Evaluation of Lipid Parameters for Hyperlipidemia

The National Cholesterol Education Program (NCEP) has encouraged each American adult to know his/her cholesterol "number". NCEP guidelines for accuracy and precision are met by the WellSpan laboratories' testing methods for cholesterol: accuracy within ±3% and imprecision less than ±3%. Initial classification of patients into risk categories is based on measurement of serum total cholesterol and high-density lipoprotein cholesterol (HDL) cholesterol. The recommended specimen for initial classification is serum or plasma without any requirement for patient preparation or fasting[1]. Follow-up testing may include a complete lipid profile containing serum total cholesterol, HDL cholesterol and triglycerides. However, follow-up testing requires that the patient be fasting for a period of 10-14 hours because triglyceride concentrations are affected by dietary lipid intake and by extended fasting (i.e. >48 hours) which causes mobilization of endogenous triglycerides from fat depot storage. If the patient has had a recent illness or surgery, the lipid results may be altered; lipid profile testing is not recommended for hospitalized patients. Lipid profiles are to be repeated at an interval not to exceed five years in a normolipidemic adult with no additional cardiovascular risk factors.

Current NCEP guidelines released in 2001, have been modified from previous recommendations to focus on lowering LDL cholesterol, raising the cut-point for low HDL cholesterol, and incorporating new triglyceride levels into treatment strategies. A metabolic syndrome is identified as a secondary target of risk-reduction therapy and persons with diabetes without previous CHD are raised to an equivalent risk level of CHD.

The National Cholesterol Education Program (NCEP) has recommended that individuals be classified for risk of coronary heart disease on the basis of Framingham 10 year CV risk calculation and their LDL cholesterol levels.

Risk Category	LDL Cholesterol Goal
High risk: CHD or risk equivalents (10-year risk >20%)	<100 mg/dL
Moderate high risk: 2+ risk factors (10-year risk 10-20%)	<130 mg/dL
Moderate risk: 2+ risk factors (10-year risk <10%)	<130 mg/dL
Lower risk: 0-1 risk factors	<160 mg/dL

Emphasis is placed on CHD risk status as a guide to the type and intensity of cholesterol-lowering therapy including a recommendation to delay drug therapy in most young men and pre-menopausal women with high LDL cholesterol levels who are otherwise at low risk for CHD. Because the laboratory does not obtain sufficient information to apply the appropriate NCEP range of LDL values for individual patients, expected interval information for LDL cholesterol is not included in laboratory reports.

HDL cholesterol is recognized as a CHD risk factor independent of LDL cholesterol. The updated NCEP guidelines raise the cutpoint for low HDL cholesterol from <35 mg/dL to <40 mg/dL. Alternatively, HDL cholesterol ≥60 mg/dL is considered a negative risk factor, serving to remove one risk factor from the total count.

Elevated serum triglycerides are most often observed in persons with metabolic syndrome or diabetes, although secondary or genetic factors can heighten triglyceride levels. ATP III adopts the following classification of serum triglycerides:

- Normal triglycerides: <150 mg/dL
- Borderline triglycerides: 150-199 mg/dL
- High triglycerides: 200-499 mg/dL
- Very high triglycerides: ≥500 mg/dL

NOTE: When the triglyceride concentration is greater than 400 mg/dL, the calculated LDL-cholesterol is artifactually low and should be considered to be unreliable. In this case, a measured LDL cholesterol is reflexively performed.

LDL cholesterol is calculated using the following formula:

$$\text{LDL Cholesterol} = \text{Total Cholesterol} - \left(\frac{\text{Triglycerides}}{5} + \text{HDL Cholesterol}\right)$$

An executive summary of the panels finding can be found in the Journal of the American Medical Association (JAMA 2001;285:2486-2497) or the full report with complete risk calculator can be obtained on online at www.nhlbi.nih.gov.

References:

1 Executive Summary of the Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). JAMA 2001;285:2486-2497.

2 Grundy, SM, et al. Implications of Recent Clinical Trials for the National Cholesterol Education Program Adult Treatment Panel III Guidelines. Circulation. 2004;110:227-239.

Blood is obtained in a gold top gel tube when testing for lipid profiles. A fasting period of 10 to 14 hours is suggested before the sample is obtained for analysis. Lipoprotein lipase activity should be in a basal state by that time.

Lipid testing is best performed on an outpatient basis when the patient is in a relatively homeostatic situation. Stress situations such as hospitalization, acute illness, I.V. infusions, and various medications can cause spurious interpretations of lipid profiles.

Expected Pediatric Lipid Ranges (5th-90th Percentiles)

AGE	TRIGLYCERIDES[1,2]		CHOLESTEROL[1,3]		HDL CHOLESTEROL[4,5]	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
0-4	29-89	34-94	110-193	108-196	-	-
5-9	29-105	32-110	123-203	120-205	39-76	37-75
10-14	35-134	38-138	114-195	120-198	38-76	38-72
15-19	44-172	40-135	114-196	123-212	31-65	36-76

1 Appendix: Lipid and Lipoprotein Values In: Rifai N, Warnick GR, eds Lipid and Lipoprotein Risk Factors, Washington: AACC Press 1991:139

2 Upper limits of normal for triglycerides follow the recommendations of the NIH Consensus

Conference on Hypertriglyceridemia. JAMA 1984; 251:1196-1200.

3 The NCEP has classified cholesterol results in adults 20 years of age and older as: Less than 200 mg/dL is desirable; 200-239 mg/dL is borderline high risk; 240 mg/dL or greater is high risk. Arch Intern Med 1/88;148:36.

4 Report of the expert panel on blood cholesterol levels in children and adolescents, U.S.Dept.of Health and Human Services, Public Health Service, National Institutes of Health, NIH Publication N 91-2732 September 1991.

5 Summary of the Second Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel II) JAMA 1993; 269:3 015-23