Biochemistry Adult Reference Ranges

Certified correct on 28/06/2016

Test	Reference range	Units	Reference range from	Traceable to standard reference material
Albumin	35 – 50	g/L	Pathology harmonisation[1]	IRMM ERM-DA470k/IFCC
AFP	0 - 6	kU/l	Roche[2]	1st IRP WHO Reference Standard 72/225
AST	4 – 40 male 4 – 32 female	U/L	Roche[2]	Original formulation IFCC (2002)
ALT	4 – 41 male 4 – 33 female	U/L	Roche[2]	Original IFCC formulation (without pyridoxal phosphate activation)
Alkaline Phosphatase	30 – 130	U/L	Pathology Harmonisation[1]	Proposed formulation IFCC
Ammonia	15 – 55 male 11 – 48 female	µmol/L		"A primary standard"
Amylase	28 - 100	U/L	Roche[2]	
β2-Microglobulin	0.8 – 2.2	mg/L	Roche[2]	"the WHO standard"
β-HCG	<2	IU/L	Roche[2]	4th Standard 1999 (NIBSC), coded 75/589
Bile Acid	<10	µmol/L	Dialab[4]	
Total Bilirubin	Less than 21	µmol/L	Pathology Harmonisation[1]	Against the Doumas method[3] (Clin.Chem1985)
Ca125	Less than 35	U/ml	Roche[2]	Commercially available radiobinding immunoassay[3]
Ca153	Less than 25	U/ml	Roche[2]	Commercially available radiobinding immunoassay[3]
Ca199	Less than 27	kU/L	Roche[2]	Commercially available radiobinding immunoassay[3]
Calcium	2.2-2.6	mmol/L	Pathology harmonisation[1]	SRM 956 c
Carbamezpine	4 - 12	mg/L	Pathology harmonisation[1]	Standardised against USP reference standards
CEA	Less than 4	µg/L	Roche[2]	1st IRP WHO Reference Standard 73/601
Chloride	95 - 108	mmol/L	Pathology Harmonisation[1]	Gravimetrically defined

Total Cholesterol	NICE CG181 guidelines	mmol/L	NICE	Standardised against ID/MS
Corrected Calcium	2.2 – 2.6	mmol/L	Pathology harmonisation[1]	SRM 956 c (calcium), IRMM ERM-DA470k/IFCC (albumin)
Cortisol	None stated	nmol/L		Standardised against ID/MS[3]
Creatine Kinase	40 – 320 male 25 – 200 female	IU/L	Pathology harmonisation1	Original IFCC formulation
Creatinine (jaffa)	62 – 106 male 44 – 80 female	µmol/L	Roche[2]	Standardised against ID/MS[3]
Creatinine (enzymatic)	59 – 104 male 45 – 84 female	µmol/L	Roche2	Standardised against ID/MS3
CRP	Less than 5	mg/L	Roche[2]	CRM 470
Digoxin	0.5 – 2.0	µg/L	Roche2	Standardised by weighing United States Pharmacopoeia (USP) material into serum
Direct bilirubin	Less than 5	µmol/L	Roche[2]	Standardised against the Jendrassik Grof method[3] (Biochem.J 1938)
Ethanol	None stated	mg/dL		Standardised against NIST traceable materials
Ferritin	30 – 400 male 13 – 150 female	µg/L	Roche[2]	Standardised against the 1st International Standard NIBSC “Reagent for Ferritin (human liver)” 80/602.
Free T3	3.1 – 6.8	pmol/L	Roche[2]	Equilibrium dialysis[3]
Free Thyroxine (FT4)	12.0 -22.0	pmol/L	Roche[2]	Equilibrium dialysis[3]
Follicle stimulating hormone (FSH)	3.5 – 12.5; follicular 4.7 – 25.1; mid-cycle 1.7 – 7.7 luteal phase	IU/L	Roche[2]	2nd IRP WHO reference standard 78/549
Gentamycin	Follow local guidelines	mg/L		Standardised against USP reference standards
Glucose (fasting)	3.5 – 5.4	mmol/L	NICE PH38[5]	Standardised against ID/MS[3]
γ-glutamyltransferase (GGT)	10 – 71 male 6 – 42 female	IU/L	Roche[2]	Original formulation Persijn/Slik (1976)
HbA1c (IFCC)	Less than 50, Good control	mmol/mol HbA	IFCC	IFCC reference material

	51 – 65, Fair control 66 – 75, Poor Control Greater than 75, refer to specialist			
HDL cholesterol	NICE CG181 guidelines	mmol/L	NICE	CDC reference material
IgA	0.7 – 4.0	g/L	Roche[2]	CRM 470
IgG	7.0 – 16.0	g/L	Roche[2]	ERM-DA470k/IFCC
IgM	0.4 – 2.3	g/L	Roche[2]	CRM 470
Iron	5.8 – 34.5	µmol/L	Roche[2]	SRM 937
LDH	240 - 480	IU/L	Roche[2]	Original formulation IFCC (2002), manual measurement[3]
LDL cholesterol	NICE CG181 guidelines	mmol/L	NICE	Calculated result
Lithium	0.4 – 0.8	mmol/L	British journal of Pharmaceutical Practice, April 1989	
Luteinising hormone (LH)	Follicular 2.4-12.6 Mid-cycle 14.0-95.6 Luteal 1.0-11.4 Male 1.7-8.6	IU/L	Roche[2]	2nd International Standard (NIBSC) 80/552
Magnesium	0.7-1.0	mmol/L	Pathology Harmonisation[1]	Standardised against atomic absorption[3]
Oestradiol	follicular 98–571 Mid-cycle 177–1153; Luteal 122–1094 Male 99-192	pmol/L	Roche[2]	CRM 6400a via ID-GC/MS
Paracetamol (acetaminophen)		mg/L	Pathology Harmonisation[1]	USP reference standards
Parathyroid Hormone (PTH)	1.6 – 6.9	pmol/L	Roche[2]	Standardised against an RIA method
Phenytoin	5 - 20	mg/L	Pathology	USP reference standards

			Harmonisation[1]	
Phosphate	0.8 – 1.5	mmol/L	Roche[2]	Primary reference material (NERL), weighed in purified material
Potassium	3.5 – 5.3	mmol/L	Pathology Harmonisation[1]	Gravimetrically defined
N-terminal pro B-type natriuretic peptide (NT-Pro-BNP)	NICE CG108	ng/L	NICE	In-house Roche reference system
Progesterone		nmol/L		Standardised against ID GC/MS3
Testosterone	11.4-27.9 male less than 50 years old; 9.5-28.3 male over 50 years old; 0.3-1.7 female less than 50 years old; 0.1-1.4 female over 50 years old	nmol/L	Roche[2]	Standardised against ID GC/MS[3]
Total protein	60 - 80	g/L	Pathology Harmonisation[1]	SRM 927d
Prolactin	102-496 Female 86-324 Male	mIU/L	Roche[2]	WHO 3rd IRP 84/500
Total PSA	Under 50 years old - less than 2.5 Under 60 years old - less than 3.0 Under 70 years old - less than 4.0 Over 70 years old - less than 5.0	ug/L	Roche[2]	WHO 96/670 (90% PSA-ACT+10% free PSA)
Triglyceride	NICE CG181 guidelines	mmol/L	NICE	SRM 909b
Transferrin	2.0 – 3.6	g/L	Roche[2]	IRMM BCR470/CRM470
Transferrin saturation	15 - 45	%	Roche[2]	IRMM BCR470/CRM470
Troponin T (high sensitivity)	Not consistent with acute event: <20%	ng/L	NICE	In-house Roche reference system (Elecsys Troponin T STAT 3.Gen) [3]

	change; Significant rise:20-100% change with one sample >14; Consistent with MI: >100% change with one sample >14			
Salicylate	None stated	mg/L	Pathology Harmonisation[1]	USP reference standards
Sodium	133 – 146	mmol/L	Pathology Harmonisation[1]	Gravimetrically defined
TSH	0.27-4.2	mU/L	Roche[2]	2nd IRP WHO Reference Standard 80/558
Urate	200 – 430 male 140 – 360 female	µmol/L	Pathology Harmonisation[1]	Standardised against ID/MS[3]
Urea	2.5 – 7.8	mmol/L	Pathology Harmonisation[1]	Standardised against ID/MS[3]
Vancomycin	Follow local guidelines	mg/L		USP reference standards
Vitamin D	<30 severe deficiency 30 – 70 borderline insufficiency >250 possible toxicity	ng/ml	Based on National Osteoporosis Society and Endocrine Society guidelines	NIST standard

References

1- Pathology Harmonisation of Reference Intervals (RWF-BS-BIO-EXT518 rev 1.0)
2 – Roche kit insert active in the MTW Q-pulse Pathology database on 08/01/2016
3 – This test is traceable to a reference method selected by Roche Diagnostics.
4 - Dialab kit insert active in the MTW Q-pulse Pathology database on 08/01/2016
5 – Glucose reference range changed in revision 1.1 from the WHO to the NICE recommended range.

SRM = Standard reference material
CDC = centre for disease control
ID/MS = Isotope dilution mass spectrometry
ID GC/MS = Isotope dilution gas chromatography mass spectrometry

NIBSC = National institute for biological standards and control
USP = US pharmacopeial convention
IRMM = Joint Research Centre Institute for Reference Materials and Measurements