



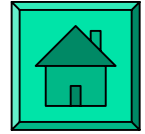
Premises

Thawed/fresh serum

Component	Number	Deviation	Biol. Variation	Deviation/Desirable goal
		ST/SF-1	(lnH-lnL)/4	(ST/SF-1)/[(lnH-lnL)/16]
Albumin	696	-0.2 %	6.5 %	-0.1
ALT	607	-8.2 %	47.0 %	-0.7
Amylase	328	-0.9 %	33.9 %	-0.1
AST	586	-0.5 %	26.0 %	-0.1
Bilirubin	722	-1.3 %	39.0 %	-0.1
Calcium	648	0.2 %	3.8 %	0.2
CK	504	-2.7 %	57.1 %	-0.2
Creatinin	720	0.2 %	11.6 %	0.1
Iron	657	-0.1 %	34.0 %	0.0
Ferritin	23	0.4 %		
Glucose	376	-0.8 %	12.1 %	-0.3
GT	295	-0.3 %	51.4 %	0.0
HDL-Cholesterol	672	-0.8 %	22.1 %	-0.1
Potassium	684	-0.1 %	6.1 %	-0.1
Cholesterol	705	0.7 %	20.9 %	0.1
Magnesium	461	-0.3 %	7.3 %	-0.2
Sodium	384	-0.1 %	1.4 %	-0.2
Phosphate	666	0.2 %	16.5 %	0.0
P-amylase	65	0.9 %		
Protein	564	-0.4 %	5.7 %	-0.3
TIBC	46	2.5 %	14.8 %	0.7
Triglycerides	391	1.4 %	45.2 %	0.1
Urea	668	0.7 %	22.6 %	0.1
Uric acid	654	0.7 %	18.3 %	0.2



Albumin



- Control values
 - CAL-value (ref. method): 40.8 g/L
 - X-value: 40.0 g/L
- Home site, compiled data as example



Albumin

- Fresh plasma - thawed serum

Component	Instr. prod.		No
Albumin	Dade behring (du pont)	-6.0 %	32
Albumin	Ortho (Vitros)	-2.7 %	93
Albumin	Roche (Hitachi)	-1.9 %	327
Albumin	Beckman coulter	1.6 %	106
Albumin	Bayer (technicon)	1.0 %	32
Albumin	Roche (Cobas)	-0.7 %	398
Albumin	Konelab	-0.6 %	231

Albumin

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	limit	Lower	Upper	limit	Lower	Upper
S	g/L	F	1423	35.7	35.4	36.0	46.4	45.8	46.9
		M	1266	36.9	36.6	37.3	47.7	47.4	48.2
		F+M	2689	36.2	35.9	36.6	47.2	47.0	47.5
P	g/L	F	667	34.9	34.5	35.6	45.7	45.1	46.7
		M	618	35.9	35.5	36.7	47.4	46.6	48.0
		F+M	1285	35.5	34.9	35.8	46.7	46.2	47.3



Albumin

Final ref. intervals (unit: g/L)

- **FM: 36 – 47 (SP)**

- Age

- **For comparison:**

Tietz (3rd Ed.)

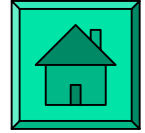
- **FM: 35-52 (S)**
- **FM, >60 y: 32-46 (S)**

Laurell (7:e uppl.)

- **FM: 36-48 (S)**



Bilirubin



- Control values
 - CAL-value (ref. method): 8.5 $\mu\text{mol/L}$
 - X-value: 8.1 $\mu\text{mol/L}$



Bilirubin

- Fresh plasma - thawed serum

Bayer (technicon)	30.6 %	32
Roche (Cobas)	29.1 %	398
Ortho (Vitros)	8.0 %	143
Konelab	7.9 %	126
Dade behring (du pont)	5.8 %	32
Beckman coulter	3.2 %	106
Roche (Hitachi)	1.0 %	378

Bilirubin

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	Lower	Upper	Lower	Upper		
S	μmol/L	F	1420	4.4	4.3	4.7	21.6	20.3	23.1
		M	1266	5.3	5.2	5.7	26.0	24.6	30.2
		F+M	2686	4.9	4.7	5.1	23.9	23.0	25.0
P	μmol/L	F	640	5.2	4.8	5.9	24.7	22.5	28.1
		M	590	6.2	5.3	6.6	31.4	28.4	33.8
		F+M	1230	5.7	5.1	6.0	28.3	26.7	30.0



Bilirubin

Final ref. intervals (unit: $\mu\text{mol/L}$)

- **FM: 5-24 (S), 6-28 (P)**

- Age

- **For comparison:**

 - Tietz (3rd Ed.)

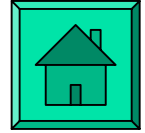
 - **FM: 5-21 (S)**

 - Laurell (7:e uppl.)

 - **FM: <20 (S)**



Calcium



- Control values
 - CAL-value (ref. method): 2.267 mmol/L
 - X-value: 2.217 mmol/L
- CAL - method specific
- CAL-corrected mean of ref.values



Calcium

- Fresh plasma - thawed serum

Ortho (Vitros)	-3.5 %	143
Bayer (technicon)	3.2 %	32
Roche (Cobas)	-2.1 %	371
Roche (Hitachi)	-1.8 %	385
Beckman coulter	-1.1 %	106
Konelab	-1.0 %	127
Dade behring (du pont)	-0.8 %	32

Calcium

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	limit	Lower	Upper	limit	Lower	Upper
S	mmol/L	F	1347	2.15	2.14	2.16	2.49	2.48	2.51
		M	1191	2.17	2.16	2.19	2.51	2.50	2.54
		F+M	2538	2.16	2.15	2.17	2.50	2.49	2.52
P	mmol/L	F	605	2.13	2.11	2.15	2.47	2.44	2.48
		M	565	2.17	2.16	2.18	2.50	2.48	2.54
		F+M	1170	2.15	2.14	2.16	2.48	2.47	2.50

Calcium

Final ref. intervals (unit: mmol/L)

- **FM: 2.16-2.50 (S), 2.15-2.48 (P)**

- Age

- **For comparison:**

Tietz (3rd Ed.)

- **FM: 2.15-2.50 (S)**
- **M, >60 y: 2.20-2.55 (S)**

Laurell (7:e uppl.)

- **FM: 2.20-2.60 (S)**

Calcium

Albumin corrected

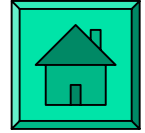
- $Ca + 0.025 \times (40 - Alb)$: Lancet, Dec 24/31,1988, 1477-1479
- $Ca + 0.020 \times (40 - Alb)$: Tietz (1999)
- $Ca + 0.020 \times (45 - Alb)$: Stakkestad

- $Ca + 0.020 \times (41.3 - Alb)$: NORIP
 - Age

	ST			SF		PT		PF			
	Ca, tot	90% CI		Ca	Ca korr	Ca	Ca korr	Ca	Ca korr	Ca	Ca korr
Antall	2538			2556		824		545		1181	
Median (50%)				2.34	2.33	2.32	2.33	2.33	2.32	2.30	2.31
2.5 %	2.15	2.14	2.16	2.17	2.19	2.17	2.18	2.15	2.17	2.16	2.16
97.5 %	2.49	2.48	2.51	2.51	2.49	2.50	2.49	2.51	2.48	2.48	2.48



Cholesterol



- Control values
 - CAL-value (ref. method): 4.94 mmol/L
 - X-value: 4.65 mmol/L
- CAL - Method differences



Cholesterol

- Fresh plasma - thawed serum

Dade behring (du pont)	-5.6 %	32
Bayer (technicon)	-4.9 %	32
Roche (Hitachi)	-3.5 %	402
Roche (Cobas)	-1.7 %	374
Konelab	-1.4 %	127
Beckman coulter	-1.3 %	106
Ortho (Vitros)	-0.9 %	143

Cholesterol

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	limit	Lower	Upper	limit	Lower	Upper
S	mmol/L	F	1420	3.41	3.27	3.52	7.67	7.52	7.79
		M	1261	3.23	3.16	3.35	7.47	7.33	7.64
		F+M	2681	3.31	3.23	3.41	7.58	7.47	7.70
P	mmol/L	F	659	3.42	3.22	3.52	7.36	7.20	7.53
		M	609	3.21	2.98	3.38	6.94	6.81	7.16
		F+M	1268	3.34	3.20	3.45	7.20	7.11	7.33



Cholesterol

Final ref. intervals (unit: mmol/L)

- **FM: 3.3-7.6 (S), 3.3-7.2 (P)**

- Age, female, male

- **For comparison:**

Tietz (3rd Ed.)

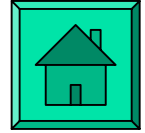
- reference interval for each 5 y period and gender (SP)

Laurell (7:e uppl.)

- 3.5-8.0, increase after 40 y, **F** > **M** (S)



HDL-Cholesterol



- Control values
 - CAL-value (ref. method): 1.331 mmol/l
 - X-value: 1.275 mmol/L



HDL cholesterol

- Fresh plasma - thawed serum

Bayer (technicon)	4.9 %	32
Dade behring (du pont)	-3.0 %	32
Konelab	-1.8 %	175
Roche (Cobas)	1.4 %	374
Ortho (Vitros)	1.2 %	32
Roche (Hitachi)	0.7 %	400
Beckman coulter	-0.3 %	105

HDL Cholesterol

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	limit	Lower	Upper	limit	Lower	Upper
S	mmol/L	F	1351	1.04	1.01	1.07	2.60	2.53	2.70
		M	1199	0.85	0.81	0.86	2.12	2.04	2.15
		F+M	2550	0.89	0.87	0.92	2.43	2.40	2.52
P	mmol/L	F	628	1.05	1.01	1.10	2.67	2.58	2.79
		M	575	0.83	0.78	0.87	2.13	2.04	2.27
		F+M	1203	0.89	0.86	0.93	2.54	2.46	2.61



HDL Cholesterol

Final ref. intervals (unit: mmol/L)

- **F: 1.04-2.60 (S), 1.05-2.67 (P)**
- **M: 0.85-2.12 (S), 0.83-2.13 (P)**
 - Age, female, male
- **For comparison:**

Tietz (3rd Ed.)

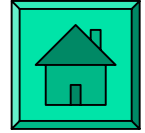
- reference interval for each 5 y period and gender (SP)

Laurell (7:e uppl.)

- **F: 0.75-1.90 (S)**
- **M: 0.70-1.60 (S)**



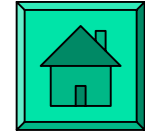
Triglycerides



- Control values
 - CAL-value (ref. method): 1.31 mmol/l
 - X-value: 1.33 mmol/L



Triglycerides



- Fresh plasma - thawed serum

Bayer (technicon)	7.1 %	32
Konelab	-4.5 %	127
Roche (Cobas)	-4.3 %	373
Roche (Hitachi)	-3.4 %	399
Ortho (Vitros)	-1.1 %	143
Dade behring (du pont)	-0.5 %	32
Beckman coulter	0.0 %	105

Triglycerides

(all and ≥ 12 h fasters)

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N		Lower	Upper		Lower	Upper
S	mmol/L	F	1392	0.43	0.41	0.45	2.30	2.19	2.53
		M	1237	0.48	0.46	0.50	3.22	2.99	3.45
		F+M	2629	0.45	0.44	0.47	2.86	2.73	2.99
P	mmol/L	F	659	0.40	0.38	0.42	2.12	1.98	2.38
		M	604	0.48	0.44	0.51	2.74	2.38	3.14
		F+M	1263	0.42	0.41	0.44	2.38	2.25	2.50
fS (≥ 12 h fasting)	mmol/L	F	627	0.45	0.40	0.47	2.23	2.19	2.45
		M	544	0.47	0.44	0.50	2.85	2.53	3.20
		F+M	1171	0.46	0.44	0.48	2.53	2.31	2.79
fP (≥ 12 h fasting)	mmol/L	F	358	0.41	0.37	0.46	2.18	1.98	2.50
		M	323	0.49	0.43	0.51	2.35	2.17	2.55
		F+M	681	0.44	0.41	0.48	2.25	2.15	2.40

Triglycerides

(all and ≥ 12 h fasters)

Final ref. intervals (unit: mmol/L)

- **FM: 0.5-2.9 (S), 0.4-2.4 (P)**
- **FM: 0.5-2.5 (fS), 0.4-2.3 (fP)**

- Age

■ For comparison:

Tietz (3rd Ed.)

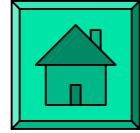
- reference interval for each 10 y period and gender (fS)

Laurell (7:e uppl.)

- **FM: 0.4-1.6, increase after 40 y (fS)**



LDL



- Control values
 - CAL-value: 2.954 mmol/l
 - X-value: ? mmol/L

LDL Cholesterol

(all and ≥ 12 h fasters)

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	Ref. limit	Lower	Upper	Ref. limit	Lower	Upper
S	mmol/L	F	1348	1.46	1.36	1.57	5.14	4.97	5.29
		M	1189	1.51	1.42	1.58	5.20	5.09	5.37
		F+M	2537	1.50	1.42	1.55	5.17	5.08	5.26
P	mmol/L	F	625	1.51	1.40	1.55	4.87	4.75	5.04
		M	569	1.50	1.29	1.62	4.79	4.60	4.90
		F+M	1194	1.51	1.41	1.55	4.81	4.73	4.91
fS (≥ 12 h fasting)	mmol/L	F	615	1.53	1.31	1.61	5.21	4.95	5.46
		M	523	1.65	1.50	1.78	5.14	4.95	5.36
		F+M	1138	1.56	1.47	1.65	5.16	5.01	5.31
fP (≥ 12 h fasting)	mmol/L	F	338	1.53	1.41	1.62	5.00	4.80	5.87
		M	300	1.54	1.29	1.72	4.73	4.59	4.95
		F+M	638	1.54	1.49	1.62	4.87	4.76	5.04

LDL Cholesterol

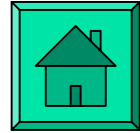
(all and ≥ 12 h fasters)

Final ref. intervals (unit: mmol/L)

- **FM: 1.5-5.2 (S), 1.5-4.8 (P)**
- **FM: 1.6-5.2 (fS), 1.5-4.9 (fP)**
 - Age
- **For comparison:**
Laurell (7:e uppl.)
 - 2.2-6.2, increase after 40 y, **F** > **M** (S)



Creatinin



- Control values
 - CAL-value (ref. method): 69.6 $\mu\text{mol/l}$
 - X-value: 66.4 $\mu\text{mol/L}$
- Method specific cal values
- Mean ref.values before and after correction



Creatinin

- Fresh plasma - thawed serum

Beckman coulter	-3.7 %	65
Konelab	3.1 %	127
Bayer (technicon)	-1.7 %	32
Dade behring (du pont)	0.5 %	32
Ortho (Vitros)	0.4 %	142
Roche (Hitachi)	-0.3 %	381
Roche (Cobas)	-0.2 %	398

Creatinine

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	limit	Lower	Upper	limit	Lower	Upper
S	μmol/L	F	1363	50.4	49.6	51.2	83.1	81.7	86.0
		M	1219	62.6	62.0	63.4	99.0	97.4	100.4
		F+M	2582	52.4	51.6	52.9	94.4	93.1	96.4
P	μmol/L	F	628	49.7	46.9	51.8	86.7	83.3	89.5
		M	582	61.5	59.8	62.9	99.5	97.1	101.5
		F+M	1210	53.3	51.6	54.8	95.8	93.8	97.1



Creatinine

Final ref. intervals (unit: $\mu\text{mol/L}$)

- **F: 50-83 (S), 50-87 (P)**
- **M: 63-99 (S), 62-100 (P)**
 - Age, female, male
 - Vitros/not Vitros
- **For comparison:**

Tietz (3rd Ed.)

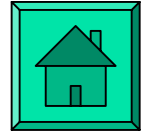
- **F: 53-97 (S)**
- **M: 62-115 (S)**

Laurell (7:e uppl.)

- **F: 45-100 (S)**
- **M: 55-115 (S)**



Ferritin



- Control values
 - CAL-value (ref. method): 48.9 ug/L
 - X-value: 45.8 ug/L
- Methos specific CAL-values

Ferritin

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	Lower	Upper	Lower	Upper		
S	μg/L	F	117	5.5	*****	*****	224.8	*****	*****
		M	114	26.2	*****	*****	416.3	*****	*****
		F+M	231	9.3	5.3	11.0	330.0	255.5	474.0



Ferritin

Final ref. intervals (unit: $\mu\text{g/L}$)

- **F: 6-225 (S)**

- **M: 26-416 (S)**

- Age

- **For comparison:**

Tietz (3rd Ed.)

- **F: 10-120 (S)**

- **M: 20-250 (S)**

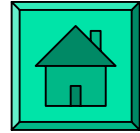
Laurell (7:e uppl.)

- **F: 5-80 (premenop.), 14-190 (postmenop.) (S)**

- **M: 30-230 (18-30 y), 30-280 (31-60 y) (S)**



Glucose



- Control values
 - CAL-value (ref. method): 4.49 mmol/L
 - X-value: 4.54 mmol/L
- CAL - method specific



Glucose

- Fresh plasma - thawed serum

Kyoto daiichi	8.2 %	63
Beckman coulter	7.5 %	67
Ortho (Vitros)	6.2 %	77
Roche (Hitachi)	5.3 %	312
Dade behring (du pont)	4.9 %	32
Roche (Cobas)	4.2 %	340
Konelab	4.0 %	154

Glucose

(all and ≥ 12 h fasters)

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N		Lower	Upper		Lower	Upper
S	mmol/L	F	1197	3.89	3.80	3.93	6.24	6.05	6.46
		M	1072	4.03	3.91	4.11	6.53	6.28	6.68
		F+M	2269	3.93	3.89	3.97	6.38	6.24	6.54
P	mmol/L	F	589	4.17	4.06	4.26	6.07	5.97	6.29
		M	535	4.38	4.19	4.45	6.64	6.40	6.70
		F+M	1124	4.23	4.16	4.33	6.40	6.26	6.54
fS (≥ 12 h fasting)	mmol/L	F	551	3.97	3.87	4.07	5.94	5.73	6.05
		M	489	4.20	4.06	4.23	6.28	6.07	6.55
		F+M	1040	4.06	3.97	4.10	6.07	5.97	6.25
fP (≥ 12 h fasting)	mmol/L	F	325	4.15	3.98	4.27	6.15	5.95	6.31
		M	292	4.47	4.16	4.56	6.61	6.39	7.04
		F+M	617	4.19	4.15	4.37	6.38	6.24	6.54



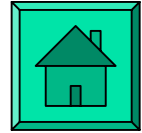
Glucose

Final ref. intervals (unit: mmol/L)

- **FM: 3.9-6.4 (S), 4.2-6.4 (P)**
- **FM: 4.1-6.1 (fS), 4.2-6.4 (fP)**
 - Age
- **For comparison:**
 - Tietz (3rd Ed.)**
 - **FM: 4.1-5.9, 4.6-6.4 (>60y), 4.2-6.7 (>90y) (fS)**
 - Laurell (7:e uppl.)**
 - **FM: 3.3-5.6 (fB), 10-15% higher values in S/P**



Iron



- Control values
 - CAL-value: 20.23 $\mu\text{mol/l}$
 - X-value: 21.39 $\mu\text{mol/L}$
- Collection time



Iron

- Fresh plasma - thawed serum

Ortho (Vitros)	-4.3 %	114
! See comment	-3.5 %	41
Konelab	-2.6 %	54
Roche (Cobas)	-2.3 %	336
Roche (Hitachi)	-2.1 %	384
Beckman coulter	0.5 %	65

Iron

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	Ref. limit	Lower	Upper	Ref. limit	Lower	Upper
S	μmol/L	F	1205	7.5	6.9	8.1	31.8	30.2	33.2
		M	1052	9.8	9.1	10.3	32.4	31.4	33.0
		F+M	2257	8.2	7.9	8.7	32.0	31.3	32.8
P	μmol/L	F	555	5.7	5.0	7.6	30.7	29.3	32.9
		M	501	9.3	8.7	10.1	32.8	30.9	35.2
		F+M	1056	7.7	6.1	8.3	31.8	30.7	33.4



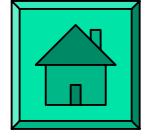
Iron

Final ref. intervals (unit: $\mu\text{mol/L}$)

- **FM: 8-32 (SP)**
 - Age, female, male
- **For comparison:**
 - **Tietz (3rd Ed.)**
 - **F: 9.0-30.4 (S)**
 - **M: 11.6-31.3 (S)**
 - **Laurell (7:e uppl.)**
 - **F: 10-29 (fS)**
 - **M: 13-36 (fS)**



TIBC



- Control values
 - CAL-value (ref. method): 63.2 $\mu\text{mol/l}$
 - X-value: 62.37 $\mu\text{mol/L}$
- CAL - method specific
- Oestrogen users excluded



TIBC

Roche (Hitachi)	-3.8 %	107
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Lower plasma

TIBC

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	limit	Lower	Upper	limit	Lower	Upper
S	μmol/L	F	345	46.7	39.6	47.0	80.3	79.4	83.6
		M	422	45.4	45.0	47.2	76.5	73.8	78.4
		F+M	767	45.5	43.1	46.4	77.9	75.6	80.0
P	μmol/L	F	67	46.7	*****	*****	88.3	*****	*****
		M	63	44.2	*****	*****	74.6	*****	*****
		F+M	130	44.8	*****	*****	76.0	*****	*****



TIBC

Final ref. intervals (unit: $\mu\text{mol/L}$)

- **FM: 45-78 (S), 45-76 (P)**

- Age

- **For comparison:**

- Tietz (3rd Ed.)

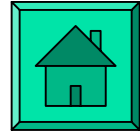
- **FM: 44.8-71.6 (S)**

- Laurell (7:e uppl.)

- **FM: 46-70 (S)**



Iron saturation



- Control values
 - CAL-value: 32%
 - X-value: ?



Iron Saturation

Final ref. intervals (unit: %)

- **F: 12-54 (S)**
- **M: 16-58 (S)**
 - Age
 - female
 - male
- **For comparison:**
 - **Tietz (3rd Ed.)**
 - **F: 15-50 (S)**
 - **M: 20-50 (S)**

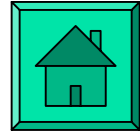
Iron Saturation

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	limit	Lower	Upper	limit	Lower	Upper
S	%	F	339	11.8	8.1	12.9	54.0	49.6	59.9
		M	409	16.4	14.7	17.9	57.6	53.7	59.2
		F+M	748	13.3	12.1	14.6	56.2	53.5	58.8



Magnesium



- Control values
 - CAL-value (ref. method): 0.807 mmol/l
 - X-value: 0.797 mmol/L
- CAL - method specific
- CAL - corrected mean ref.values



Mg

- Fresh plasma - thawed serum

Roche (Cobas)	-2.6 %	333
Beckman coulter	2.5 %	80
Konelab	1.8 %	32
Ortho (Vitros)	1.1 %	110
Perkin elmer	-1.1 %	66
Roche (Hitachi)	-0.7 %	264
Dade behring (du pont)	-0.3 %	32

Magnesium

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	limit	Lower	Upper	limit	Lower	Upper
S	mmol/L	F	1114	0.71	0.70	0.72	0.93	0.93	0.94
		M	956	0.72	0.71	0.73	0.96	0.94	0.97
		F+M	2070	0.71	0.70	0.72	0.94	0.94	0.95
P	mmol/L	F	475	0.72	0.71	0.73	0.93	0.92	0.94
		M	434	0.73	0.71	0.74	0.93	0.93	0.94
		F+M	909	0.72	0.71	0.73	0.93	0.93	0.94



Magnesium

Final ref. intervals (unit: mmol/L)

- **FM: 0.71-0.94 (S)**

- **FM: 0.72-0.93 (P)**

- Age

- **For comparison:**

- Tietz (3rd Ed.)

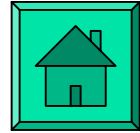
- **FM: 0.66-1.07 (S)**

- Laurell (7:e uppl.)

- **FM: 0.7-1.1 (S)**



Phosphate



- Control values
 - CAL-value (ref. method): 1.03 mmol/l
 - X-value: 1.02 mmol/L
- CAL - method specific



Phosphate

Konelab	-9.0 %	63
Bayer (technicon)	-8.1 %	32
Dade behring (du pont)	-7.9 %	32
Roche (Cobas)	-4.8 %	336
Roche (Hitachi)	-4.7 %	393
Beckman coulter	-3.7 %	106
Ortho (Vitros)	-3.0 %	143

Phosphate

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	limit	Lower	Upper	limit	Lower	Upper
S	mmol/L	F	1337	0.84	0.83	0.86	1.48	1.45	1.50
		M	1204	0.74	0.72	0.77	1.56	1.52	1.59
		F+M	2541	0.78	0.77	0.80	1.50	1.49	1.53
P	mmol/L	F	599	0.75	0.72	0.78	1.40	1.36	1.45
		M	554	0.72	0.68	0.73	1.44	1.38	1.51
		F+M	1153	0.73	0.71	0.74	1.42	1.38	1.45



Phosphate

Final ref. intervals (unit: mmol/L)

- **FM: 0.8-1.5 (S), 0.7-1.4 (P)**

- Age

- **For comparison:**

Tietz (3rd Ed.)

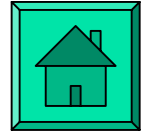
- **F: 0.87-1.45, 0.90-1.32 (>60 y) (S)**
- **M: 0.87-1.45, 0.74-1.20 (>60 y) (S)**

Laurell (7:e uppl.)

- **FM: 0.7-1.3 (S)**



Potassium



- Control values
 - CAL-value (ref. method): 3.7 mmol/l
 - X-value: 3.7 mmol/L
- Method mean for CAL



Potassium

- Fresh plasma - thawed serum

Dade behring (du pont)	-5.9 %	32
Beckman coulter	-5.4 %	105
Roche (Hitachi)	-4.9 %	327
Roche (Cobas)	-4.7 %	367
Ortho (Vitros)	-3.9 %	143
Konelab	-3.2 %	216

Potassium

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	limit	Lower	Upper	limit	Lower	Upper
S	mmol/L	F	1352	3.58	3.56	3.59	4.56	4.52	4.59
		M	1202	3.61	3.59	3.64	4.59	4.57	4.68
		F+M	2554	3.59	3.58	3.60	4.58	4.56	4.59
P	mmol/L	F	588	3.41	3.39	3.45	4.30	4.26	4.42
		M	550	3.48	3.42	3.54	4.35	4.30	4.45
		F+M	1138	3.42	3.41	3.46	4.33	4.28	4.39



Potassium

Final ref. intervals (unit: mmol/L)

- **FM: 3.6-4.6 (S), 3.4-4.3 (P)**

- Age

- **For comparison:**

Tietz (3rd Ed.)

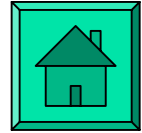
- **F: 3.5-5.1 (S), 3.4-4.4 (P)**
- **M: 3.5-5.1 (S), 3.5-4.5 (P)**

Laurell (7:e uppl.)

- **FM: 3.5-5.0 (S), 3.2-4.2 (P)**



Protein



- Control values
 - CAL-value (ref. method): 67.1 g/L
 - X-value: 65.5 g/L
- CAL, method specific
- CAL-corrected mean of ref.values



Protein

Konelab	4.7 %	217
Roche (Hitachi)	3.9 %	171
Beckman coulter	3.3 %	65
Bayer (technicon)	3.1 %	32
Roche (Cobas)	2.3 %	250
Dade behring (du pont)	2.0 %	32
Ortho (Vitros)	1.9 %	48

Protein

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	limit	Lower	Upper	limit	Lower	Upper
S		F	1016	62.0	61.6	62.6	77.5	76.7	78.1
		M	949	62.8	62.2	63.5	78.5	77.5	79.8
		F+M	1965	62.4	61.9	62.8	77.8	77.3	78.6
P		F	458	64.2	63.8	64.8	79.5	78.6	80.4
		M	419	64.7	63.5	65.4	79.8	79.1	80.7
		F+M	877	64.4	63.9	64.9	79.5	79.1	79.9



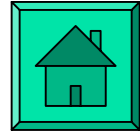
Protein

Final ref. intervals (unit: g/L)

- **FM: 62-78 (S), 64-80 (P)**
 - Age
- **For comparison:**
Tietz (3rd Ed.)
 - **FM: 64-83 (S)**
 - **FM, >60 y: , lower by ~2 (S)**



Sodium



- Control values
 - CAL-value (ref. method): 137.6 mmol/l
 - X-value: 134.3 mmol/L
- Lab mean before and after correction



Sodium

- Fresh plasma - thawed serum

Konelab	-0.4 %	216
Roche (Hitachi)	-0.3 %	326
Beckman coulter	-0.3 %	105
Dade behring (du pont)	0.2 %	32
Ortho (Vitros)	-0.2 %	142
Roche (Cobas)	-0.1 %	367

Sodium

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	limit	Lower	Upper	limit	Lower	Upper
S	mmol/L	F	843	137.2	136.9	137.6	144.2	144.1	144.9
		M	737	137.9	137.6	138.4	145.1	144.5	145.3
		F+M	1580	137.6	137.3	137.8	144.6	144.3	145.1
P	mmol/L	F	310	137.0	136.1	137.7	143.5	143.0	144.0
		M	302	137.4	136.9	138.1	143.5	143.4	144.5
		F+M	612	137.3	136.5	137.7	143.5	143.3	143.7



Sodium

Final ref. intervals (unit: mmol/L)

- **FM: 138-145 (S), 137-144 (P)**

- Age

- **For comparison:**

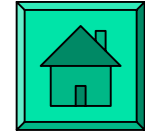
- Tietz (3rd Ed.)

- **FM: 136-145 (SP)**

- **Laurell (7:e uppl.)**

- **FM: 136-146 (S)**

Thyroxine, total



- Control values
 - CAL-value (ref. method): 96 nmol/l
 - X-value: 94 nmol/L
- Fresh plasma - thawed serum

T4	Roche/boehringer mannheim	-0.2 %	32
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Thyroxine, Total

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	limit	Lower	Upper	limit	Lower	Upper
S	nmol/L	F	89	69.1	*****	*****	167.9	*****	*****
		M	78	66.1	*****	*****	122.4	*****	*****
		F+M	167	68.9	62.1	74.5	157.3	140.5	172.7



Thyroxine, Total

Final ref. intervals (unit: nmol/L)

- **F: 69-168 (S)**

- **M: 66-122 (S)**

- Age

- **For comparison:**

- **Tietz (3rd Ed.)**

- **F: 71-142 (S)**

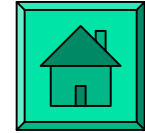
- **M: 59-135 (S)**

- **Laurell (7:e uppl.)**

- **FM: 50-150 (S)**



TSH



- Control values
 - CAL-value (ref. method): 1.35 mU/L
 - X-value: 1.10 mU/L
- Plasma, fresh - serum, thawed

TSH	Roche/boehringer mannheim	-0.4 %	32
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TSH

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	Ref. limit	Lower	Upper	Ref. limit	Lower	Upper
S	mU/L	F	125	0.32	0.01	0.64	5.97	3.96	6.55
		M	107	0.38	*****	*****	3.57	*****	*****
		F+M	232	0.38	0.10	0.51	4.50	3.80	6.40



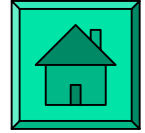
TSH

Final ref. intervals (unit: mU/L)

- **F: 0.32-6.0 (S)**
- **M: 0.38-4.0 (S)**
 - Age
- **For comparison:**
 - Tietz (3rd Ed.)
 - **FM: 0.32-5.0 (SP)**
 - Laurell (7:e uppl.)
 - **FM: 0.4-4.0 (S)**



Urea



- Control values
 - CAL-value (ref. method): 4.94 mmol/l
 - X-value: 4.84 mmol/L



Urea

- Method specific low plasma
 - The sinner
- Fresh plasma - thawed serum

Urea	Konelab	-11.3 %	94
Urea	Dade behring (du pont)	-2.9 %	32
Urea	Roche (Hitachi)	-1.8 %	393
Urea	Roche (Cobas)	-0.7 %	304
Urea	Beckman coulter	0.6 %	106
Urea	Ortho (Vitros)	0.2 %	112

Urea

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	limit	Lower	Upper	limit	Lower	Upper
S	mmol/L	F	1328	2.80	2.75	2.90	7.64	7.49	7.88
		M	1172	3.44	3.38	3.54	8.41	8.23	8.63
		F+M	2500	2.97	2.90	3.06	8.06	7.91	8.28
P	mmol/L	F	568	2.80	2.67	2.87	7.28	6.99	7.58
		M	519	3.46	3.27	3.59	8.29	8.07	8.81
		F+M	1087	2.89	2.82	3.01	7.99	7.76	8.17



Urea

Final ref. intervals (unit: mmol/L)

- **F: 2.8-7.6 (S), 2.8-7.3 (P)**
- **M: 3.4-8.4 (S), 3.5-8.3 (P)**

- Age

- **For comparison:**

Tietz (3rd Ed.)

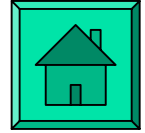
- **FM: 2.1-7.1, 2.9-8.2 (>60 y) (S)**

Laurell (7:e uppl.)

- **FM: 3.3-9.7 (S)**



Uric acid (urate)



- Control values
 - CAL-value (ref. method): 285 $\mu\text{mol/l}$
 - X-value: 268 mmol/L
- CAL-corrected mean ref.values

Uric Acid

Nonparametric RefVal 4.0 Results

				Reference limits					
				2.5 percentile			97.5 percentile		
				Ref. limit	90% CI		Ref. limit	90% CI	
Mat.	Unit	Gender	N	limit	Lower	Upper	limit	Lower	Upper
S	μmol/L	F	1370	150.4	144.2	155.3	365.6	361.3	377.2
		M	1217	227.1	221.5	233.4	464.0	454.8	472.0
		F+M	2587	161.6	157.3	167.9	440.2	433.9	448.6
P	μmol/L	F	621	151.5	137.9	158.7	390.1	364.3	412.5
		M	582	223.1	216.2	229.1	463.6	446.2	481.8
		F+M	1203	168.6	157.8	173.4	439.9	424.3	453.1



Uric Acid

Final ref. intervals (unit: $\mu\text{mol/L}$)

- **F: 150-366 (S), 152-390 (P)**
- **M: 227-464 (S), 223-464 (P)**

- Age, female, male

- **For comparison:**

Tietz (3rd Ed.)

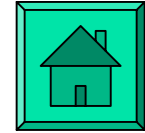
- **F: 130-390, 200-430 (>60 y) (S)**
- **M: 260-450, 250-470 (>60 y) (S)**

Laurell (7:e uppl.)

- **F: 120-340 (S)**
- **M: 160-450 (S)**



ALP

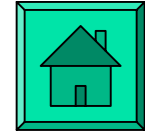


- Fresh plasma - thawed serum

Roche (Cobas)	-3.8 %	361
Beckman coulter	-3.0 %	80
Roche (Hitachi)	-3.0 %	203
Dade behring (du pont)	-2.4 %	32
Ortho (Vitros)	-0.7 %	141
Konelab	0.3 %	182



Amylase

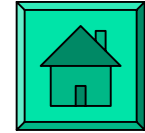


- Fresh plasma - thawed serum

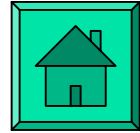
Ortho (Vitros)	35.6 %	143
Beckman coulter	8.2 %	39
Roche (Cobas)	-3.2 %	333
Dade behring (du pont)	-1.5 %	32
Konelab	-1.2 %	184
Roche (Hitachi)	-0.9 %	129



Pancreas amylase



Roche (Hitachi)	-4.8 %	234
Roche (Cobas)	-1.7 %	28
Beckman coulter	0.3 %	41

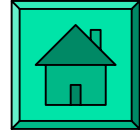


- Fresh plasma - thawed serum

Konelab	21.2 %	178
Beckman coulter	-10.2 %	106
Ortho (Vitros)	-8.3 %	143
Roche (Cobas)	6.6 %	371
Roche (Hitachi)	-5.7 %	321
Dade behring (du pont)	2.7 %	32



AST

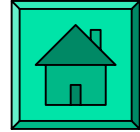


- Fresh plasma - thawed serum
 - Ortho

Ortho (Vitros)	17.2 %	110
Dade behring (du pont)	-7.1 %	32
Roche (Cobas)	-2.4 %	367
Roche (Hitachi)	-2.1 %	312
Konelab	1.5 %	184
Beckman coulter	-1.4 %	106

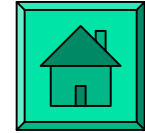


CK



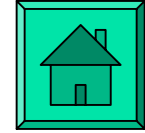
■ Fresh plasma - thawed serum

Dade behring (du pont)	-6.3 %	32
Konelab	2.6 %	231
Roche (Cobas)	2.6 %	380
Ortho (Vitros)	2.3 %	65
Roche (Hitachi)	-0.9 %	304
Beckman coulter	-0.7 %	106



- Fresh plasma - thawed serum

Dade behring (du pont)	-24.9 %	32
Roche (Cobas)	-3.7 %	398
Konelab	3.7 %	183
Roche (Hitachi)	-2.5 %	321
Ortho (Vitros)	0.3 %	110
Beckman coulter	0.1 %	106



- Fresh plasma - thawed serum
 - Konelab??

Dade behring (du pont)	-4.0 %	32
Roche (Hitachi)	-3.4 %	178
Beckman coulter	-1.9 %	80
Ortho (Vitros)	1.5 %	112
Roche (Cobas)	0.5 %	361
Konelab	-0.1 %	62