Biochemistry Adult Reference ranges

Analyte	Reference Range	Units	Reference source	Traceable to standard reference material
Albumin	35 – 50	g/L	Pathology harmonisation[1]	IRMM BCR470/CRM470
AFP	0 - 6	kU/l	Roche[2]	1st IRP WHO Reference Standard 72/225
AST	Male < 50 Female < 35	U/L	Roche[2]	Original formulation IFCC (2002)
ALT	Male < 50 Female < 35	U/L	Roche[2]	Original IFCC formulation (2002)
Alkaline Phosphatase	30 – 130	U/L	Pathology Harmonisation[1]	Proposed formulation IFCC (2011)
Ammonia	<40	µmol/L	MetBioNet	"A primary standard"
Amylase	28 - 100	U/L	Roche[2]	
β2-Microglobulin	<60yrs 0.8-2.4 >60yrs </=3.0	mg/L	Roche[2]	WHO standard
β-HCG	Male <3 Female: Under 50 years old <5 Over 50 years old <8	IU/L	Roche[2]	4th Standard 1999 (NIBSC), coded 75/589
Bile Acid	<10	µmol/L	Dialab[4]	
Total Bilirubin	< 21	µmol/L	Pathology Harmonisation[1]	Against the Doumas method[3] (Clin.Chem1985)

Analyte	Reference Range	Units	Reference source	Traceable to standard reference material
Ca125	< 35	U/ml	NICE guidelines CG122	Commercially available radiobinding immunoassay[3]
Ca153	< 25	U/ml	Roche[2]	Commercially available radiobinding immunoassay[3]
Ca199	< 27	kU/L	Roche[2]	Commercially available radiobinding immunoassay[3]
Calcium	2.15-2.55	mmol/L	Pathology harmonisation[1]	SRM 956 c
Calprotectin	<150	ug/g		Internal working calibrators and measurement procedures according to EN/ISO 17511 and the EN ISO 18153.
Carbamazepine	4 - 12	mg/L	Pathology harmonisation[1]	Standardised against USP reference standards
CEA	< 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
Adjusted Calcium	2.20 – 2.60	mmol/L	Pathology harmonisation[1]	SRM 956 c (calcium), IRMM IFCC BCR470/CRM470 (albumin)
Cortisol	Interpretative comment provided with report	nmol/L		Standardised against IRMM/IFCC 451-panel
Creatine Kinase	Male 40 – 320 Female 25 – 200	IU/L	Pathology harmonisation1	Original IFCC Formulation

Analyte	Reference Range	Units	Reference source	Traceable to standard reference material
Creatinine (Jaffe)	Male 62 – 106 Female 44 – 80	µmol/L	Roche[2]	Standardised against ID/MS[3]
Creatinine (enzymatic)	Male 59 – 104 Female 45 – 84	µmol/L	Roche2	Standardised against ID/MS[3]
CRP	< 5	mg/L	Roche[2]	IRMM ERM-DA474/IFCC
Digoxin	0.5 – 2.0	µg/L	Roche2	Standardised by weighing United States Pharmacopoeia (USP) material into serum
Direct bilirubin	<3	µmol/L	Roche[2]	Standardised against the Jendrassik Grof method[3] or Doumas method.
Ethanol	None stated	mg/100mL		Standardised against NIST traceable materials
Ferritin	Male 30 – 400 Female 13 – 150	µg/L	Roche[2]	Standardised against the 1st International Standard NIBSC “Reagent for Ferritin (human liver)” 80/602.
Free T3 (FT3)	3.1 – 6.8	pmol/L	Roche[2]	Equilibrium dialysis[3]
Free Thyroxine (FT4)	11.9-21.6	pmol/L	Roche[2]	Equilibrium dialysis[3]
Follicle stimulating hormone (FSH)	Follicular 3.5 – 12.5 Mid-cycle 4.7 – 21.5 Luteal phase 1.7 – 7.7 Male 1.5-12.4	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]

Analyte	Reference Range	Units	Reference source	Traceable to standard reference material
Glucose (random)	<7.7	mmol/L	NICE PH38[5]	Standardised against ID/MS[3]
γ-glutamyltransferase (GGT)	Male 10 – 71 Female 6 – 42	IU/L	Roche[2]	IFCC formulation (2002)
HbA1c (IFCC)	NICE NG28 guidelines	mmol/mol HbA0	NICE	IFCC reference material
HDL cholesterol	NICE CG181 guidelines	mmol/L	NICE	CDC reference material
IgA	0.70 – 4.00	g/L	Roche[2]	BCR470/CRM470
IgG	7.00 – 16.00	g/L	Roche[2]	ERM-DA470k/IFCC
IgM	0.40 – 2.30	g/L	Roche[2]	BCR470/CRM470
Iron	5.8 – 34.5	µmol/L	Roche[2]	SRM 937
LDH	Female 135-214 Male 135-225	U/L	Roche[2]	IFCC
LDL cholesterol	NICE CG181 guidelines	mmol/L	NICE	Calculated result
Lithium	0.4 – 1.0	mmol/L	Pathology Harmonisation[1]	SRM 999a

Analyte	Reference Range	Units	Reference source	Traceable to standard reference material
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	0.70-1.00	mmol/L	Pathology Harmonisation[1]	Standardised against atomic absorption[3]
Oestradiol	Follicular 114-332 Mid-cycle 222-1959 Luteal 222-854 Male <159	pmol/L	Roche[2]	CRM 6400a via ID-GC/MS
Osmolality (serum)	275 - 295	mmol/kg	Pathology Harmonisation[1]	NIST (SRM) 919b
Paracetamol (acetaminophen)	None stated	mg/L	Pathology Harmonisation[1]	USP reference standards
Parathyroid Hormone (PTH)	1.6 – 6.9	pmol/L	Roche[2]	Standardised against an RIA method
PET Ratio	<85	pg/mL	NICE guidelines DG49	Commercially available assay[3]
Phenytoin	5 - 20	mg/L	Pathology Harmonisation[1]	USP reference standards
Phosphate	0.80 – 1.50	mmol/L	Roche[2]	Primary reference material (NERL), weighed in purified material
Potassium	3.5 – 5.3	mmol/L	Pathology Harmonisation[1]	Gravimetrically defined

Analyte	Reference Range	Units	Reference source	Traceable to standard reference material
N-terminal pro Btype natriuretic peptide (NT-ProBNP)	<400 NICE CG106	ng/L	NICE	In-house Roche reference system
Procalcitonin	<0.49	ug/L	NICE	BRAHMS PCT LIA assay
Prolactin	Female 102-496 Male 86-324	mIU/L	Roche[2]	WHO 3rd IRP 84/500
Progesterone	Interpretative comment provided with result	nmol/L		Standardised against ID GC/MS[3]
qFIT (Faecal Immunochemical test)	0-9	Ug Hb/g		WHO standard Haemoglobincyanide NIBSC code 98/708 reference material 522
Testosterone	Male less than 50 years old 11.4-27.9 Male over 50 years old 9.5-28.3 Female less than 50 years old 0.3-1.7 Female over 50 years old 0.1-1.4	nmol/L	Roche[2]	Standardised against ID GC/MS[3]
Theophylline	10 - 20	mg/L	Pathology Harmonisation[1]	USP reference standards
Total protein	60 - 80	g/L	Pathology Harmonisation[1]	SRM 927d

Analyte	Reference Range	Units	Reference source	Traceable to standard reference material
Total PSA	0-49yrs 0-2.5 50-69yrs 0-3.0 69-79yrs 0-6.5 Above 79 yrs 0-10.0	ug/L	NICE	Stanford Reference standard/WHO 96/670 (90% PSA-ACT+10% free PSA)
Triglyceride	NICE CG181 guidelines	mmol/L	NICE	ID/MS
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% change; Significant rise:20-100% change with one sample >14; Consistent with MI: >100% change with one sample >14	ng/L	NICE	In-house Roche reference system (Elecsys Troponin T STAT 3.Gen) [3]
Salicylate	None stated	mg/L	Pathology Harmonisation[1]	USP reference standards
SHBG	Males (20-49yrs) 18.3-54.1 Males (>/= 50yrs) 20.6-76.7 Females (20-49 yrs) 32.4-128 Females (>/= 50 yrs) 27.1-128	nmol/L	Roche[2]	2nd International Standard (NIBSC) 95/560
Sodium	133 – 146	mmol/L	Pathology Harmonisation[1]	Gravimetrically defined

Analyte	Reference Range	Units	Reference source	Traceable to standard reference material
TSH	0.27-4.2	mU/L	Roche[2]	2nd IRP WHO Reference Standard 80/558
Urate	Male 200 – 430 Female 140 – 360	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	<25 deficient 25-50 Insufficient >50 Sufficient for almost whole population >200 Potentially toxic. Advise review dose and check adjusted Calcium. Recheck vitamin D after 3 months.	nmol/L	National Osteoporosis Society	ID-LC-MS/MS 25-hydroxyvitamin D RMP

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

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

5 – Glucose reference range changed in revision 1.1 from the WHO to the NICE recommended range.

Key:

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 pharmacopeia convention

IRMM = Joint Research Centre Institute for Reference Materials and Measurements