

Normal Laboratory Values for Children

NORMAL LABORATORY VALUES FOR CHILDREN

	Normal Values	
CHEMISTRY		
Albumin	0-1 y	2.0-4.0 g/dL
	1 y to adult	3.5-5.5 g/dL
Ammonia	Newborns	90-150 mcg/dL
	Children	40-120 mcg/dL
	Adults	18-54 mcg/dL
Amylase	Newborns	0-60 units/L
	Adults	30-110 units/L
Bilirubin, conjugated, direct	Newborns	<1.5 mg/dL
	1 mo to adult	0-0.5 mg/dL
Bilirubin, total	0-3 d	2.0-10.0 mg/dL
	1 mo to adult	0-1.5 mg/dL
Bilirubin, unconjugated, indirect		0.6-10.5 mg/dL
Calcium	Newborns	7.0-12.0 mg/dL
	0-2 y	8.8-11.2 mg/dL
	2 y to adult	9.0-11.0 mg/dL
Calcium, ionized, whole blood		4.4-5.4 mg/dL
Carbon dioxide, total		23-33 mEq/L
Chloride		95-105 mEq/L
Cholesterol	Newborns	45-170 mg/dL
<i>See following tables for age- and gender-specific values</i>	0-1 y	65-175 mg/dL
	1-20 y	120-230 mg/dL
Creatinine	0-1 y	≤0.6 mg/dL
	1 y to adult	0.5-1.5 mg/dL
Glucose	Newborns	30-90 mg/dL
	0-2 y	60-105 mg/dL
	Children to Adults	70-110 mg/dL
Iron		
	Newborns	110-270 mcg/dL
	Infants	30-70 mcg/dL
	Children	55-120 mcg/dL
	Adults	70-180 mcg/dL

Iron binding	Newborns	59-175 mcg/dL
	Infants	100-400 mcg/dL
	Adults	250-400 mcg/dL
Lactic acid, lactate		2-20 mg/dL
Lead, whole blood		<10 mcg/dL
Lipase		
	Children	20-140 units/L
	Adults	0-190 units/L
Magnesium		1.5-2.5 mEq/L
Osmolality, serum		275-296 mOsm/kg
Osmolality, urine		50-1400 mOsm/kg
Phosphorus	Newborns	4.2-9.0 mg/dL
	6 wk to 19 mo	3.8-6.7 mg/dL
	19 mo to 3 y	2.9-5.9 mg/dL
	3-15 y	3.6-5.6 mg/dL
	>15 y	2.5-5.0 mg/dL
Potassium, plasma	Newborns	4.5-7.2 mEq/L
	2 d to 3 mo	4.0-6.2 mEq/L
	3 mo to 1 y	3.7-5.6 mEq/L
	1-16 y	3.5-5.0 mEq/L
Protein, total	0-2 y	4.2-7.4 g/dL
	>2 y	6.0-8.0 g/dL
Sodium		136-145 mEq/L
Triglycerides	Infants	0-171 mg/dL
<i>See following tables for age- and gender-specific values</i>	Children	20-130 mg/dL
	Adults	30-200 mg/dL
Urea nitrogen, blood	0-2 y	4-15 mg/dL
	2 y to Adult	5-20 mg/dL
Uric acid	Male	3.0-7.0 mg/dL
	Female	2.0-6.0 mg/dL
ENZYMES		
Alanine aminotransferase (ALT) (SGPT)	0-2 mo	8-78 units/L
	>2 mo	8-36 units/L
Alkaline phosphatase (ALKP)	Newborns	60-130 units/L

	0-16 y	85-400 units/L
	>16 y	30-115 units/L
Aspartate aminotransferase (AST)	Infants	18-74 units/L
(SGOT)	Children	15-46 units/L
	Adults	5-35 units/L
Creatine kinase (CK)	Infants	20-200 units/L
	Children	10-90 units/L
	Adult male	0-206 units/L
	Adult female	0-175 units/L
Lactate dehydrogenase (LDH)	Newborns	290-501 units/L
	1 mo to 2 y	110-144 units/L
	>16 y	60-170 units/L

Blood Gases

	Arterial	Capillary	Venous
pH	7.35-7.45	7.35-7.45	7.32-7.42
pCO ₂ (mm Hg)	35-45	35-45	38-52
pO ₂ (mm Hg)	70-100	60-80	24-48
HCO ₃ (mEq/L)	19-25	19-25	19-25
TCO ₂ (mEq/L)	19-29	19-29	23-33
O ₂ saturation (%)	90-95	90-95	40-70
Base excess (mEq/L)	5 to +5	5 to +5	5 to +5

Classification Serum Lipid Concentrations

Classification	Percentile	Cholesterol (mg/dL)		LDL-C (mg/dL)		Triglycerides (mg/dL)
		Children	Adults	Children	Adults	Adults
Acceptable/optimal	<75th	<170	<200	<110	<100	<150
Above optimal	*	*	*	*	100-129	*
Borderline high	75th to 95th	170-199	200-239	110-129	130-159	150-199
High	>95th	≥200	≥240	≥130	160-189	200-499
Very high	*	*	*	*	≥190	≥500

¹Adapted from American Academy of Pediatrics Committee on Nutrition, "Cholesterol in Childhood," *Pediatrics*, 1998, 101(1 Pt 1):141-7.

²American Academy of Pediatrics Committee on Nutrition, "Lipid Screening and Cardiovascular Health in Childhood," *Pediatrics*, 2008, 122:(1)198-208 and "Third Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III)," May 2001, www.nhlbi.nih.gov/guidelines/cholesterol.

*Lack of specific type of classification in either pediatric or adult recommendations.

Serum Lipid Concentrations by Age and Gender

	Males (mg/dL)		Females (mg/dL)			
	5-9 y	10-14 y	15-19 y	5-9 y	10-14 y	15-19 y
Total Cholesterol						
50th percentile	153	161	152	164	159	157
75th percentile	168	173	168	177	171	176
90th percentile	183	191	183	189	191	198
95th percentile	186	201	191	197	205	208
Triglycerides						
50th percentile	48	58	68	57	68	64
75th percentile	58	74	88	74	85	85
90th percentile	70	94	125	103	104	112
95th percentile	85	111	143	120	120	126
LDL-C						
50th percentile	90	94	93	98	94	93
75th percentile	103	109	109	115	110	110
90th percentile	117	123	123	125	126	129
95th percentile	129	133	130	140	136	137
HDL						
5th percentile	38	37	30	36	37	35
10th percentile	43	40	34	38	40	38
25th percentile	49	46	39	48	45	43
50th percentile	55	55	46	52	52	51

Adapted from American Academy of Pediatrics Committee on Nutrition, "Lipid Screening and Cardiovascular Health in Childhood," *Pediatrics*, 2008, 122:(1)198-208.

Thyroid Function Tests

T ₄ (thyroxine)	1-7 d	10.1-20.9 mcg/dL
	8-14 d	9.8-16.6 mcg/dL
	1 mo to 1 y	5.5-16.0 mcg/dL
	>1 y	4.0-12.0 mcg/dL
FTI	1-3 d	9.3-26.6
	1-4 wk	7.6-20.8
	1-4 mo	7.4-17.9

	4-12 mo	5.1-14.5
	1-6 y	5.7-13.3
	>6 y	4.8-14.0
T ₃	Newborns	100-470 ng/dL
	1-5 y	100-260 ng/dL
	5-10 y	90-240 ng/dL
	10 y to Adult	70-210 ng/dL
T ₃ uptake		35%-45%
TSH	Cord	3-22 micro international units/mL
	1-3 d	<40 micro international units/mL
	3-7 d	<25 micro international units/mL
	>7 d	0-10 micro international units/mL

Hematology Values

Age	Hgb (g/dL)	Hct (%)	RBC (mill/mm ³)	RDW	MCV (fL)	MCH (pg)	MCHC (%)	PLTS (x 10 ³ /mm ³)
0-3 d	15.0-20.0	45-61	4.0-5.9	<18	95-115	31-37	29-37	250-450
1-2 wk	12.5-18.5	39-57	3.6-5.5	<17	86-110	28-36	28-38	250-450
1-6 mo	10.0-13.0	29-42	3.1-4.3	<16.5	74-96	25-35	30-36	300-700
7 mo to 2 y	10.5-13.0	33-38	3.7-4.9	<16	70-84	23-30	31-37	250-600
2-5 y	11.5-13.0	34-39	3.9-5.0	<15	75-87	24-30	31-37	250-550
5-8 y	11.5-14.5	35-42	4.0-4.9	<15	77-95	25-33	31-37	250-550
13-18 y	12.0-15.2	36-47	4.5-5.1	<14.5	78-96	25-35	31-37	150-450
Adult male	13.5-16.5	41-50	4.5-5.5	<14.5	80-100	26-34	31-37	150-450
Adult female	12.0-15.0	36-44	4.0-4.9	<14.5	80-100	26-34	31-37	150-450

WBC and Diff

Age	WBC (x 10 ³ /mm ³)	Segs	Bands	Lymphs	Monos	Eosinophils	Basophils	Atypical Lymphs	No. of NRBCs
0-3 d	9.0-35.0	32-62	10-18	19-29	5-7	0-2	0-1	0-8	0-2
1-2 wk	5.0-20.0	14-34	6-14	36-45	6-10	0-2	0-1	0-8	0
1-6 mo	6.0-17.5	13-33	4-12	41-71	4-7	0-3	0-1	0-8	0
7 mo to 2 y	6.0-17.0	15-35	5-11	45-76	3-6	0-3	0-1	0-8	0
2-5 y	5.5-15.5	23-	5-11	35-65	3-6	0-3	0-1	0-8	0

		45							
5-8 y	5.0-14.5	32-54	5-11	28-48	3-6	0-3	0-1	0-8	0
13-18 y	4.5-13.0	34-64	5-11	25-45	3-6	0-3	0-1	0-8	0
Adults	4.5-11.0	35-66	5-11	24-44	3-6	0-3	0-1	0-8	0

Segs = segmented neutrophils.

Bands = band neutrophils.

Lymphs = lymphocytes.

Monos = monocytes.

Erythrocyte Sedimentation Rates and Reticulocyte Counts

Sedimentation rate, Westergren	Children	0-20 mm/hour
	Adult male	0-15 mm/hour
	Adult female	0-20 mm/hour
Sedimentation rate, Wintrobe	Children	0-13 mm/hour
	Adult male	0-10 mm/hour
	Adult female	0-15 mm/hour
Reticulocyte count	Newborns	2%-6%
	1-6 mo	0%-2.8%
	Adults	0.5%-1.5%

Cerebrospinal Fluid Values, Normal

Cell count		% PMNs
Preterm mean	9 (0-25.4 WBC/mm ³)	57%
Term mean	8.2 (0-22.4 WBC/mm ³)	61%
>1 mo	0.7	0
Glucose		
Preterm	24-63 mg/dL	mean 50
Term	34-119 mg/dL	mean 52
Children	40-80 mg/dL	
CSF glucose/blood glucose		
Preterm	55-105%	
Term	44-128%	
Children	50%	
Lactic acid dehydrogenase	5-30 units/mL	mean 20 units/mL

Myelin basic protein	<4 ng/mL	
Pressure: Initial LP (mm H ₂ O)		
Newborns	80-110 (<110)	
Infants/children	<200 (lateral recumbent position)	
Respiratory movements	5-10	
Protein		
Preterm	65-150 mg/dL	mean 115
Term	20-170 mg/dL	mean 90
Children		
Ventricular	5-15 mg/dL	
Cisternal	5-25 mg/dL	
Lumbar	5-40 mg/dL	