Reference Values For Hematological And Serum Biochemical

	Free-ranging		Captive	
Parameter (units)	Mean (±SD)	Range	Mean (±SD)	Reference Range
Total Cholesterol (mmol/l)	4.13 (±1.20) [6]	2.8–6.2	4.14 (±1.3)	1.7–7.3
Triglycerides (mmol/l)	0.50 (±0.17) [6]	0.3–0.7	0.63 (±0.21)	0.49–0.88
HDL-Cholesterol (mmol/l)	2.02 (±0.88) [6]	0.9–3.5	N/A	N/A
LDL-Cholesterol (mmol/l)	1.87 (±0.86) [6]	1–2.9	N/A	N/A
Total Chol./HDL-Chol. Ratio	2.28 (±1.10) [6]	1.7–4.5	N/A	N/A
Total Bilirubin (umol/l)	2.27 (±0.88) [6]	1.7–3.4	5 (±2)	2–10
AST (U/L)	269 (±141.86) [6]	94–461	46 (±22)	16–106
ALT (U/L)	121 (±43.43) [6]	76–179	51 (±26)	20–95
AP (U/L)	99.80 (±211.98) [6]	5–479	38 (±24)	9–77
GGT (U/l)	4.60 (±1.34) [6]	4–7	2 (±2)	0–3
Na (mmol/l)	149 (±4.86) [6]	140–153	153 (±3)	148–159
K (mmol/l)	4.28 (±0.44) [6]	3.8–5.1	4.2 (±0.6)	3.4–5.3
Cl (mmol/l)	117.67 (±3.50) [6]	115–123	118 (±4)	112–126
Urea (mmol/l)	13 (±4.46) [6]	8.7–20.2	12.14 (±3.92)	7.85–20.81
Crea (umol/l)	92.40 (±10.78) [6]	79.2–105.6	124 (±27)	80–159
Ca (mmol/l)	2.05 (±0.43) [6]	1.2–2.3	2.50 (±0.28)	2.05–2.93
P (mmol/l)	1.82 (±0.33) [6]	1.5–2.2	1.62 (±0.68)	0.48–2.84
PCV (%)	31 (±0.06) [4]	27–40	46	30–55
WBC (10^3/µl)	12.07 (±5.35) [4]	4.8–15.9	9.0	6.9–15.2

[a] Values reported as mean, standard deviation in round brackets, sample size in square brackets. [b] Values for serum biochemistry reported by Teare [2002]; values for PCV and WBC reported by Salakij *et al.* (2010). N/A: Not available

Reference values for hematological and serum biochemical tests are crucial components of medical diagnostics and patient management. These values serve as benchmarks against which individual test results can be compared, helping healthcare professionals identify potential health issues or diseases. Understanding these reference ranges is essential for interpreting lab results accurately, guiding treatment decisions, and monitoring disease progression or response to therapy.

What are Hematological Tests?

Hematological tests analyze components of blood to assess overall health, diagnose conditions, and monitor diseases. Common hematological tests include:

- Complete Blood Count (CBC)
- Hemoglobin and Hematocrit Levels
- White Blood Cell Count (WBC)
- Platelet Count

Each of these tests measures specific elements in the blood and provides

valuable insights into a patient’s health status.

Complete Blood Count (CBC)

A CBC is one of the most commonly ordered tests in medical settings. It evaluates various components of blood, including:

- Red Blood Cells (RBC)
- White Blood Cells (WBC)
- Hemoglobin (Hgb)
- Hematocrit (Hct)
- Mean Corpuscular Volume (MCV)
- Mean Corpuscular Hemoglobin (MCH)
- Mean Corpuscular Hemoglobin Concentration (MCHC)
- Platelet Count

The reference values for a CBC can vary by age, sex, and laboratory standards, but typical ranges include:

- RBC:
- Males: 4.7 to 6.1 million cells/µL
- Females: 4.2 to 5.4 million cells/µL

- Hemoglobin:
- Males: 13.8 to 17.2 g/dL
- Females: 12.1 to 15.1 g/dL

- Hematocrit:
- Males: 40.7% to 50.3%
- Females: 36.1% to 44.3%

- WBC: 4,500 to 11,000 cells/µL

- Platelet Count: 150,000 to 450,000 platelets/µL

Serum Biochemical Tests

Serum biochemical tests assess various substances in the blood, providing insight into organ function and metabolic status. These tests often measure:

- Electrolytes (Sodium, Potassium, Chloride)
- Enzymes (Alanine Aminotransferase, Aspartate Aminotransferase)
- Proteins (Albumin, Total Protein)
- Glucose Levels
- Lipid Profiles (Cholesterol, Triglycerides)

Reference values for serum biochemical tests are typically established by laboratories and can differ based on methodology. However, standard ranges are generally accepted.

Electrolyte Levels

Electrolytes are essential for various bodily functions, including nerve signaling and muscle contraction. Common reference ranges include:

- Sodium: 135 to 145 mEq/L
- Potassium: 3.5 to 5.0 mEq/L
- Chloride: 98 to 106 mEq/L

Enzyme Levels

Certain enzymes in the blood can indicate organ health, particularly liver and heart function. Reference values for significant enzymes include:

- Alanine Aminotransferase (ALT):
- Males: 10 to 40 U/L
- Females: 7 to 35 U/L

- Aspartate Aminotransferase (AST):
- Males: 14 to 20 U/L
- Females: 10 to 36 U/L

Proteins

Measuring protein levels in the blood can provide clues about nutritional status and organ function. Reference values include:

- Total Protein: 6.0 to 8.3 g/dL
- Albumin: 3.5 to 5.0 g/dL

Glucose Levels

Blood glucose levels are critical for diagnosing and managing diabetes. Normal fasting glucose levels are typically:

- Fasting Glucose: 70 to 99 mg/dL
- Postprandial Glucose (2 hours after eating): less than 140 mg/dL

Lipid Profiles

Lipid profiles assess cholesterol and triglycerides, important indicators of cardiovascular health. Standard reference ranges include:

- Total Cholesterol: less than 200 mg/dL
- LDL (Low-Density Lipoprotein): less than 100 mg/dL
- HDL (High-Density Lipoprotein): 40 mg/dL or higher for males, 50 mg/dL or higher for females
- Triglycerides: less than 150 mg/dL

Factors Influencing Reference Values

Several factors can influence hematological and serum biochemical reference values, leading to variations in results. These factors include:

- Age: Different age groups may have different normal ranges.
- Sex: Some values may differ between males and females.
- Ethnicity: Genetic variations can lead to differences in reference values.
- Physiological State: Pregnancy, hydration status, and recent food intake can impact test results.
- Lab Methodology: Different laboratories may use various techniques and equipment, affecting the reference ranges.

Importance of Understanding Reference Values

Understanding reference values for hematological and serum biochemical tests is essential for:

- Accurate Diagnosis: Helps healthcare providers identify conditions based on abnormal test results.
- Monitoring Treatment: Enables tracking of disease progression and response to treatment.
- Preventive Care: Identifying risk factors early can lead to preventive interventions.
- Patient Education: Educating patients about their lab results fosters better health management.

Conclusion

In summary, reference values for hematological and serum biochemical tests are vital tools for diagnosing and managing health conditions. By understanding these reference ranges and the factors that influence them, healthcare professionals can provide more effective care to their patients. Accurate interpretation of lab results leads to better health outcomes, emphasizing the importance of continuous education and awareness in the medical field.

Frequently Asked Questions

What are reference values for hematological tests?

Reference values for hematological tests are the established ranges of blood cell counts and characteristics that are considered normal for healthy individuals. These values help in diagnosing and monitoring diseases.

How are reference values for serum biochemical tests determined?

Reference values for serum biochemical tests are determined through population studies, using samples from healthy individuals to establish normal ranges for various substances in the blood, such as electrolytes, enzymes, and hormones.

Why are reference values important in clinical practice?

Reference values are important because they provide a baseline for interpreting test results, helping healthcare providers to distinguish between normal and abnormal findings, which is crucial for diagnosis and treatment.

What factors can affect hematological reference values?

Factors that can affect hematological reference values include age, sex, race, hydration status, altitude, and underlying health conditions. These variables can lead to variations in blood cell counts and characteristics.

What are common biochemical markers measured in serum tests?

Common biochemical markers measured in serum tests include glucose, cholesterol, liver enzymes (ALT, AST), kidney function tests (creatinine, BUN), electrolytes (sodium, potassium), and proteins (albumin, total protein).

How often should reference values for hematological and biochemical tests be updated?

Reference values should be periodically updated based on new research, changes in population health, and advances in testing technology. Regular reviews help ensure that the values remain relevant and accurate.

What is the impact of medications on serum biochemical reference values?

Medications can significantly impact serum biochemical reference values by altering metabolic processes, enzyme activity, or electrolyte balance. It's essential for healthcare providers to consider a patient's medication history when interpreting test results.

Are reference values the same for all laboratories?

No, reference values may vary between laboratories due to differences in equipment, techniques, and population demographics. Each laboratory typically establishes its own reference ranges based on its specific testing methods.

What role does ethnicity play in determining reference values?

Ethnicity can play a role in determining reference values as genetic and environmental factors can influence physiological parameters. Some studies

suggest that specific ethnic groups may have different normal ranges for certain hematological and biochemical markers.

What is the significance of abnormal hematological and biochemical values?

Abnormal hematological and biochemical values can indicate underlying health issues, infections, organ dysfunction, or metabolic disorders. They serve as critical indicators for further diagnostic evaluation and treatment planning.

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