

Manchester University NHS Foundation Trust - Division of Laboratory Medicine			
Document title	Biochemistry Reference ranges with source	Q-Pulse identifier	BC-CL-G-50
Department	Biochemistry	Revision number	10 (Mar 2025)
Author	Leanne Wherrett	Copy number	Electronic
Authorised by	Gill Tranter	Page number	1 of 44

Test	Sample Type (Preferred , Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
Blood									
1,25-Dihydroxy Vitamin D	Plain serum, gel serum	4 weeks	ALL	ALL			43	144	pmol/L
3-methoxytyramine	EDTA plasma , lithium heparin plasma	240 hours	ALL	ALL			0	180	pmol/L
5-hydroxyindole acetic acid (5HIAA)	Plain serum, gel serum	240 hours	All	ALL	ALL	ALL	0	140	nmol/L
17-hydroxyprogesterone	Plain serum, gel serum, lithium heparin plasma	240 hours	Male	Years	N/A	Up to 1	None	≤2.4	nmol/L
			Male	Years	1	Up to 5	None	≤2.6	
			Male	Years	5	Up to 10	None	≤2.1	
			Male	Years	10	Up to 15	None	≤3.9	
			Male	Years	15	Up to 20	1.3	6.9	
			Male	Years	20	Up to 40	0.9	6.3	
			Male	Years	40	Up to 60	0.7	5.2	
			Male	Years	60	Up to 80	0.7	4.4	
			Female	Years	N/A	Up to 1	None	≤2.3	
			Female	Years	1	Up to 5	None	≤1.9	
			Female	Years	5	Up to 10	None	≤1.8	
			Female	Years	10	Up to 15	None	≤7.2	
			Female	Years	15	unspecified	0.4	5	
17-Hydroxyprogesterone – Blood Spot	Whole blood spot	1 month	no ref range						nmol/L

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25-Hydroxy Vitamin D	Plain serum, gel serum	1 week	autocomments: Thresholds for treatment are based on Total 25(OH)VitD i.e the sum of 25(OH)VitD2 and 25(OH)VitD3. For guidance refer to National Osteoporosis Society Guidelines (2018). Total 25(OH)VitD <25nmol/L: Consistent with VitD deficiency. Treatment with colecalciferol recommended. Total 25(OH)VitD 25-50 nmol/L: VitD status may be inadequate in some patient groups. Treatment with colecalciferol advised in high-risk groups. Total 25(OH)VitD >50 nmol/L: Adequate VitD status. Supplementation not usually required. Total 25(OH)VitD >375 nmol/L: VitD levels may be associated with toxicity.						nmol/L
Adjusted Calcium	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	days	0	<14	1.9	2.8	mmol/L
			Both	days	14	<28	2.2	2.7	
			Both	days	28	<18yrs	2.2	2.7	
			Both	years	≥18	unspecified	2.2	2.6	
Alanine aminotransferase (ALT)	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	Days	0	28	None	≤90	IU/L
			F	Days	29	unspecified	None	≤35	
			M	Days	29	unspecified	None	≤50	
Albumin	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	days	0	28	25	35	g/L
			Both	Days	29	182	28	40	

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			Both	Days/Years	183	17	30	45	
			Both	Years	>17	18	34	48	
			Both	Years	>18	unspecified	35	50	
Aldosterone	Lithium heparin plasma, EDTA plasma	240 hours	Male	years	16	150	0	630	pmol/L
			Female	years	16	150	0	630	
Aldosterone: Paediatric	Plain serum, EDTA plasma	240 hours	M, F	days	0	30	139	4856	pmol/L
			M, F	months	1	Up to 12	139	2498	
			M, F	years	1	Up to 2	194	1499	
			M, F	years	2	Up to 10	83	971	
			M, F	years	10	Up to 18	56	611	
Aldosterone:renin ratio	Lithium heparin plasma, EDTA plasma	240 hours	M, F	years	18	150			N/A
Alkaline Phosphatase (ALP)	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	Days	0	7	75	300	U/L
			Both	Days	8	28	90	477	
			Both	Days	29	90	90	540	
			Both	Days	91	180	77	540	
			Both	Days	181	360	87	382	
			Both	Days	361	540	69	434	
			Both	Days	541	730	60	370	
			F	Years	2	< 10	60	320	
			M	Years	2	< 10	60	300	
			Both	Years	10	< 13	129	417	
			F	Years	13	< 15	57	254	
			M	Years	13	< 15	116	468	

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			F	Years	15	< 17	50	117	
			M	Years	15	< 17	82	331	
			F	Years	17	< 18	45	87	
			M	Years	17	< 18	55	149	
			Both	Years	18	unspecified	30	130	
Alkaline Phosphatase Isoenzymes	Plain serum, gel serum , lithium heparin plasma	3 weeks	N/A						N/A
Alpha-1 antitrypsin	plain serum, gel serum, lithium heparin plasma	96 hours	Both		All	All	0.9	2	g/L
Alpha-feto protein (AFP)	Plain serum, gel serum, lithium heparin plasma	24 hours	M+F	Days	0	<2	0	103990	kIU/L
			M+F	Days	≥2	<8	0	60750	
			M+F	Days	≥8	<15	0	48590	
			M+F	Days	≥15	<22	0	19000	
			M+F	Days	≥22	<29	0	5500	
			M+F	Weeks	≥5	<6	0	4750	
			M+F	Weeks	≥6	<8	0	1650	
			M+F	Months	≥2	<3	0	850	
			M+F	Months	≥3	<4	0	350	
			M+F	Months	≥4	<5	0	100	
			M+F	Months	≥5	<9	0	3	
			M+F	Months/ Years	≥9	<18	0	5	
			M+F	Years	≥18	unspecified	0	6	

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Amikacin	Plain serum, gel serum, lithium heparin plasma, EDTA plasma	Urgent 2 hours, routine 4 hours	autocomment on all: ONCE DAILY DOSING (O.D.D.): Trough level: less than 5 mg/L Peak levels not required to assess therapy. Non-tuberculosis mycobacterium (NTM) O.D.D. peak 25-35 mg/L MULTIPLE DAILY DOSING (M.D.D.): Trough level: less than 10 mg/L Peak level (1h post dose): <30 mg/L Non-tuberculosis mycobacterium (NTM) 3x/week peak: 65-80 mg/L						mg/L
Ammonia	EDTA plasma	4 hours	M/F	Months	0	1	0	100	µmol/L
			M/F	Months	1	>1	0	40	
Androstenedione	Plain serum, gel serum (lithium hep plasma for WYTH only)	240 hours	Female	days	0	14	None	2.5	nmol/L
				days	15	364	None	5.7	
				months	12	24	None	<0.5	
				years	2	3 (+364 days)	None	<0.5	
				years	4	5 (+364 days)	None	<0.6	
				Years	6	7 (+364 days)	0.1	1	
				Years	8	9 (+364 days)	0.1	1.5	
				years	10	11 (+364 days)	0.3	4.3	
				years	12	13 (+364 days)	0.8	6	
				years	14	15 (+364 days)	1.4	7	

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				years	16	17 (+364 days)	1.2	7.4	
				years	>18 (pre- menopau sal)		0.9	7.5	
				years	>18 (post- menopau sal)		0.5	2.9	
			Male	days	0	14	None	2.5	
				days	15	364	None	5.7	
				months	12	24	None	<0.5	
				years	2	3 (+364 days)	None	<0.4	
				years	4	5 (+364 days)	None	<0.5	
				Years	6	7 (+364 days)	0.1	0.8	
				Years	8	9 (+364 days)	0.1	1	
				years	10	11 (+364 days)	0.2	1.4	
				years	12	13 (+364 days)	0.3	2.2	
				years	14	15 (+364 days)	0.6	3.3	
				years	16	17 (+364 days)	1	3.9	

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Test	Sample Type (Preferred, Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
				years	18	39 (+364 days)	1.2	4.7	
				years	40	67	0.8	3.1	
Angiotensin Converting Enzyme (ACE)	Plain serum, gel serum, lithium heparin plasma	72 hours	ALL	years	0	0.5	No reference interval		IU/L
			ALL	years	0.5	18	29	112	
			ALL	years	≥18	unspecified	20	70	
Anion gap	Plain serum, gel serum, lithium heparin plasma, flouride oxalate plasma	4 hours	M/F	Years	0	150	12	16	mmol/L
Antimullerian hormone (AMH)	Plain serum, gel serum, lithium heparin plasma	Same day	Male	Days	0	<3	68	523.7	pmol/L
			Male	Days	3	<8	138.3	1023.7	
			Male	Days	8	<11	195.2	1200.9	
			Male	Days	11	<21	140.1	1130.9	
			Male	Days	21	<29	212	951.4	
			Male	Days	29	<365	203.8	971.7	
			Male	Years	1	<5	268.6	1229.9	
			Male	Years	5	<8	206.2	956.5	
			Male	Years	8	<12	84	976.4	
			Male	Years	12	<15	8.8	286.8	
			Male	Years	15	<18	16.8	130	
			Female	Days	0	<29	None	</= 6.7	
			Female	Days	29	<365	None	</= 31.2	
			Female	Years	1	<5	1.3	43.7	
			Female	Years	5	<8	1.4	39.5	
			Female	Years	8	<12	2.9	52.8	

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Test	Sample Type (Preferred, Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
			Female	Years	12	<15	3	46.6	
			Female	Years	15	<18	2.1	84.1	
Aspartate aminotransferase (AST)	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	Days	0	14	20	98	U/L
			Both	Days/ Years	15	3	16	69	
			F	Years	>3	unspecified	None	<35	
			M	Years	>3	unspecified	None	<50	
Serum Vitamin B12	Gel serum, lithium heparin plaqsma (paeds)	24 hours	All	All	All	All	197	771	ng/L
beta-Human Chorionic Gonadatropin (beta hCG)	Plain serum, gel serum, lithium heparin plasma	24 hours	F+M	Months	0	3	0	50	IU/L
			F+M	Months	3	unspecified	0	4	
β-hydroxybutyrate	Plain serum, gel serum, lithium heparin plasma	2 weeks	No reference range						μmol/L
Bicarbonate	Plain serum, gel serum, lithium heparin plasma	4 hours	M/F	Years	0	16	19	28	mmol/L
			M/F	Years	16	150	22	29	
Bile Acids (serum/plasma)	Plain serum, gel serum	24 hours	all	Years	18	150	0	14	μmol/L
			all	Years	0	18	No reference interval		
Bilirubin Total	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	Days	0	28	No reference interval		μmol/L
			Both	Days	>28	unspecified	None	<21	
Busulfan Pharmacokinetics (blood)	EDTA plasma	Same day	There is no defined reference range for Busulfan. Rather, drug dosage is targetted according to the total area under the curve (AUC) of the Busulfan Pharmacokinetics profile. Target AUC values vary according to						mg/L/hr

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Test	Sample Type (Preferred , Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
			the indication for bone marrow transplant, co-administered chemotherapeutics and clinical status of the patient. Target AUC ranges are described for a number of common scenarios on the Busulfan PK report, which were written by Prof Rob Wynn.						
CA125	Plain serum, gel serum, lithium heparin plasma, EDTA plasma	Same day	F+M	Years	0	150	0	34	kU/L
Ca19-9 (blood)	Plain serum, gel serum, lithium heparin plasma, EDTA plasma	Same day	M+F	Years	0	150	0	33	kU/L
Caeruloplasmin (serum/plasma)	Plain serum, gel serum, lithium heparin plasma	1 week	All	Weeks	0	0 to 8weeks	45	213	mg/L
			All	Weeks/ Years	>8	8 weeks to 1 years	109	371	
			All	years	1	18	181	416	
			All	Years	18	18 to 150	200	600	
Calcium (serum/plasma)	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	Years	0	<1	2.16	2.74	mmol/L
			Both	Years	1	<18	2.31	2.64	
			Both	Years	18	unspecified	2.2	2.6	
Carbamazepine	Plain serum, gel serum, lithium heparin plasma	Urgent 2 hours, routine 4 hours	Not age or gender specific 4.0 – 12.0 mg/L <25 mg/L not usually seriously toxic >26 mg/l associated with life threatening toxicity						mg/L
Carcinoembryonic antigen (CEA)	Plain serum, gel serum, lithium heparin plasma	96 hours	M+F	Years	0	150	0	5	µg/L
Chloride	Plain serum, gel serum, lithium heparin plasma	4 hours	All	All			95	108	mmol/L
Total Cholesterol		4 hours	Female	Day	0	14	1.3	3.2	mmol/L

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	Plain serum, gel serum, lithium heparin plasma		Male	Day	0	14	1.2	2.8	
			Both	Days/Year	15	<1	1.7	6.1	
			Both	Years	1	<19	2.9	5.4	
Total Cholesterol to HDL ratio	Plain serum, gel serum, lithium heparin plasma	4 hours	No reference range						N/A
Ciclosporin	Whole blood EDTA	24 hours	no ref ranges						ug/L
Conjugated bilirubin	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	Days	0	28	1	13	μmol/L
			Both	Days/Years	29	18	1	8	
			Both	Years	>18	unspecified	None	<5	
Copper	Plain serum	1 week	All	Months	0	<3	1.5	7	μmol/L
			All	Months	3	<6	4	17	
			All	Months	6	<12	8	20.5	
			All	Years	1	<6	12.5	23.5	
			All	Years	6	<10	13	21.5	
			All	Years	10	<14	12.5	19	
			All	Years	14	120	13	26	
			No reference range autocomment on all: Reference range 08:30-11:30 AM 100-500 nmol/L						
Cortisol	Plain serum, gel serum , lithium heparin plasma, EDTA plasma	36 hours							nmol/L
C-peptide (blood)	Plain serum, gel serum, lithium heparin plasma	2 weeks	All				343	1803	pmol/L
C-Reactive protein (CRP) (Plasma/serum)	Plain serum, gel serum, lithium heparin plasma, EDTA plasma	4 hours	All	Years	18	150	0.6	5	mg/L
			All	Years	0	17	0.6	5	
		4 hours	MALE	Days	0	90	1	475	IU/L

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Creatine Kinase, total (CK) (Plasma/serum)	Plain serum, gel serum, lithium heparin plasma, EDTA plasma			Months	3	12	1	250	
				Years	1	150	40	320	
			FEMALE	Days	0	90	1	475	
				Months	3	12	1	250	
				Years	1	150	25	200	
Creatinine	Plain serum, gel serum, lithium heparin plasma	4 hours	M	Days	0	<14	27	81	μmol/L
			M	Days/ Years	14	<1	14	34	
			M	Years	1	< 3	15	31	
			M	Years	3	< 5	23	37	
			M	Years	5	<7	25	42	
			M	Years	7	<9	30	48	
			M	Years	9	<11	28	57	
			M	Years	11	11	36	64	
			M	Years	12	12	36	67	
			M	Years	13	13	38	76	
			M	Years	14	14	40	83	
			M	Years	15	15	47	98	
			M	Years	16	16	54	99	
			M	Years	16	18	55	104	
			M	Years	>18	unspecified	59	104	
			F	Days	0	14	27	81	
			F	Days/ Years	14	<1	14	34	
			F	Years	1	< 3	15	31	

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			F	Years	3	< 5	23	37	
			F	Years	5	<7	25	42	
			F	Years	7	<9	30	48	
			F	Years	9	<11	28	57	
			F	Years	11	11	36	64	
			F	Years	12	12	36	67	
			F	Years	13	13	38	74	
			F	Years	14	14	43	75	
			F	Years	15	15	44	79	
			F	Years	16	16	48	81	
			F	Years	16	unspecified	45	84	
C-terminal telopeptides (CTx)	EDTA plasma	1 week	M	years	0	<7	446	1756	ng/L
			M	years	7	<12	659	1975	
			M	years	12	<17	393	2131	
			M	years	17	<21	263	1554	
			M	years	21	unspecified	154	771	
			F	years	0	<7	179	1690	
			F	years	7	<12	300	1978	
			F	years	12	<17	151	1912	
			F	years	17	<21	109	1130	
			F	years	21	unspecified	121	747	
			F	Post menopausal			189	1003	
			F	None - Reference range applied as an auto comment to all female patients					
Cystatin C			ALL	Years	50	150	0.61	1.4	mg/L

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	Gel serum, lithium heparin plasma	Urgent 2 hours, routine 4 hours	ALL	Years	18	50	0.56	0.98	
			ALL	Years	1	17	0.56	1.3	
			ALL	Days	29	364	0.7	1.5	
			ALL	Days	0	28	0.8	2.3	
Dehydroepiandrosterone Sulphate (DHEAS)	Plain serum, gel serum, (lithium heparin WYTH only)	240 hours	Female	years	0	4 (+364 days)	None	≤1.0	μmol/L
				years	5	9 (+364 days)	None	≤2.8	
				years	10	14 (+364 days)	None	≤5.8	
				Years	15	19 (+364 days)	1.2	11	
				Years	20	39 (+364 days)	1.2	8	
				years	40	59 (+364 days)	None	≤6.5	
				years	60	80	None	≤4.8	
			Male	years	0	4 (+364 days)	None	≤1.0	
				Years	5	9 (+364 days)	None	≤2.7	
				Years	10	14 (+364 days)	None	≤6.8	
				years	15	19 (+364 days)	1.5	12	
				years	20	39 (+364 days)	1.8	12.8	

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				years	40	59 (+364 days)	None	≤10.1	
				years	60	80	None	≤8.7	
Dexamethasone	Plain serum, gel serum	360 hours	no ref range. Comment Concentrations <3.0 nmol/L suggest impaired absorption or excess metabolism of dexamethasone. Consider an alternative biochemical screening test to investigate hypercortisolism						nmol/L
Digoxin (Blood)	Plain serum, gel serum, lithium heparin plasma	Urgent 2 hours, routine 4 hours	All	All			0.6	1.2	mg/L
Estimated GFR (Children's) and Patient height (cm)	Plain serum, gel serum, lithium heparin plasma	4 hours	No reference range						mL/min/1.73 m^2, cm (for height)
Estimated Glomerular Filtration Rate CKD-EPI 2012 (EGFR)	Plain serum, gel serum, lithium heparin plasma	4 hours	all	Y	18	150	90*	none	ml/min/1.73 m2
Ethanol	Gel serum	4 hours	No ref range						mg/L
Everolimus (Blood)	Whole blood EDTA	24 hours	All	All			3	8	µg/L
Ferritin	Gel serum, (lithium heparin plasma paed's)	24 hours	F	Years	0	5	12	150	µg/L
			F	years	5	120	15	150	
			M	years	0	5	12	400	
			M	years	5	120	15	400	
FIB4 (blood)	Plain serum, gel serum, lithium heparin plasma		Comment: Score <1.45 suggests low risk of liver fibrosis, A score between 1.45 and 2.67 identifies patients at moderate risk of liver fibrosis, A score of >2.67 is consistent with significant fibrosis. Suggest referral to hepatology if not already made.						none

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Test	Sample Type (Preferred, Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
Folate (blood)	Gel serum, (lithium heparin plasma paed)	24 hours	All	All			3.9	20	µg/L
Follicle Stimulating Hormone (FSH)	Plain serum, gel serum, lithium heparin plasma	24 hours	Male	years	18	150	1.5	12.4	IU/L
			Female	years	18	150	Depends on cycle-report as comment		
			Female	Follicular			3.5	12.5	
			Female	Mid - cycle			4.7	21.5	
			Female	Luteal			1.7	7.7	
			Female	Post menopa usal			25.8	none	
Free Androgen Index (FAI)	Plain serum, gel serum, lithium heparin plasma	240 hours	Female	Years	18	49 + 364 days	0.3	5.6	%
				Years	50	150	0.2	3.6	
			Male	NA, not provided in males					
Free Fatty Acids (blood)	Plain serum, gel serum, lithium heparin plasma	2 weeks	No reference range						µmol/L
Free T3	Plain serum, gel serum, lithium heparin plasma	72 hours	M&F	years	≥18	150	3.1	6.8	pmol/L
			M&F	years	≥11	<18	3.9	7.7	
			M&F	years	≥6	<11	3.9	8	
			M&F	years	≥1	<6	3.7	8.5	
			M&F	months	≥3	<12	3.3	9	
			M&F	days	≥4	<91	3	9.3	

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Test	Sample Type (Preferred, Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
Free T4	Plain serum, gel serum, lithium heparin plasma	4 hours	M&F	Years	≥18	150	11.3	21.6	pmol/L
			M&F	Years	≥12	<18	11.3	21.6	
			M&F	Years	≥7	<12	12.5	21.5	
			M&F	Years	≥1	<7	12.3	22.8	
			M&F	Months	≥1	<12	14	22	
			M&F	Days	≥4	<30	18	31	
			M&F	days	≥0	≤3	No ranges		
Gamma-Glutamyl Transferase (blood)	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	Days	0	14	17	175	U/L
			Both	Days	15	364	5	101	
			Both	Years	1	<11	4	12	
			Both	Years	11	<18	4	16	
			M	Years	18	unspecified	10	71	
			F	Years	18	unspecified	6	42	
Gentamicin (Blood)	Plain serum, gel serum, lithium heparin plasma	urgent 2 hours, routine 4 hours	Comment: ONCE DAILY DOSING: Pre-dose: less than 1 mg/L Neonates, pre-dose: less than 2 mg/L MULTIPLE DAILY DOSING All patients (without endocarditis): Pre-dose: less than 2 mg/L 1 hr post-dose: 5-10 mg/L All patients (with endocarditis):						mg/L
Globulin (blood)	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	D	10	150	15	42	g/L
Fasting glucose	Flouride oxalate, flouride EDTA plasma	4 hours	All	Years	18	150	4.1	5.6	mmol/L
			All	Days/	8 days	17 years	3	6.5	

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Test	Sample Type (Preferred, Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
				Years					
			All	Days	2 days	7 days	2.6	6.1	
			All	Days	0 days	6 days	2	6.1	
Glucose, non-fasting random	Flouride oxalate, flouride EDTA plasma	4 hours	None. Comment added if glucose ≥ 11.0 mmol/L "Random Glucose > 11.0 mmol/L diagnostic of DM, if confirmed by repeat"						mmol/L
Glucose Tolerance Test (Blood)	Flouride oxalate, flouride EDTA plasma	4 hours	Comments: WHO Criteria for Diabetes Mellitus on Venous Plasma Normal - Fasting < 6.1 mmol/L and 2hr < 7.8 mmol/L Impaired fasting glucose: Fasting $6.1 - 6.9$ and 2h < 7.8 mmol/L Impaired glucose tolerance: Fasting glucose < 7.0 mmol/L and 2 hr plasma glucose between 7.8 and 11.0 mmol/L Diabetes: fasting > 6.9 or 2hr > 11.0 mmol/L Fasting glucose < 5.3 mmol/L and 120 minute value < 8.5 mmol/L: comment: Results exclude gestational diabetes. Fasting glucose of ≥ 5.3 mmol/L and/or 120 minute value ≥ 8.5 mmol/L: Results consistent with gestational diabetes mellitus. Refer to MFT GDM (HAPO) guidelines 2021						mmol/L
Growth Hormone human	Plain serum, gel serum	2 weeks	No reference ranges are provided. Interpretative comments added if part of DFT						$\mu\text{g/L}$
HbA1c for Diagnosis (blood)	EDTA whole blood	96 hours	20-41						mmol/mol
HbA1c for Monitoring (blood)	EDTA whole blood	96 hours	No reference range quoted						mmol/mol
HDL – blood	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	Day	0	< 15	0.2	1	mmol/L
			Both	Day/Year	15	< 1	0	2	
			Both	Year	1	< 4	0.7	1.7	
			Both	Year	4	< 13	0.8	2	

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Test	Sample Type (Preferred, Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
			Female	Year	13	<16	0.7	2	
			Male	Year	13	<19	0.7	1.9	
Insulin (blood)	Plain serum, gel serum, lithium heparin plasma	2 weeks	No reference range						pmol/L
Insulin-like Growth Factor-1 (IGF-1)	Plain serum, gel serum	2 weeks	Extensive age and sex related reference ranges. Full details available on request.						µg/L
IGF-Binding Protein 3 (IGF-BP3) – Serum	Plain serum, gel serum	3 weeks	Extensive age and sex related reference ranges. Full details available on request.						mg/L
Iron	Plain serum, gel serum, lithium heparin plasma	4 hours	all	Weeks/ Years	4	1	10	30	µmol/L
			all	Years	1	10	5	25	
			all	Years	10	18	10	25	
			all	Years	18	150	5.8	34.5	
Isavuconazole	Plain serum	1-2 days	No reference range, comment on all samples on normal isavuconazole dosing, most patients achieve levels between 2-4 mg/L. Levels above 5 mg/L have been associated with increased GI side effects						mg/L
Itraconazole	Plain serum	1-2 days	All	ALL	ALL	ALL	1	2	mg/L
Lactate (blood)	Flouride oxalate plasma	2 hours	M/F	y	0	150	0.6	2.5	mmol/L
Lactate Dehydrogenase (LDH)	Plain serum, gel serum, lithium heparin plasma	4 hours	ALL	Years	15	150	139	249	IU/L
			MALE	Years	10	14	163	279	
			FEMALE	Years	10	14	163	269	
			ALL	Years	1	9	196	314	
			ALL	Days	15	364	169	435	
			ALL	Days	0	14	30	1143	

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Test	Sample Type (Preferred, Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
LDL	Plain serum, gel serum, lithium heparin plasma	4 hours	M+F	Year	0	<18	1.3	2.9	mmol/L
Lipase	Plain serum, gel serum, lithium heparin plasma	4 hours	all	none	all	none	13	60	U/L
Lithium	Plain serum, gel serum	24 hours	All	All			0.4	1	mmol/L
Luteinising Hormone (LH)	Plain serum, gel serum, lithium heparin plasma	24 hours	M	years	18	150	1.7	8.6	IU/L
			F	Years	18	150			
					Follicular		2.4	12.6	
					Mid-cycle		14	95.6	
					Luteal		1	11.4	
					Post Menopausal				
Magnesium	Plain serum, gel serum, lithium heparin plasma	4 hours	all				0.7	1	mmol/L
Metanephrine Plasma	Lithium heparin plasma, EDTA plasma	240 hours	ALL	ALL	ALL	ALL	0	510	pmol/L
Methotrexate	Plain serum	Same day (OOH following day)	No reference range						µmol/L
Mitra tacrolimus and creatinine	Mitra collection device		No reference range. Autocomment "Tentative Target Range for Tacrolimus is 4-12 ug/l. Target ranges for heart and lung transplant patients ONLY. Please consult local specialist for other uses."						µg/L
Mycophenolic acid	EDTA plasma	192 hours		ALL	ALL	ALL	2.5	4.5	mg/L
NON HDL Cholesterol (calculation)	Plain serum, gel serum, lithium heparin plasma	4 hours	No reference range						mmol/L

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Test	Sample Type (Preferred, Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
Normetanephrine (plasma)	Lithium heparin plasma, EDTA plasma	240 hours	ALL	ALL	ALL	ALL	0	1180	pmol/L
NTproBNP	Plain serum, gel serum, lithium heparin plasma	Urgent 2 hours, routine 4 hours				4W	NA	NA	ng/L
						1Y	37	646	
						2Y	39	413	
						6Y	23	289	
						14Y	22	157	
						18Y	6	158	
						150Y	0	400	
Oestradiol	Plain serum, gel serum, lithium heparin plasma	24 hours immunoassay, 8 days lcms	Female	years	18	55			pmol/L
				Years	follicular		45	854	
					Mid-Cycle		151	1461	
					luteal		82	1251	
					Post menopausal			77	
				Days	15	Up to 365		78	
				Years	1	Up to 9		19	
				Years	9	Up to 11		170	
				Years	11	Up to 12		354	
				Years	12	Up to 14	21	664	
				Years	14	Up to 18		996	
			Males	years	18	150	41	159	
				Days	15	Up to 365		78	
				Years	1	Up to 11		28	

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Test	Sample Type (Preferred , Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
				Years	11	Up to 13		82	
				Years	13	Up to 15		89	
				Years	15	Up to 18		132	
Oestradiol MS	Plain serum, gel serum, lithium heparin plasma	8 days	Female	Years	18	150			pmol/L
					Pre-menopausal		11	969	
					Post-menopausal		7	77	
				Days	15	Up to 365		78	
				Years	1	Up to 9		19	
				Years	9	Up to 11		170	
				Years	11	Up to 12		354	
				Years	12	Up to 14	21	664	
				Years	14	Up to 18		996	
			Male	Days	15	Up to 365		78	
				Years	1	Up to 11		28	
				Years	11	Up to 13		82	
				Years	13	Up to 15		89	
				Years	15	Up to 18		132	
Orosomucoid	Gel serum, lithium heparin plasma	Same day	ALL	ALL	ALL	ALL	0.3	1.2	g/L
Osmolal Gap, serum/plasma	Plain serum, gel serum, lithium heparin plasma	4 hours	all	none	all	none	-10	10	mmol/kg

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Osmolality (Blood)	Plain serum, gel serum, lithium heparin plasma	36 hours	all	Y		150	275	295	mmol/Kg
Paracetamol	Plain serum, gel serum, lithium heparin plasma	4 hours	no reference range						mg/L
Parathyroid Hormone	Lithium heparin plasma, EDTA plasma	24 hours	ALL	Years	19	150	1.6	6.9	pmol/L
				Years	11	<19	1.6	7.2	
				Years	1	<11	1.2	6.3	
				Months	1	<12	0.9	6.5	
				Days	0	31	0.7	6.3	
Phenobarbital	Plain serum, gel serum, lithium heparin plasma	Urgent 2 hours, routine 4 hours	All	All			10	40	mg/L
Phenytoin (blood)	Plain serum, gel serum, lithium heparin plasma	Urgent 2 hours, routine 4 hours	Not age or gender specific 5-20 mg/L						mg/L
Phosphate (blood)	Gel serum, lithium heparin plasma	4 hours	Both	month	0	<1 month	1.4	2.8	mmol/L
			Both	Month/yr	1 month	<1 yr	1.2	2.2	
			Both	years	1	<3	1.1	2	
			Both	years	3	<12	1	1.8	
			Both	years	12	<15	0.95	1.5	
			Both	years	16	<18	0.8	1.4	
			Both	years	18	unspecified	0.8	1.5	

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Test	Sample Type (Preferred , Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
Placental Growth Factor (PLGF), Soluble FMS Tyrosine Kinase-1 (SFLT), SFLT:PLGF ratio	Plain serum, gel serum	Same day	comment: Clinical decision points: sFIt:PLGF ratio is used in suspected pre-eclampsia not confirmed by clinical assessment <37 weeks. Clinical pathway includes clinical assessment of maternal symptoms, BP, proteinuria, other markers and foetal assessment in conjunction with sFIt:PLGF ratio: sFIt:PLGF ratio <38 pre-eclampsia excluded for next 7 days sFIt:PLGF ratio >38 to <85 Intermediate result, increased surveillance sFIt:PLGF ratio >85 diagnosis of pre-eclampsia/placental disease confirmed Note a positive ratio is not an isolated indication for delivery <37 weeks.						<i>none</i>
Posaconazole (Blood)	Plain serum	1-2 days	No reference range. Autocomment "The target pre-dose levels are 1.0 - 3.75 mg/L on therapy and 0.7 - 1.5 mg/L for prophylaxis."						<i>mg/L</i>
Post-Mortem Glucose (lab orderable only, not reported onto patient record)	Flouride oxlate	4 hours	No ref range						<i>mmol/L</i>
Post-Mortem Urea (lab orderable only, not reported onto patient record)	Plain serum, gel serum, lithium heparin plasma	4 hours	No ref range						<i>mmol/L</i>
Potassium	Plain serum, gel serum, lithium heparin plasma	4 hours	All	years	18 years	150 years	3.5	5.3	mmol/L
			All	Weeks / years	4 weeks	17 years	3.5	5	
			All	Weeks	0 weeks	4 weeks	3.4	6	
Prednisolone	Plain serum, gel serum, lithium heparin plasma	192 hours	No reference range						<i>µg/L</i>

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Test	Sample Type (Preferred, Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
Procalcitonin	Plain serum, gel serum	Same day	no reference range - autocomment "Consider stopping antibiotics if procalcitonin concentration has decreased by more than or equal to 80% from the PEAK concentration or is less than 0.5ug/L. Review of antibiotics is STRONGLY encouraged if procalcitonin concentration is increasing AND >0.5ug/L. Refer to microbiology for further advice on interpretation & antibiotic dosing."						µg/L
Procollagen type 1 N Peptide (P1NP)	Plain serum, gel serum, lithium heparin plasma	2 weeks	BOTH	All			27	128	µg/L
Procollagen Type 3 N Peptide (P3NP)	Plain serum, gel serum, lithium heparin plasma	4 weeks	F	Years	0	0.25	42.4	64.1	µg/L
			M	Years	0	0.25	46.5	77.6	
			F	Years	0.25	0.5	31.3	37.8	
			M	Years	0.25	0.5	24.6	43.3	
			F	Years	0.5	0.75	16.2	23.2	
			M	Years	0.5	0.75	14.9	21.4	
			F	Years	0.75	1	13.7	26	
			M	Years	0.75	1	11.5	18.9	
			F	Years	1	2	11.2	15.7	
			M	Years	1	2	7.4	16	
			F	Years	2	3	7.2	12.5	
			M	Years	2	3	5.9	11	
			F	Years	3	10	5.6	9.9	
			M	Years	3	10	5.6	9.9	
			F	Years	10	11	5.5	10.6	
			M	Years	10	11	6.2	9.4	

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			F	Years	11	12	8.2	14.2	
			M	Years	11	12	5.1	9.4	
			F	Years	12	13	7.1	14.6	
			M	Years	12	13	6	11.9	
			F	Years	13	14	3	8.7	
			M	Years	13	14	7.7	18.8	
			F	Years	14	15	6.5	9.7	
			M	Years	14	15	8.8	17	
			F	Years	15	16	7.2	7.5	
			M	Years	15	16	11.4	19.7	
			F	Years	16	17	3	5	
			M	Years	16	17	7.4	18	
			F	Years	17	18	3	5.2	
			M	Years	17	18	3.8	5.9	
Progesterone	Gel serum, lithium heparin plasma	24 hours	No reference range, autocomment: Progesterone level >30 nmol/L on day 21/mid-luteal phase sample is consistent with ovulation						nmol/L
Prolactin	Gel serum, lithium heparin plasma	24 hours	Male	Years	18	150	86	324	mU/L
				Years	12	17	65	648	
				Years	9	11	60	750	
				Years	5	8	69	593	
				Years	2	4	82	967	
				Years	1	1	93	1063	
				Months	9	12	148	1105	
				Months	6	8	121	2213	
				Months	3	5	113	2813	

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				Days	61	90	151	2820	
				Days	31	60	689	4208	
				Days	0	30	900	6751	
			Female	Years	18	150	102	496	
				Years	12	17	84	813	
				Years	9	11	65	740	
				Years	5	8	66	630	
				Years	2	4	81	864	
				Years	1	1	96	1165	
				Months	9	12	148	1105	
				Months	6	8	121	2213	
				Months	3	5	113	2813	
				Days	61	90	151	2820	
				Days	31	60	689	4208	
				Days	0	30	900	6751	
Free Monomeric Prolactin	Gel serum, lithium heparin plasma	24 hours	Male	Years	18	150	67	251	mU/L
				Years	12	17	50	502	
				Years	9	11	47	581	
				Years	5	8	53	460	
				Years	2	4	64	749	
				Years	1	1	72	824	
				Months	9	12	115	856	
				Months	6	8	94	1715	
				Months	3	5	88	2180	
				Days	61	90	117	2186	

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				Days	31	60	534	3261	
				Days	0	30	698	5232	
			Female	Years	18	150	79	384	
				Years	12	17	65	630	
				Years	9	11	50	574	
				Years	5	8	51	488	
				Years	2	4	63	670	
				Years	1	1	74	903	
				Months	9	12	115	856	
				Months	6	8	94	1715	
				Months	3	5	88	2180	
				Days	61	90	117	2186	
				Days	31	60	534	3261	
				Days	0	30	698	5232	
Prostate Specific Antigen (PSA)	Gel serum, lithium heparin plasma	24 hours	MALE	Years	18	39	NONE	NONE	µg/L
				Years	40	49	0	2.5	
				Years	50	59	0	3.5	
				Years	60	69	0	4.5	
				Years	70	79	0	6.5	
				Years	80	150	NONE	NONE	
Protein, total	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	Days	0	<15	51	80	g/L
				Days/Years	15	<1	43	69	
				Years	1	<6	59	73	
				Years	6	<9	62	75	

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				Years	9	unspecified	63	78	
Renin activity	Lithium heparin plasma, EDTA plasma	240 hours	M,F	years	18	150	0.3	2.2	<i>nmol/L/hour</i>
Renin Concentration	EDTA plasma	240 hours	M/F	D	0	up to 7	0	312	mU/L
				D & Y	7 days	up to 1 year	31.2	109.2	
				Y	1	up to 2	32.4	93.6	
				Y	2	up to 10	22.8	62.4	
				Y	10	unspecified	12	31.2	
Salicylate	Plain serum, gel serum, lithium heparin plasma	4 hours	No reference range						mg/L
Selenium	Plain serum	2 weeks	F	Days	0	<28	0.25	0.82	µmol/L
				Months	1	<12	0.11	0.92	
				Years	1	<5	0.26	1.27	
				Years	5	<14	0.45	1.24	
			M	Days	0	<28	0.18	0.9	
				Months	1	<12	0.11	0.76	
				Years	1	<5	0.32	1.19	
				Years	5	<14	0.43	1.25	
			All	Years	14	120	0.8	1.5	
Sex Hormone Binding Globulin (SHBG)	Plain serum, gel serum, lithium heparin plasma	240 hours	Female	days	4	31	14	120	nmol/L
				months	1	12	36	229	
				years	1	7 + 364 days	42	189	
				Years	8	10 +364 days	26	162	

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Test	Sample Type (Preferred , Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
				Years	11	12 + 364 days	15	108	
				years	13	14 +364 days	11	98	
				years	15	16 + 364 days	10	84	
				years	17	17 + 364 days	11	155	
				years	18	49 + 364 days	32	128	
				years	≥50	unspecified	27	128	
			Male	days	4	31	14	120	
				months	1	12	36	229	
				years	1	7 + 364 days	42	189	
				Years	8	10 + 364 days	26	162	
				Years	11	12 + 364 days	15	108	
				years	13	14 + 364 days	11	98	
				years	15	17 + 364 days	10	50	
				years	18	49 + 364 days	18	54	
				years	≥50	unspecified	21	77	
Sirolimus	EDTA whole blood	24 hours					4	12	µg/L

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Sodium	Plain serum, gel serum, lithium heparin plasma	4 hours	All	Weeks/y ears	4 weeks	150 years	133	146	mmol/L
			All	weeks	1 week	4 weeks	132	142	
			All	weeks	0 weeks	1 week	131	144	
Tacrolimus	Whole blood EDTA	24 hours	All	All			3	8	µg/L
Teicoplanin	Plain serum, gel serum , lithium heparin plasma	120 hours	no ref range. Autocomment "In severe Staph. aureus infections including infective endocarditis, pre dose target range is 20 - 60 mg/L. For other severe infections, target levels 10 - 60 mg/L"						mg/L
Testosterone (Roche)	Gel serum, lithium heparin plasma	240 hours	Male	years	18	49 + 364 days	8.6	29	nmol/L
				Years	≥50	unspecified	6.7	25.7	
Testosterone by LC/LC-MS	Plain serum, gel serum, (lithium heparin plasma WYTH only)	240 hours	Female	days	0	14	None	<0.4	nmol/L
				days	15	364	None	<0.2	
				months	12	24	None	<0.3	
				years	2	3 (+364 days)	None	<0.5	
				years	4	5 (+364 days)	None	0.7	
				Years	6	7 (+364 days)	None	0.2	
				Years	8	9 (+364 days)	None	0.4	
				years	10	11 (+364 days)	0.1	1.1	
				years	12	13 (+364 days)	0.2	1.7	

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Test	Sample Type (Preferred , Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
				years	14	15 (+364 days)	0.2	1.8	
				years	16	17 (+364 days)	0.3	2	
				years	>18 (pre- menopau sal)		0.3	1.9	
				years	>18 (post- menopau sal)		0.2	1.1	
			Male	days	0	14	0.3	6.3	
				days	15	364	None	<8.9	
				months	12	24	None	<1.0	
				years	2	3 (+364 days)	None	<0.5	
				years	4	5 (+364 days)	None	<0.6	
				Years	6	7 (+364 days)	None	<0.5	
				Years	8	9 (+364 days)	0.1	0.3	
				years	10	11 (+364 days)	0.1	5.7	
				years	12	13 (+364 days)	0.1	21.5	

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Test	Sample Type (Preferred , Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
				years	14	15 (+364 days)	1.1	25.4	
				years	16	17 (+364 days)	5.5	28.6	
				Years	18	49(+364days)	8.6	29	
				Years		≥50	6.7	25.7	
Theophylline	Plain serum, gel serum, lithium heparin plasma, EDTA plasma	Urgent 2 hours, routine 4 hours	Not age or gender specific 10-20 mg/L						mg/L
Thiopental	Plain serum, gel serum, lithium heparin plasma	By arrangement only through DB	autocomment: It is recommended that brain-stem testing should not be undertaken if the concentration is >5mg/L (AoMRC Code of practice for the diagnosis and confirmation of death (2008)).						mg/L
Thiopurine metabolites	Whole blood EDTA	2 weeks	6-TGN: 235-450 pmol 6TGN/8x10 ⁸ cells: maximum drug efficacy in IBD. >1000 pmol 6TGN/8x10 ⁸ cells: increased risk of myelosuppression 6-MMPN: >5700 pmol 6MMPN/8x10 ⁸ cells: Increased risk of hepatotoxicity						
Thiopurine Methyl Transferase (TPMT)	Whole blood EDTA	10 days	Deficient activity less than 10 mU/L Low activity 20 - 85 mU/L Normal activity 85 - 185 mU/L High activity > 185 mU/L						mU/L
Thiopurine Methyl Transferase (TPMT) Genotype	Whole blood EDTA	2 weeks	No reference range						N/A

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Test	Sample Type (Preferred, Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
Thyroid Peroxidase Antibodies (TPO)	Plain serum, gel serum, lithium heparin plasma	96 hours	ALL	ALL	ALL	ALL	0	34	IU/mL
Thyroid Stimulating Hormone (TSH)	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	Years	≥18	150	0.27	4.2	mu/L
			Both	Years	≥12	<18	0.27	4.2	
			Both	Years	≥7	<12	0.6	4.84	
			Both	Years	≥1	<7	0.7	5.97	
			Both	Months	≥1	<12	1.02	6.8	
			Both	Days	≥4	<30	1.23	9.7	
			Both	days	≥0	≤3	No ranges		
TSH – Blood spot	Whole blood spot	4 hours	All		All ages		0	3	mU/L
TmP/GFR	Gel serum, lithium heparin plasma		Both	Months	0	<3	1.43	3.43	
				Months	3	<6	1.48	3.3	
				Months /years	6	<2	1.15	2.6	
				Years	2	<18	1.15	2.44	
			Male	Years	18	<35	1	1.35	
				Years	35	<65	0.9	1.35	
			Female	Years	18	<35	0.96	1.44	
				Years	35	<65	0.88	1.42	
			Both	Years	65	unspecified	0.8	1.35	
Tobramycin	Plain serum, gel serum, lithium heparin plasma	4 hours	comment on all: ONCE DAILY DOSING: Trough level: less than 1mg/L Peak levels not required to assess therapy.						mg/L
Transferrin	Plain serum, gel serum, lithium heparin plasma	4 hours	All	Months/ Years	2	1	1.04	2.24	g/L

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Test	Sample Type (Preferred , Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
			All	Years	1	17	2.2	3.37	
			All	Years	17	150	2	3.6	
Transferrin saturation	Plain serum, gel serum, lithium heparin plasma	4 hours	All	Years	0	150	15	45	%
Triglycerides	Plain serum, gel serum, lithium heparin plasma	4 hours	M+F	Day	0	<15	1	3.3	mmol/L
			M+F	Day/Year	15	<1	0.7	3.2	
			M+F	Year	1	<18	0.5	2.5	
			M+F	Year	18	150	unspecified	1.6	
Troponin T	Gel serum, lithium heparin plasma	2 hours	ALL	ALL	ALL	ALL	0	14	ng/L
Urate	Plain serum, gel serum, lithium heparin plasma	4 hours	M/F	Days	0	15	158	748	µmol/L
				Days	15	365	88	370	
			F	Years	1	12	100	282	
				Years	12	19	147	342	
				Years	19	150	140	360	
			M	Years	1	12	100	282	
				Years	12	19	150	446	
				Years	19	150	200	430	
Urea	Plain serum, gel serum, lithium heparin plasma	4 hours	M/F	Months	0	1	2	5	mmol/L
				Months	1	12	2.5	6	
				Years	1	12	2.5	6.5	
				Years	12	18	3	7.5	
				Years	18	150	2.5	7.8	
Valproate	Plain serum, gel serum, lithium heparin plasma	Urgent 2 hours,	All	All			50	100	mg/L

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Test	Sample Type (Preferred , Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
		routine 4 hours							
Vancomycin	Plain serum, gel serum, lithium heparin plasma	Urgent 2 hours, routine 4 hours	autocomment:" Trough level: 10 - 15 mg/L Trough level: 15 - 20 mg/L for bacteraemia, endocarditis, osteomyelitis, meningitis, hospital acquired pneumonia. Post dose levels not required. Continuous infusion - adult critical care areas only: 15-24.9mg/L Very rarely, immunoglobulin interference may lead to unreliable vancomycin results.						mg/L
Vitamin A	Plain serum , lithium heparin plasma	2 weeks	M/F	Years	0	≤1	0.5	1.5	μmol/L
				Years	>1	≤7	0.7	1.4	
				Years	>7	≤13	0.91	1.71	
				Years	>13	≤20	0.91	2.51	
				Years	>20	≤120	1.05	2.8	
Vitamin E	Plain serum , lithium heparin plasma	2 weeks	M/F	Weeks	0	≤4	2.3	11.6	VITE μmol/L, CHOL mmol/L
				Weeks / years	>4	≤13	7	21	
				Years	>13	≤20	14	23	
				Years	>20	≤120	12	42	
Vitamin E to Cholesterol ratio	Plain serum, lithium heparin plasma	2 weeks	M/F	Years	0	120	3.5	9.5	μmol/mmol
Voriconazole	Plain serum	96 hours	All	ALL	ALL	ALL	1.3	5.7	mg/L
Zinc	Plain serum	1 week	All	Months	0	1	10	22	μmol/L
			All	Months/ years	>1	12	10	18	

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Test	Sample Type (Preferred, Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
			All	Year	>12	120	10	22	
Urine									
5-hydroxyindole acetic acid (5HIAA)	24 hour acidified urine	240 hours	All	ALL			4	46	µmol/24 hours
Albumin to Creatinine Ratio	Spot urine	24 hours	All	All				<3	mg/mmol
Anti-hypertensive Medication Screen (urine)	Spot urine	4 weeks	N/A						N/A
Urine Calcium	Spot urine	4 hours	No reference range						mmol/L
Urine Calcium Excretion	24 hour acidified urine	24 hours	Both	Years	0	<18	Reference interval 0 to 0.1mmol/kg/24hrs AND SO REQUIRES CONSIDERATION OF PATIENT WEIGHT to interpret		mmol/24hrs
				Years	18	150	2.5	7.5	
urine calcium:creatinine clearance ratio (spot)	Spot urine	24 hours	autocomments, depending on results: Ca/Cr clearance ratio <0.02: In the presence of hypercalcaemia, suggest CaSR gene analysis to rule in/out familial hypocalciuric hypercalcaemia. Ca/Cr clearance ratio >0.02: In the presence of hypercalcaemia, Calcium:creatinine clearance ratio is suggestive of primary hyperparathyroidism.						mmol/mmol
urine calcium:creatinine ratio	Spot urine	24 hours	Both	Years	0	<1	0	1.49	mmol/mmol Cr
				Years	1	<2	0	1.24	
				Years	2	<5	0	0.99	

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Test	Sample Type (Preferred, Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
				Years	5	<10	0	0.69	
				Years	10	<18	0	0.59	
				Years	18	150	0	0.52	
Catecholamine metabolites (urine) - urine VMA/creatinine ratio	Spot urine	7 days	Any	Months	0	6	N/A	17	(μmol/mmol)
					>6	12		15	
					>12	24		10	
					>24	36		9	
					>36	48		8	
					>48	72		7	
					>72	96		6	
					>96	144		5.5	
					>144	192		5	
Catecholamine metabolites (urine) - urine HVA/Creatinine ratio	Spot urine	7 days	Any	Months	0	6	N/A	23	(μmol/mmol)
					>6	12		21	
					>12	24		17.5	
					>24	36		15	
					>36	48		13	
					>48	60		11	
					>60	72		10	
					>72	96		8	
					>96	120		7	
					>120	156		6	
					>156	192		5	
Chloride (Urine)	24 hour plain urine	24 hours	No reference range						mmol/L

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Test	Sample Type (Preferred, Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
Urine citrate (24 hour)	24 hour acidified urine	240 hours	All	Year	18	unspecified	1680	6450	umol/24 hours
Urine Copper Excretion	24 hour plain urine	4 weeks	All	Years	0	120	0	1	µmol/24hr
Urine free cortisol	24 hour plain, 24hour acidified	192 hours	All	ALL			0	164	nmol/24h
Urine cotinine	Spot urine	192 hours	No ref range autocomment added: <5 µg/L - Results consistent with a non-smoker; 5-50 µg/L - Result consistent with passive smoking; >50 µg/L - Results consistent with active smoking						µg/L
Urine creatinine		24 hours	No reference range						mmol/L
Creatinine Clearance	Gel serum, lithium heparin plasma, 24 hour plain urine	24 hours	ALL	ALL			71	151	mL/min
Urine Creatinine excretion	24 hour plain urine	24 hours	All	Years	3	8	1	6	mmol/24h
				Years	9	12	1.5	12.5	
				Years	13	17	2.6	16.6	
			Female	Years	18	unspecified	7	14	
			Male	Years			9	21	
Urine cystine	24 hour plain urine	240 hours	All	ALL			0	99	mg/24 hours
Drugs of Abuse Panel (Urine)	Spot urine	14 days	N/A						
Magnesium (urine)	24 hour acidified, spot urine	24 hours	no ref range						mmol/L
Magnesium urine excretion	24 hour acidified urine	24 hours	all				2.4	6.5	mmol/L/24h
Urine oxalate excretion (adult)	24 hour acidified urine	240 hours	Male	Year	18	ALL	80	490	umol/24 hours
			Female	Year	18	All	40	320	
Urine pH	Spot urine		ALL	ALL	ALL	ALL	4	9	none
Urine Phosphate (Spot)	Spot urine	24 hours	No reference range						mmol/L

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Urine Phosphate Excretion	24hour acidified urine	24 hours	Male	Years	0	< 2		None readily available	mmol/kg/24h rs
				Years	2	6	0.3	1	
				Years	7	10	0.25	0.9	
				Years	11	14	0.2	0.8	
				Years	15	18	0.15	0.7	
			Female	Years	0	< 2		None readily available	
				Years	2	6	0.3	1.1	
				Years	7	10	0.25	1	
				Years	1	14	0.2	0.7	
				Years	15	18	0.15	0.55	
			Both	Years	18	150	15	50	mmol/24hrs
Potassium (Urine)	24 hour plain, spot urine	24 hours	no ref range						mmol/L
Urine potassium excretion	24 hour plain	24 hours	All	Years	0	150	25	125	mmol/24 hours
Fractional excretion of potassium	Plain serum, gel serum, lithium heparin plasma, spot urine		autocomment: >10% suggests renal cause for hypokalaemia, <10% suggests extra-renal cause						%

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Test	Sample Type (Preferred, Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
Trans-Tubular Potassium Gradient	Plain serum, gel serum, lithium heparin plasma, spot urine		autocomment: Valid if urine osm >serum osm and urine sodium >20mmol/L and normal diet. <4% to 5% indicates a lack of aldosterone effect at the corticol collecting duct if hyperkalaemic at the time. If hypokalaemic, >2 to 3% would indicate renal losses. Comparison after a trial of mineralocorticoid is useful to differentiate deficiency (increases within 4-6h post dose) or resistance (no increase).						%
Urine total protein	Spot urine	24 hours	no ref range						mg/L
Urine Protein Creatinine Ratio (PCR)	Spot urine	24 hours	M/F	All			0	29	mg/mmol
Urine protein excretion	24 hour plain urine	24 hours	All	All				<140	mg/24h
Urine Sodium	Spot urine	24 hours	no ref range						mmol/L
Urine Sodium Excretion	24 hour plain urine	24 hours	ALL	ALL			40	220	mmol/L/24h
Fractional Excretion of Sodium	Plain serum, gel serum, lithium heparin plasma, spot urine		autocomment: <1% suggests pre-renal cause for hyponatraemia, >1% renal wasting of sodium and >4% an obstructive cause						%
Urine Urate	Spot urine	24 hours	no ref range						mmol/L
Urine Urate Creatinine Ratio	Spot urine	24 hours	no ref range						µmol/mmol creatinine
Urine Urate Excretion	24 hour plain urine	24 hours	ALL	ALL			1.5	4.5	mmol/24 hr
Urea (Urine)	24 hour plain urine		no ref range						mmol/L
Urea urine excretion	24 hour plain urine		all	Y		150	428	714	mmol/L/24h
Fluids									
Fluid albumin	Fluid, plain	24 hours	No reference range						g/L
Alpha-feto protein (AFP) (CSF)	CSF, plain	24 hours	all	Weeks	all	6	2	889	kU/L
			All	W/M	6 weeks	2 months	0	13	
			All	Months	>2	unspecified	0	3	

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beta-Human Chorionic Gonadatropin (beta hCG) (CSF)	CSF, plain	4 hours	no ref range						IU/L
Fluid Bilirubin	Fluid, plain		No reference range						µmol/L
Ca125 (Fluid)	Fluid, plain	96 hours	No reference Range						kU/L
CA19-9 (Fluid)	Fluid, plain	96 hours	No reference Range						kU/L
Fluid calcium	Fluid, plain		No reference range						mmol/L
CEA (Fluid)	Fluid, plain	96 hours	No reference Range						µg/L
Chloride (Fluids)	Fluid, plain		all	none	all	none	none	none	mmol/L
Cholesterol (Fluid)	Fluid, plain	24 hours	No reference Range						mmol/L
Salivary cortisol	Saliva salivette tube , saliva passive drool	240 hours	No reference range . Comment "Salivary cortisol reference range: 8-9 am = 5-46 nmol/L Late night = < 2.6 nmol/L"						nmol/L
Salivary cortisone	Saliva salivette tube , saliva passive drool	240 hours	No reference range. Comment "Salivary cortisone reference range: 9 am = 18-47 nmol/L Late night = < 18 nmol/L", "Waking salivary cortisone less than 7.0 nmol/L , adrenal insufficiency is highly likely and requires prompt review. Waking salivary cortisone 7.0 nmol/L to 17.0 nmol/L, adrenal insufficiency cannot be excluded, arrange for a synacthen test. Waking salivary cortisone greater than 17.0 nmol/L , adrenal function likely normal. "						nmol/L
Salivary cortisol & cortisone - short synacthen test	Saliva salivette tube , saliva passive drool	240 hours	No reference range						nmol/L
Creatinine (Fluid)	Fluid, plain		No reference Range						µmol/L
CSF glucose	Fluoride oxalate [F-EDTA / F-LiHep also OK]	4 hours	All	Years	1	150	2.2	4.4	mmol/L
			All	Months	2	12	1.9	5	
			All	Days	29	58	1.6	5.6	

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			All	Days	0	28	1.9	5.6	
Fluid glucose	Fluid, flouride oxalate	24 hours	No reference Range						mmol/L
CSF lactate	Fluoride oxalate [F-EDTA / F-LiHep also OK]	Urgent 2 hours, routine 4 hours	all	all			1.1	2.4	mmol/L
Lactate Dehydrogenase (Fluid)	Fluid, plain	24 hours	No Reference Interval; interpretation depends on other tests and clinical status. Light's criteria - Exudate if fluid to plasma lactate dehydrogenase (LDH)/serum LDH ratio is greater than 0.6. Exudate if LDH level greater than two-thirds the upper limit of the laboratory's reference range of serum LDH.						U/L
Lipase (Fluid)	Fluid, plain	24 hours	No reference Range						U/L
Fluid Osmolality	Fluid, plain	36 hours	No reference Range						mmol/Kg
pH (Fluids, usually pleural fluid)	Fluid, plain	24 hours	all	y	all	none	*	*	pH
Fluid Phosphate	Fluid, plain		no reference range						mmol/L
CSF total protein	CSF, plain	4 hours	All	Months/ Years	2	150	0.15	0.45	g/L
			All	Weeks/ Months	4	2	0.2	0.7	
			All	Days/ weeks	7	4	0.2	0.8	
			All	Days	0	7	0.4	1.1	
Fluid total protein	Fluid, plain	24 hours	No reference Range - autocomment "Light's criteria: a pleural fluid : serum protein ratio >0.5 is suggestive of an exudative pleural effusion"						g/L

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Test	Sample Type (Preferred, Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
Potassium (Fluid)	Fluid, plain		No reference Range						mmol/L
Sodium (Fluid)	Fluid, plain		No reference Range						mmol/L
Sweat Test (sweat chloride)	Sweat	Same week	Male	Months	0	6	0	29	mmol/L
			Female	Months	0	6	0	29	
			Male	Months	6	100	0	39	
			Female	Months	6	100	0	39	
Salivary testosterone	Saliva passive drool	1 month	Male	All			70	340	pmol/L
			Female				6	46	
Triglycerides (Fluid)	Fluid, plain	24 hours	No reference Range						mmol/L
URATE (ASPIRATE)	Fluid, plain		No reference Range						μmol/L
Fluid Urea	Fluid, plain		No reference Range						mmol/L
Xanthochromia Screen (CSF)	CSF plain	Analysed 8am-8pm (OOH sent to external lab if urgent)	interpretive comments						
Miscellaneous									
Breath Hydrogen Test – Lactulose	Expired breath	Same week as appt	None (interpretative comments added)						ppm (parts per million)
Breath Hydrogen Test – Lactose or Sucrose	Expired breath	Same week as appt	None (interpretative comments added)						ppm (parts per million)
Calculus studies (stone)	Stone	17 days	No reference range						N/A
Faecal Calprotectin (faeces)	Faeces	2 weeks	<100 – negative 100-250 – equivocal >250 - positive						μg/g

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Test	Sample Type (Preferred , Acceptable)	Turn around time (hours)	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units
Faecal Elastase	Faeces	336 hours	ALL	ALL			201	NONE	µg/g
Faecal Immunological Testing (FIT; faeces)	Faeces	7 days		y	18		10		µg Hb/g
Faecal Sugar Chromatography	Faeces	2 weeks	no ref range						N/A
Jejunal Biopsy Analysis (disaccharidases)	Jejunal tissue biopsy	3 weeks	M/F	ALL			Maltase 130 U/g protein Sucrase 30 U / g protein Lactase 6 / g protein	Maltase 456 U/g protein Sucrase 152 U / g protein Lactase 55 U / g protein	U/g protein