4
Plasma	Homocysteine	8.3	33.5	6.2	12.9	23.2	25.1	4.2	8.6	15.5	16.8	2.1	4.3	7.7	8.4
Serum	Hyaluronic acid	62	---	46.5		76.7	91.1	31.0		51.2	60.8	15.5		25.6	30.4
Serum	Hydroxybutyrate dehydrogenase	6.6	---	5.0		8.2	9.7	3.3		5.4	6.5	1.7		2.7	3.2

Biological Variation Goals ۲۰۱۹

Sample Type	Analyte / Test	CV _I	CV _G	Minimum Specification				Desirable Specification				Optimal Specification			
				%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%
Plasma	Hydroxyproline	34.5	56.7	25.9	24.9	67.6	75.6	17.3	16.6	45.1	50.4	8.6	8.3	22.5	25.2
Urine	Hydroxyproline/minute, first morning	36.1	38.8	27.1	19.9	64.5	72.9	18.1	13.2	43.0	48.6	9.0	6.6	21.5	24.3
Urine	Hydroxyproline/minute, second void	40.5	32.9	30.4	19.6	69.7	79.1	20.3	13.0	46.5	52.7	10.1	6.5	23.2	26.4
Serum	Immunoglobulin A	5.4	35.9	4.1	13.6	20.3	21.6	2.7	9.1	13.5	14.4	1.4	4.5	6.8	7.2
Serum	Immunoglobulin G	4.5	16.5	3.4	6.4	12.0	13.0	2.3	4.3	8.0	8.7	1.1	2.1	4.0	4.3
Serum	Immunoglobulin M	5.9	47.3	4.4	17.9	25.2	26.5	3.0	11.9	16.8	17.7	1.5	6.0	8.4	8.8
Serum	Immunoglobulins κ chains	4.8	15.3	3.6	6.0	12.0	13.1	2.4	4.0	8.0	8.7	1.2	2.0	4.0	4.4
Serum	Immunoglobulins λ chains	4.8	18	3.6	7.0	12.9	14.0	2.4	4.7	8.6	9.4	1.2	2.3	4.3	4.7
Serum	Inhibin B	10	25	7.5	10.1	22.5	24.8	5.0	6.7	15.0	16.5	2.5	3.4	7.5	8.3
Serum	Insulin	21.1	58.3	15.8	23.3	49.4	54.3	10.6	15.5	32.9	36.2	5.3	7.8	16.5	18.1
Serum	Insulin-like growth factor (IGF-1)	14.6	45.4	11.0	17.9	36.0	39.3	7.3	11.9	24.0	26.2	3.7	6.0	12.0	13.1
Serum	Insulin-like growth factor binding protein 3 (IGFBP ₃)	10.1	63.9	7.6	24.3	36.8	39.1	5.1	16.2	24.5	26.1	2.5	8.1	12.3	13.0
Serum	Intercellular adhesion molecule-1 (ICAM-1)	1.9	21	1.4	7.9	10.3	10.7	1.0	5.3	6.8	7.1	0.5	2.6	3.4	3.6
Blood Leukocyte	Interferon receptor	14	20	10.5	9.2	26.5	29.7	7.0	6.1	17.7	19.8	3.5	3.1	8.8	9.9
Serum	Interleukin 1-Beta	30	36	22.5	17.6	54.7	61.7	15.0	11.7	36.5	41.1	7.5	5.9	18.2	20.6
Serum	Interleukin-8	24	31	18.0	14.7	44.4	50.0	12.0	9.8	29.6	33.3	6.0	4.9	14.8	16.7
Serum	Iron	26.5	23.2	19.9	13.2	46.0	52.2	13.3	8.8	30.7	34.8	6.6	4.4	15.3	17.4
Plasma	Isoleucine	15.5	45.5	11.6	18.0	37.2	40.8	7.8	12.0	24.8	27.2	3.9	6.0	12.4	13.6
Serum	Kallicrein 6	11.8	27.6	8.9	11.3	25.9	28.6	5.9	7.5	17.2	19.1	3.0	3.8	8.6	9.5
Blood	Lactate	27.2	16.7	20.4	12.0	45.6	52.0	13.6	8.0	30.4	34.6	6.8	4.0	15.2	17.3
Serum	Lactate dehydrogenase (LDH)	8.6	14.7	6.5	6.4	17.0	19.0	4.3	4.3	11.4	12.7	2.2	2.1	5.7	6.3
Serum	Lactate dehydrogenase 1 isoform (LDH1)	2.3	8.3	1.7	3.2	6.1	6.6	1.2	2.2	4.1	4.4	0.6	1.1	2.0	2.2
Serum	Lactate dehydrogenase 2 isoform (LDH2)	3.3	2.4	2.5	1.5	5.6	6.4	1.7	1.0	3.7	4.3	0.8	0.5	1.9	2.1
Serum	Lactate dehydrogenase 3 isoform (LDH3)	2.8	3.8	2.1	1.8	5.2	5.9	1.4	1.2	3.5	3.9	0.7	0.6	1.7	2.0

Biological Variation Goals ۲۰۱۹

Sample Type	Analyte / Test	CV _i	CV _g	Minimum Specification				Desirable Specification				Optimal Specification			
				%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%
Serum	Lactate dehydrogenase 4 isoform (LDH4)	5.9	5.3	4.4	3.0	10.3	11.6	3.0	2.0	6.9	7.8	1.5	1.0	3.4	3.9
Serum	Lactate dehydrogenase 5 isoform (LDH5)	8	9.6	6.0	4.7	14.6	16.4	4.0	3.1	9.7	11.0	2.0	1.6	4.9	5.5
Plasma	Lactoferrin	11.8	23.7	8.9	9.9	24.5	27.3	5.9	6.6	16.4	18.2	3.0	3.3	8.2	9.1
Serum	LDL Cholesterol	7.8	20.4	5.9	8.2	17.8	19.7	3.9	5.5	11.9	13.1	2.0	2.7	5.9	6.6
Plasma	LDL Cholesterol (oxidized)	21	50	15.8	20.3	46.3	51.2	10.5	13.6	30.9	34.1	5.3	6.8	15.4	17.1
Serum	LDL Cholesterol, small dense	9.1	20	6.8	8.2	19.5	21.6	4.6	5.5	13.0	14.4	2.3	2.7	6.5	7.2
Serum	LDL receptor mRNA	21.5	13.6	16.1	9.5	36.1	41.1	10.8	6.4	24.1	27.4	5.4	3.2	12.0	13.7
Plasma	Leucine	14.8	44	11.1	17.4	35.7	39.2	7.4	11.6	23.8	26.1	3.7	5.8	11.9	13.1
Blood	Leukocytes count	11.4	21.3	8.6	9.1	23.2	25.8	5.7	6.0	15.4	17.2	2.9	3.0	7.7	8.6
Serum	Lipase	32.2	31.8	24.2	17.0	56.8	64.3	16.1	11.3	37.9	42.9	8.1	5.7	18.9	21.4
Serum	Lipoprotein (a)	20.8	18.1	15.6	10.3	36.1	40.9	10.4	6.9	24.1	27.3	5.2	3.4	12.0	13.6
Plasma	Lutein	13	21	9.8	9.3	25.3	28.4	6.5	6.2	16.9	18.9	3.3	3.1	8.4	9.5
Serum	Lutein	23.7	---	17.8	---	29.3	34.8	11.9	---	19.6	23.2	5.9	---	9.8	11.6
Serum	Luteinizing hormone (LH)	23	27.4	17.3	13.4	41.9	47.2	11.5	8.9	27.9	31.5	5.8	4.5	14.0	15.7
Plasma	Lycopene	22	33	16.5	14.9	42.1	47.2	11.0	9.9	28.1	31.5	5.5	5.0	14.0	15.7
Serum	Lycopene	40.1	33	30.1	19.5	69.1	78.4	20.1	13.0	46.1	52.3	10.0	6.5	23.0	26.1
Blood	Lymphocytes, count	10.2	35.3	7.7	13.8	26.4	28.8	5.1	9.2	17.6	19.2	2.6	4.6	8.8	9.6
Blood	Lymphocytes CD4	25	---	18.8	---	30.9	36.8	12.5	---	20.6	24.5	6.3	---	10.3	12.3
Plasma	Lysine	11.5	38.2	8.6	15.0	29.2	31.9	5.8	10.0	19.5	21.2	2.9	5.0	9.7	10.6
Erythrocyte	Magnesium	5.6	11.3	4.2	4.7	11.7	13.0	2.8	3.2	7.8	8.6	1.4	1.6	3.9	4.3
Blood Leukocyte	Magnesium	18.5	12.4	13.9	8.4	31.2	35.5	9.3	5.6	20.8	23.7	4.6	2.8	10.4	11.8
Blood Monocyte	Magnesium	18.1	20.3	13.6	10.2	32.6	36.8	9.1	6.8	21.7	24.5	4.5	3.4	10.9	12.3
Serum	Magnesium	3.6	6.4	2.7	2.8	7.2	8.0	1.8	1.8	4.8	5.4	0.9	0.9	2.4	2.7
Urine	Magnesium, ionized	1.9	5.1	1.4	2.0	4.4	4.8	1.0	1.4	2.9	3.2	0.5	0.7	1.5	1.6
Urine	Magnesium, output, 24h	38.3	37.6	28.7	20.1	67.5	76.4	19.2	13.4	45.0	51.0	9.6	6.7	22.5	25.5
Erythrocyte	Mean corpuscular hemoglobin (MCH)	1.4	5.2	1.1	2.0	3.8	4.1	0.7	1.3	2.5	2.7	0.4	0.7	1.3	1.4
Erythrocyte	Mean corpuscular hemoglobin concentration (MCHC)	1.06	1.2	0.8	0.6	1.9	2.2	0.5	0.4	1.3	1.4	0.3	0.2	0.6	0.7
Erythrocyte	Mean corpuscular volume (MCV)	1.4	4.85	1.1	1.9	3.6	4.0	0.7	1.3	2.4	2.6	0.4	0.6	1.2	1.3

Biological Variation Goals ۲۰۱۹

Sample Type	Analyte / Test	CV _i	CV _g	Minimum Specification				Desirable Specification				Optimal Specification			
				%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%
Blood/Platelet	Mean platelet volume (MPV)	4.3	8.1	3.2	3.4	8.8	9.8	2.2	2.3	5.8	6.5	1.1	1.1	2.9	3.3
Plasma	Metionine	14.7	43.4	11.0	17.2	35.4	38.8	7.4	11.5	23.6	25.9	3.7	5.7	11.8	12.9
Blood	Monocytes, count	17.8	49.8	13.4	19.8	41.9	46.0	8.9	13.2	27.9	30.7	4.5	6.6	14.0	15.3
Serum	Myeloperoxidase	36	30	27.0	17.6	62.1	70.5	18.0	11.7	41.4	47.0	9.0	5.9	20.7	23.5
Serum	Myoglobin	13.9	29.6	10.4	12.3	29.5	32.7	7.0	8.2	19.6	21.8	3.5	4.1	9.8	10.9
Urine	N-Acetyl Glucosaminidase, concentration, first morning	52.9	22	39.7	21.5	86.9	99.2	26.5	14.3	58.0	66.2	13.2	7.2	29.0	33.1
Urine	N-Acetyl Glucosaminidase/Creatinine	51.1	21.8	38.3	20.8	84.1	96.0	25.6	13.9	56.0	64.0	12.8	6.9	28.0	32.0
Blood	Neutrophiles, count	17.1	32.8	12.8	13.9	35.0	39.0	8.6	9.2	23.4	26.0	4.3	4.6	11.7	13.0
Urine	Nitrogen, output	13.9	24.2	10.4	10.5	27.7	30.9	7.0	7.0	18.4	20.6	3.5	3.5	9.2	10.3
Blood/Platelet	Norepinephrine	9.5	---	7.1		11.8	14.0	4.8		7.8	9.3	2.4		3.9	4.7
Plasma	Norepinephrine	19.5	---	14.6		24.1	28.7	9.8		16.1	19.1	4.9		8.0	9.6
Urine	N-Telopeptide type I collagen	15.5	37.6	11.6	15.3	34.4	38.0	7.8	10.2	23.0	25.4	3.9	5.1	11.5	12.7
Serum	N-terminal (NT)-proBNP	10	16	7.5	7.1	19.5	21.8	5.0	4.7	13.0	14.5	2.5	2.4	6.5	7.3
Plasma	Ornithine	18.4	54.9	13.8	21.7	44.5	48.8	9.2	14.5	29.7	32.5	4.6	7.2	14.8	16.3
Plasma	Osmolality	1.3	1.5	1.0	0.7	2.4	2.7	0.7	0.5	1.6	1.8	0.3	0.2	0.8	0.9
Saliva	Osmolality	9.5	35.8	7.1	13.9	25.6	27.9	4.8	9.3	17.1	18.6	2.4	4.6	8.5	9.3
Serum	Osmolality	1.3	1.2	1.0	0.7	2.3	2.6	0.7	0.4	1.5	1.7	0.3	0.2	0.8	0.9
Urine	Osmolality, first morning	28.3	57.9	21.2	24.2	59.2	65.8	14.2	16.1	39.5	43.8	7.1	8.1	19.7	21.9
Serum	Osteocalcin	6.35	30.9	4.8	11.8	19.7	21.2	3.2	7.9	13.1	14.1	1.6	3.9	6.6	7.1
Urine	Oxalate, concentration, 24h	44	18	33.0	17.8	72.3	82.5	22.0	11.9	48.2	55.0	11.0	5.9	24.1	27.5
Urine	Oxalate, output, 24h	42.5	19.9	31.9	17.6	70.2	80.1	21.3	11.7	46.8	53.4	10.6	5.9	23.4	26.7
Blood	pCO ₂	4.8	5.3	3.6	2.7	8.6	9.7	2.4	1.8	5.7	6.5	1.2	0.9	2.9	3.2
Blood	pH [H ⁺]	3.5	2	2.6	1.5	5.8	6.7	1.8	1.0	3.9	4.4	0.9	0.5	1.9	2.2
Blood	pH (pH units)	0.2	---	0.2		0.2	0.3	0.1		0.2	0.2	0.1		0.1	0.1
Serum	Paraoxonase 1	13.4	84	10.1	31.9	48.5	51.6	6.7	21.3	32.3	34.4	3.4	10.6	16.2	17.2
Serum	Paraoxonase 1 substrate inhibition (PON 4SI)	3.9	80.1	2.9	30.1	34.9	35.8	2.0	20.0	23.3	23.9	1.0	10.0	11.6	11.9
Serum	Paraoxonase, activity (salt stimulated)	8	86.4	6.0	32.5	42.4	44.3	4.0	21.7	28.3	29.5	2.0	10.8	14.1	14.8
Plasma	Parathyroid hormone (PTH)	25.3	43.4	19.0	18.8	50.1	56.0	12.7	12.6	33.4	37.4	6.3	6.3	16.7	18.7

Biological Variation Goals ۲۰۱۹

Sample Type	Analyte / Test	CV _I	CV _G	Minimum Specification				Desirable Specification				Optimal Specification			
				%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%
Serum	Parathyroid hormone (PTH)	25.9	23.8	19.4	13.2	45.2	51.3	13.0	8.8	30.2	34.2	6.5	4.4	15.1	17.1
Serum	Phenylacetate	6.6	25.2	5.0	9.8	17.9	19.5	3.3	6.5	12.0	13.0	1.7	3.3	6.0	6.5
Plasma	Phenylalanine	9.5	40.6	7.1	15.6	27.4	29.6	4.8	10.4	18.3	19.7	2.4	5.2	9.1	9.9
Serum	Phosphate	8.15	10.8	6.1	5.1	15.2	17.1	4.1	3.4	10.1	11.4	2.0	1.7	5.1	5.7
Urine	Phosphate, output, 24h	18	22.6	13.5	10.8	33.1	37.3	9.0	7.2	22.1	24.9	4.5	3.6	11.0	12.4
Patient-	Phosphate tubular reabsorption	2.7	3.3	2.0	1.6	4.9	5.6	1.4	1.1	3.3	3.7	0.7	0.5	1.6	1.9
Serum	Phospholipids	6.5	11.1	4.9	4.8	12.9	14.4	3.3	3.2	8.6	9.6	1.6	1.6	4.3	4.8
Plasma	Plasminogen	7.7	---	5.8		9.5	11.3	3.9		6.4	7.5	1.9		3.2	3.8
Blood	Platelets, count	9.1	21.9	6.8	8.9	20.2	22.3	4.6	5.9	13.4	14.8	2.3	3.0	6.7	7.4
Blood	Platelet distribution wide	2.8	---	2.1		3.5	4.1	1.4		2.3	2.7	0.7		1.2	1.4
Blood	Plateletcrit	11.9	---	8.9		14.7	17.5	6.0		9.8	11.7	3.0		4.9	5.8
Urine	Porphobilinogen	17	31	12.8	13.3	34.3	38.2	8.5	8.8	22.9	25.5	4.3	4.4	11.4	12.7
Urine	Porphyrins (total)	40	---	30.0		49.5	58.8	20.0		33.0	39.2	10.0		16.5	19.6
Blood Leukocyte	Potassium	13.6	13.4	10.2	7.2	24.0	27.2	6.8	4.8	16.0	18.1	3.4	2.4	8.0	9.1
Serum	Potassium	4.6	5.6	3.5	2.7	8.4	9.5	2.3	1.8	5.6	6.3	1.2	0.9	2.8	3.2
Urine	Potassium, output	24.4	22.2	18.3	12.4	42.6	48.2	12.2	8.2	28.4	32.2	6.1	4.1	14.2	16.1
Serum	Prealbumin	10.9	19.1	8.2	8.2	21.7	24.3	5.5	5.5	14.5	16.2	2.7	2.7	7.2	8.1
Serum	Pregnancy-associated plasma protein A (PAPP-A)	12.6	14	9.5	7.1	22.7	25.6	6.3	4.7	15.1	17.1	3.2	2.4	7.6	8.5
Plasma	Prolactin	39.2	65.1	29.4	28.5	77.0	86.1	19.6	19.0	51.3	57.4	9.8	9.5	25.7	28.7
Serum	Prolactin	23	35	17.3	15.7	44.2	49.5	11.5	10.5	29.4	33.0	5.8	5.2	14.7	16.5
Plasma	Proline	17	104.4	12.8	39.7	60.7	64.7	8.5	26.4	40.5	43.1	4.3	13.2	20.2	21.6
Plasma	Prolyl endopeptidase	16.8	13.9	12.6	8.2	29.0	32.9	8.4	5.5	19.3	21.9	4.2	2.7	9.7	11.0
Serum	Properdin factor B	9.5	11.2	7.1	5.5	17.3	19.5	4.8	3.7	11.5	13.0	2.4	1.8	5.8	6.5
Serum	Prostatic specific antigen (PSA)	18.1	72.4	13.6	28.0	50.4	54.6	9.1	18.7	33.6	36.4	4.5	9.3	16.8	18.2
Serum	Protein	2.75	4.7	2.1	2.0	5.4	6.1	1.4	1.4	3.6	4.1	0.7	0.7	1.8	2.0
Serum	Protein, glycated	0.9	11.6	0.7	4.4	5.5	5.7	0.5	2.9	3.7	3.8	0.2	1.5	1.8	1.9
Urine	Protein, output, 24h	35.5	23.7	26.6	16.0	59.9	68.2	17.8	10.7	40.0	45.5	8.9	5.3	20.0	22.7
Plasma	Prothrombin time	4	6.8	3.0	3.0	7.9	8.8	2.0	2.0	5.3	5.9	1.0	1.0	2.6	2.9
Urine	Pyridinoline	19.4	23.6	14.6	11.5	35.5	40.0	9.7	7.6	23.6	26.6	4.9	3.8	11.8	13.3
Blood	Pyruvate	15.2	13	11.4	7.5	26.3	29.8	7.6	5.0	17.5	19.9	3.8	2.5	8.8	9.9
Serum	Receptor for advanced glycation end-products (RAGE)	14.6	56.5	11.0	21.9	40.0	43.3	7.3	14.6	26.6	28.9	3.7	7.3	13.3	14.4

Biological Variation Goals ۲۰۱۹

Sample Type	Analyte / Test	CV _I	CV _g	Minimum Specification				Desirable Specification				Optimal Specification			
				%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%
Blood	Red cell distribution wide (RDW)	3.5	5.7	2.6	2.5	6.8	7.7	1.8	1.7	4.6	5.1	0.9	0.8	2.3	2.6
Blood	Reticulocyte highly fluorescent, count	10	62	7.5	23.6	35.9	38.3	5.0	15.7	24.0	25.5	2.5	7.9	12.0	12.8
Blood	Reticulocyte low fluorescent, count	1.6	4.9	1.2	1.9	3.9	4.3	0.8	1.3	2.6	2.9	0.4	0.6	1.3	1.4
Blood	Reticulocyte medium fluorescent, count	13	33	9.8	13.3	29.4	32.4	6.5	8.9	19.6	21.6	3.3	4.4	9.8	10.8
Blood	Reticulocyte, count	11	29	8.3	11.6	25.2	27.8	5.5	7.8	16.8	18.5	2.8	3.9	8.4	9.3
Plasma	Retinol	6.2	21	4.7	8.2	15.9	17.3	3.1	5.5	10.6	11.6	1.6	2.7	5.3	5.8
Serum	Retinol	13.6	19	10.2	8.8	25.6	28.8	6.8	5.8	17.1	19.2	3.4	2.9	8.5	9.6
Serum	Rheumatoid factor	8.5	24.5	6.4	9.7	20.2	22.2	4.3	6.5	13.5	14.8	2.1	3.2	6.7	7.4
Serum	SCC antigen	39.4	35.7	29.6	19.9	68.7	77.9	19.7	13.3	45.8	51.9	9.9	6.6	22.9	26.0
Plasma	S Protein	5.8	63.4	4.4	23.9	31.1	32.4	2.9	15.9	20.7	21.6	1.5	8.0	10.4	10.8
Plasma	Selenium	12	14	9.0	6.9	21.8	24.6	6.0	4.6	14.5	16.4	3.0	2.3	7.3	8.2
Blood	Selenium	12	12	9.0	6.4	21.2	24.0	6.0	4.2	14.1	16.0	3.0	2.1	7.1	8.0
Plasma	Serine	12.8	42.8	9.6	16.8	32.6	35.6	6.4	11.2	21.7	23.7	3.2	5.6	10.9	11.9
Serum	Sex hormone binding globulin (SHBG)	13.05	36.35	9.8	14.5	30.6	33.7	6.5	9.7	20.4	22.4	3.3	4.8	10.2	11.2
Erythrocyte	Sodium	1.8	12.4	1.4	4.7	6.9	7.3	0.9	3.1	4.6	4.9	0.5	1.6	2.3	2.4
Blood Leukocyte	Sodium	51	36.4	38.3	23.5	86.6	98.5	25.5	15.7	57.7	65.6	12.8	7.8	28.9	32.8
Serum	Sodium	0.6	0.7	0.5	0.3	1.1	1.2	0.3	0.2	0.7	0.8	0.2	0.1	0.4	0.4
Blood	Sodium Bicarbonate	4	4.8	3.0	2.3	7.3	8.2	2.0	1.6	4.9	5.5	1.0	0.8	2.4	2.7
Serum	Sodium Bicarbonate	4.8	4.7	3.6	2.5	8.5	9.6	2.4	1.7	5.6	6.4	1.2	0.8	2.8	3.2
Sweat-	Sodium Chloride	15	25	11.3	10.9	29.5	33.0	7.5	7.3	19.7	22.0	3.8	3.6	9.8	11.0
Urine	Sodium, output, 24 h.	28.7	16.7	21.5	12.5	48.0	54.6	14.4	8.3	32.0	36.4	7.2	4.2	16.0	18.2
Plasma	Soluble CD163	9	35.9	6.8	13.9	25.0	27.1	4.5	9.3	16.7	18.1	2.3	4.6	8.3	9.0
Urine	Specific gravity	0.4	1	0.3	0.4	0.9	1.0	0.2	0.3	0.6	0.7	0.1	0.1	0.3	0.3
Semen	Spermatozoa, concentration	26.8	56.4	20.1	23.4	56.6	62.8	13.4	15.6	37.7	41.9	6.7	7.8	18.9	20.9
Semen	Spermatozoa, morphology	19.6	44	14.7	18.1	42.3	46.9	9.8	12.0	28.2	31.3	4.9	6.0	14.1	15.6
Semen	Spermatozoa, progressive motility	15.2	32.8	11.4	13.6	32.4	35.9	7.6	9.0	21.6	23.9	3.8	4.5	10.8	12.0
Semen	Spermatozoa, fast progressive motility	18.8	51.8	14.1	20.7	43.9	48.3	9.4	13.8	29.3	32.2	4.7	6.9	14.6	16.1

Biological Variation Goals ۲۰۱۹

Sample Type	Analyte / Test	CV _i	CV _g	Minimum Specification				Desirable Specification				Optimal Specification			
				%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%
Semen	Spermatozoa, total motility	18.4	29.8	13.8	13.1	35.9	40.2	9.2	8.8	23.9	26.8	4.6	4.4	12.0	13.4
Semen	Spermatozoa, vitality	10.3	25.8	7.7	10.4	23.2	25.6	5.2	6.9	15.4	17.0	2.6	3.5	7.7	8.5
Serum	Superoxide dismutase	17.1	10.5	12.8	7.5	28.7	32.7	8.6	5.0	19.1	21.8	4.3	2.5	9.6	10.9
Erythrocyte	Superoxide dismutase	12.3	4.9	9.2	5.0	20.2	23.0	6.2	3.3	13.5	15.4	3.1	1.7	6.7	7.7
Plasma	Taurine	30.6	44	23.0	20.1	58.0	65.1	15.3	13.4	38.6	43.4	7.7	6.7	19.3	21.7
Plasma	Testosterone	12.6	40.8	9.5	16.0	31.6	34.5	6.3	10.7	21.1	23.0	3.2	5.3	10.5	11.5
Serum	Testosterone	9.25	22.05	6.9	9.0	20.4	22.6	4.6	6.0	13.6	15.0	2.3	3.0	6.8	7.5
Saliva	Testosterone	17.3	28.8	13.0	12.6	34.0	38.0	8.7	8.4	22.7	25.4	4.3	4.2	11.3	12.7
Urine	Testosterone	25	---	18.8	---	30.9	36.8	12.5	---	20.6	24.5	6.3	---	10.3	12.3
Serum	Testosterone, free	9.3	---	7.0	---	11.5	13.7	4.7	---	7.7	9.1	2.3	---	3.8	4.6
Urine	Testosterone, free	51.7	---	38.8	---	64.0	76.0	25.9	---	42.7	50.7	12.9	---	21.3	25.3
Serum	Thyroglobulin	14	39	10.5	15.5	32.9	36.1	7.0	10.4	21.9	24.1	3.5	5.2	11.0	12.0
Serum	Thyroglobulin antibody	8.5	82	6.4	30.9	41.4	43.4	4.3	20.6	27.6	28.9	2.1	10.3	13.8	14.5
Serum	Thyroid peroxidase antibody	11.3	147	8.5	55.3	69.3	71.9	5.7	36.9	46.2	47.9	2.8	18.4	23.1	24.0
Plasma	Thyroid stimulating hormone (TSH)	29.3	48.4	22.0	21.2	57.5	64.3	14.7	14.1	38.3	42.9	7.3	7.1	19.2	21.4
Serum	Thyroid stimulating hormone (TSH)	19.3	24.6	14.5	11.7	35.6	40.1	9.7	7.8	23.7	26.7	4.8	3.9	11.9	13.4
Serum	Thyrotropin receptor antibody	4.8	---	3.6	---	5.9	7.1	2.4	---	4.0	4.7	1.2	---	2.0	2.4
Serum	Thyroxine (T4)	4.9	10.9	3.7	4.5	10.5	11.7	2.5	3.0	7.0	7.8	1.2	1.5	3.5	3.9
Plasma	Thyroxine, free (FT4)	7.1	9.1	5.3	4.3	13.1	14.8	3.6	2.9	8.7	9.8	1.8	1.4	4.4	4.9
Serum	Thyroxine, free (FT4)	5.7	12.1	4.3	5.0	12.1	13.4	2.9	3.3	8.0	8.9	1.4	1.7	4.0	4.5
Serum	Thyroxine binding globulin (TBG)	0.09	0.06	0.1	0.0	0.2	0.2	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.1
Plasma	Tirosine	10.5	61	7.9	23.2	36.2	38.6	5.3	15.5	24.1	25.8	2.6	7.7	12.1	12.9
Serum	Tissue polypeptide antigen (TPA)	31.1	63.7	23.3	26.6	65.1	72.3	15.6	17.7	43.4	48.2	7.8	8.9	21.7	24.1
Serum	Tissue polypeptide specific antigen (TPS)	36.1	108	27.1	42.7	87.4	95.8	18.1	28.5	58.3	63.8	9.0	14.2	29.1	31.9
Urine	Total catecholamines, concentration, 24h	24	32	18.0	15.0	44.7	50.3	12.0	10.0	29.8	33.5	6.0	5.0	14.9	16.8
Serum	Transferrin	3	4.3	2.3	2.0	5.7	6.4	1.5	1.3	3.8	4.3	0.8	0.7	1.9	2.1
Plasma	Treonine	17.9	33.1	13.4	14.1	36.3	40.4	9.0	9.4	24.2	26.9	4.5	4.7	12.1	13.5
Serum	Triglyceride	19.9	32.7	14.9	14.4	39.0	43.6	10.0	9.6	26.0	29.1	5.0	4.8	13.0	14.5

Biological Variation Goals ۲۰۱۹

Sample Type	Analyte / Test	CV _i	CV _g	Minimum Specification				Desirable Specification				Optimal Specification			
				%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%
Plasma	Triiodothyronine (T3)	9.4	18.5	7.1	7.8	19.4	21.6	4.7	5.2	12.9	14.4	2.4	2.6	6.5	7.2
Serum	Triiodothyronine (T3)	6.9	12.3	5.2	5.3	13.8	15.4	3.5	3.5	9.2	10.3	1.7	1.8	4.6	5.1
Serum	Triiodothyronine, free (FT3)	7.9	17.6	5.9	7.2	17.0	18.8	4.0	4.8	11.3	12.6	2.0	2.4	5.7	6.3
Plasma	Troponin I	37.1	179.2	27.8	68.6	114.5	123.2	18.6	45.8	76.4	82.1	9.3	22.9	38.2	41.1
Serum	Troponin I	14.05	63.75	10.5	24.5	41.9	45.1	7.0	16.3	27.9	30.1	3.5	8.2	14.0	15.0
Serum	Troponin T	30.5	90	22.9	35.6	73.4	80.5	15.3	23.8	48.9	53.6	7.6	11.9	24.5	26.8
Plasma	Tryptophan	22.7	152.6	17.0	57.9	85.9	91.2	11.4	38.6	57.3	60.8	5.7	19.3	28.6	30.4
Serum	Tumor Necrosis Factor-a (TNF-a)	43	29	32.3	19.4	72.7	82.7	21.5	13.0	48.4	55.1	10.8	6.5	24.2	27.6
Serum	Urate	8.6	17.5	6.5	7.3	18.0	20.0	4.3	4.9	12.0	13.3	2.2	2.4	6.0	6.7
Urine	Urate, output, 24h	16.8	14.4	12.6	8.3	29.1	33.0	8.4	5.5	19.4	22.0	4.2	2.8	9.7	11.0
Serum	Urea	12.1	18.7	9.1	8.4	23.3	26.1	6.1	5.6	15.6	17.4	3.0	2.8	7.8	8.7
Urine	Urea, output, 24h	17.4	25.4	13.1	11.5	33.1	37.1	8.7	7.7	22.1	24.7	4.4	3.8	11.0	12.4
Plasma	Valine	10.6	40.1	8.0	15.6	28.7	31.1	5.3	10.4	19.1	20.8	2.7	5.2	9.6	10.4
Urine	Vanilmandelic Acid concentration, 24h	22.2	47	16.7	19.5	47.0	52.1	11.1	13.0	31.3	34.8	5.6	6.5	15.7	17.4
Serum	Vascular cell adhesion molecule-1 (VCAM-1)	5.2	16	3.9	6.3	12.7	14.0	2.6	4.2	8.5	9.3	1.3	2.1	4.2	4.7
Plasma	Vascular endothelial growth factor	14.1	18.1	10.6	8.6	26.1	29.3	7.1	5.7	17.4	19.6	3.5	2.9	8.7	9.8
Blood	Vascular endothelial growth factor	14.3	28.8	10.7	12.1	29.8	33.1	7.2	8.0	19.8	22.1	3.6	4.0	9.9	11.0
Serum	Vascular endothelial growth factor	10.7	47.6	8.0	18.3	31.5	34.0	5.4	12.2	21.0	22.7	2.7	6.1	10.5	11.3
Plasma	Vitamin B1	4.8	12	3.6	4.8	10.8	11.9	2.4	3.2	7.2	7.9	1.2	1.6	3.6	4.0
Blood	Vitamin B2 (Riboflavin)	5.8	10	4.4	4.3	11.5	12.9	2.9	2.9	7.7	8.6	1.5	1.4	3.8	4.3
Blood/Erythrocyte	Vitamin B2 (Riboflavin)	6.4	11	4.8	4.8	12.7	14.2	3.2	3.2	8.5	9.5	1.6	1.6	4.2	4.7
Blood/Erythrocyte	Vitamin B2 status (gluthation reductase activation)	5.2	40	3.9	15.1	21.6	22.8	2.6	10.1	14.4	15.2	1.3	5.0	7.2	7.6
Blood/Erythrocyte	Vitamin B12	15	69	11.3	26.5	45.0	48.5	7.5	17.7	30.0	32.4	3.8	8.8	15.0	16.2
Blood/Erythrocyte	Vitamin B6	14	24	10.5	10.4	27.7	31.0	7.0	6.9	18.5	20.7	3.5	3.5	9.2	10.3
Blood	Vitamin B6	20	34	15.0	14.8	39.5	44.2	10.0	9.9	26.4	29.5	5.0	4.9	13.2	14.7
Blood/Erythrocyte	Vitamin E (Tocopherol)	7.6	21	5.7	8.4	17.8	19.5	3.8	5.6	11.9	13.0	1.9	2.8	5.9	6.5
Blood/Erythrocyte	Vitamin K (Phylloquinone)	38	44	28.5	21.8	68.8	77.7	19.0	14.5	45.9	51.8	9.5	7.3	22.9	25.9

Biological Variation Goals ۲۰۱۹

Sample Type	Analyte / Test	CV _I	CV _g	Minimum Specification				Desirable Specification				Optimal Specification			
				%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%	%CV	%Bias	%TEa 90%	%TEa 95%
Serum	VLDL Cholesterol	27.6	---	20.7	12.9	47.1	53.5	13.8		22.8	27.0	6.9		11.4	13.5
Plasma	Von Willebrand factor	2.5	27.3	1.9	1.2	4.3	4.8	1.3	6.9	8.9	9.3	0.6	3.4	4.5	4.7
Serum	Water	3.1	0.1	2.3	1.5	5.3	6.0	1.6	0.8	3.3	3.8	0.8	0.4	1.7	1.9
Serum	Zeaxanthine	34.7	---	26.0	16.3	59.2	67.3	17.4		28.6	34.0	8.7		14.3	17.0
Serum	Zinc	9.3	9.4	7.0	4.4	15.9	18.0	4.7	3.3	11.0	12.4	2.3	1.7	5.5	6.2
Plasma	Zinc	11	14	8.3	5.2	18.8	21.3	5.5	4.5	13.5	15.2	2.8	2.2	6.8	7.6