INSTITUTE OF NUTRITIONAL ENDOCRINOLOGY

Blood Chemistry: Lipids and Cardiovascular System

Dr. Ritamarie Loscalzo

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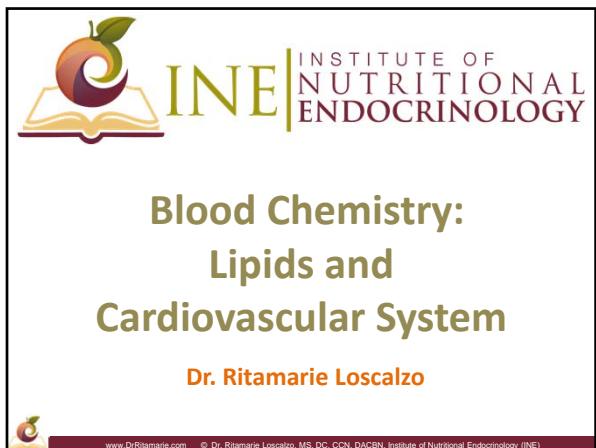
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Cardiovascular System

- ✓ Cholesterol
- ✓ Triglycerides (1/2 of cholesterol, equal to HDL)
- ✓ HDL
- ✓ LDL
- ✓ VLDL
- ✓ CRP
- ✓ Homocysteine
- ✓ Apolipoprotein A and B

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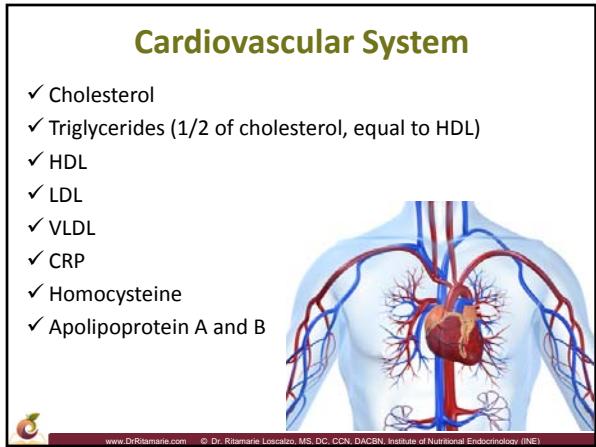
Cardiovascular Markers

- ✓ **Cholesterol, Total**
- ✓ **HDL:** High-density lipoproteins - take cholesterol away from cells and transport it back to the liver for removal - "good" cholesterol
- ✓ **LDL:** Low-density lipoproteins - deposit cholesterol on the artery walls - "bad" cholesterol
- ✓ **Cholesterol/HDL Ratio:** Relative risk for cardiovascular disease
- ✓ **Triglycerides:** Fat in the blood responsible for providing energy to the cells of the body; sugar raises them
- ✓ **CRP-hs:** Indicator of endothelial inflammation
- ✓ **Homocysteine:** Part of methylation cycle; increased cardiac risk when high
- ✓ **CPK:** Creatine phosphokinase – indicates damage to cardiac tissue

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C-Reactive Protein Highly Sensitive

- ✓ CRP Increases during systemic inflammation.
- ✓ Associated with lower survival rates in patients with unstable angina and heart attack.
- ✓ High levels of hs-CRP may increase the risk that an artery will reclose after it's been opened by balloon angioplasty.
- ✓ High levels of hs-CRP predict prognosis and recurrent events in patients with stroke or peripheral arterial disease.
- ✓ High hs-CRP levels increase risk heart attack; upper third has double the risk of lower.
- ✓ Studies found association between sudden cardiac death, peripheral arterial disease, and hs-CRP.

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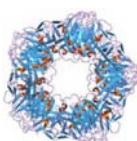
Homocysteine

- ✓ High homocysteine levels in the blood can damage the lining of the arteries.
- ✓ High levels a result of low B6, B12 and folate.
- ✓ Fruits and vegetables, especially leafy green vegetables, can lower homocysteine.
- ✓ Genetic predispositions: methylation defects
- ✓ Retest in 8 weeks.
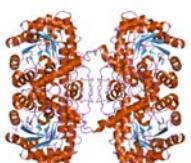
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Creatine PhosphoKinase (CPK)

✓ Enzyme found mainly in the heart, brain, and skeletal muscle

✓ Elevated when significant damage to cardiac tissue – i.e. myocardial infarct (heart attack)

✓ Elevated after intense exercise – breakdown of skeletal muscle

✓ Medications can elevate

✓ Isoenzymes
  ➢ CPK-1 (CPK-BB) - mostly in the brain and lungs
  ➢ CPK-2 (CPK-MB) - mostly in the heart
  ➢ CPK-3 (CPK-MM) - mostly in skeletal muscle
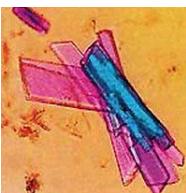
Conditions That Can Contribute to Lipid Abnormalities

✓ Thyroid
✓ Adrenal stress
✓ Insulin resistance
✓ Diabetes
✓ Fatty liver
✓ Biliary stasis
✓ Poor fat metabolism
✓ Hypoglycemia
✓ Nutrient deficiencies
✓ Multiple sclerosis

Low Cholesterol

✓ Heavy metal and chemical overload

✓ Liver/biliary congestion (Gallbladder dysfunction)

✓ Excessive low fat intake

✓ Hyperthyroid

✓ Autoimmune process

VAP (Vertical Analyzer Panel)

http://www.drritamarie.com/go/VAPCholesterolTest

Cholesterol Measurements	The VAP® Test	Routine Test
LDL	LDL is directly measured	LDL is a calculation
HDL	♥	•
Triglyceride	♥	•
Total Cholesterol	♥	•
VLDL	♥	
Non-HDL	♥	
apoB 100	♥	
Lp(a)	♥	
IDL	♥	
LDL-R	♥	
LDL-R Subclass Pattern	♥	
Remnant Lipoproteins	♥	
Metabolic Syndrome	♥	
HDL2	♥	
HDL3	♥	

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VAP Markers - 1

| LDL-Cholesterol-Direct	a direct measure of your Low Density Lipoprotein cholesterol. LDL is considered to be your "bad" or "heart disease" cholesterol.
Total HDL-Cholesterol-Direct	a direct measure of your High Density Lipoprotein cholesterol. HDL is considered to be the "good" or "protective" type of cholesterol.
Total VLDL-Cholesterol-Direct	a direct measure of your Very Low Density Lipoprotein cholesterol, a major carrier of energy rich molecules called "triglycerides." excess VLDL increases risk for heart disease and diabetes.
SUM Total Cholesterol	the sum of your HDL + LDL + VLDL. As a sum total of three different cholesterol measurements, SUM Total Cholesterol alone should not be used to predict the risk of heart disease or stroke.
Triglycerides-Direct	a direct measure of energy rich Triglyceride molecules used by the body. Elevated triglycerides are a risk factor which can lead to the formation of "heart disease" lipoproteins.
Total Non-HDL Cholesterol	the sum of your LDL + VLDL; the higher the number, the greater the risk of heart disease.

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VAP Markers - 2

Total apoB100	a measurement of apolipoprotein B100, which helps form, carry and deliver "bad" cholesterol particles to cells. Knowing your apoB100 value greatly increases the VAP's risk predictive value.
Lp(a) Cholesterol	a measurement of "lipoprotein a" cholesterol in your body. A highly inherited risk factor for heart disease, Lp(a) does not respond to traditional LDL-lowering drugs.
IDL Cholesterol	a measurement of your Intermediate Density Lipoprotein cholesterol. A strongly inherited risk factor for heart disease, it is elevated in patients with a family history of diabetes.
LDL-R (Real)-C	the "Real" cholesterol circulating in your body; it is a component of Total LDL Cholesterol.
Sum Total LDL-C	a sum of Lp(a) + IDL + Real LDL.
Real-LDL Size Pattern	refers to LDL cholesterol's density. A description of type rather than amount of cholesterol, Real-LDL Size Pattern can be A, A/B or B. Pattern A is the safest density, as the human body can rid itself more easily of excess Pattern A LDL. Pattern B LDL carries the highest threat; it is much more susceptible to oxidation (a primary cause of atherosclerosis) and remains in the bloodstream longer than Pattern A LDL. The longer you are exposed to bad cholesterol groups, the greater your risk for disease. Treatments for Pattern B LDL and elevated LDL cholesterol are different, so both measurements must be known for effective treatment. Pattern A/B patients have a mix of both patterns and should work toward a Pattern A LDL value.

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VAP Markers - 3

Metabolic Syndrome	Consider Insulin Resistance/Metabolic Syndrome: If this value is marked as being a risk factor, it is because your profile indicates the combined presence of Pattern B LDL, low HDL/HDL2 and elevated triglycerides, creating an elevated risk for diabetes due to insulin resistance.
HDL-2	the protective portion of HDL. Low HDL2 is a risk factor for Coronary Artery Disease (CAD), even in patients with normal cholesterol.
HDL-3	important but does not play as great a protective role in protecting against CAD as does HDL-2.
VLDL-3	a triglyceride-rich lipid which can represent an independent risk factor for heart disease.

Vap Action Plan

Diagnosis	Therapeutic Lifestyle Changes
Elevated LDL-R	Low Fat Diet, Exercise
Elevated Lp(a)	No Effect
Elevated IDL	Low Carbohydrate Diet, Exercise
Small Dense LDL Pattern B, A/B	Low Carbohydrate Diet, Reduce Sugar Intake, Exercise
Remnant Lipoproteins	Reduce Carbohydrates
Low HDL$_2$	Aerobic Exercise
VLDL and Elevated Triglycerides	Low Carbohydrate Diet, Reduce Sugar Intake, Exercise
Metabolic Syndrome	No Sugar, 35% Calories as Fat, Exercise

Nutrition and Lifestyle Based Treatment Recommendations

✓Smoking cessation
✓Weight loss
✓Exercise
✓Omega-3 fatty acids (EPA/DHA)
✓Red yeast rice
✓Niacin
✓Flaxseed oil
✓Dietary fiber
✓Plant sterols

Lipids/Fats

CATEGORIES	Units	PATHOLOGICAL RANGE		FUNCTIONAL RANGE		CURRENT 01/20/10
		Min	Max	Min	Max	
Cholesterol, total	mg/dl	0.0	200.0	150.0	200.0	186
Triglycerides	mg/dL	35.0	160.0	75.0	100.0	73
HDL Cholesterol	mg/dl	40.0	-	55.0	-	83
LDL Cholesterol Calc	mg/dl	0.0	130.0	0.0	120.0	88
T. Cholesterol/HDL Ratio	-	0.0	3.7	0.0	3.1	2.2

❖ Normal Findings
❖ Triglycerides fall below 75 with lower fat diet and vegetarian diet

Follow-ups:
❖ If high LDLs, High total cholesterol, consider follow-up with a panel called VAP that goes into the details, as well as Homocysteine, C-reactive Protein cardio specific

CATEGORIES	Units	PATHOLOGICAL RANGE		FUNCTIONAL RANGE	
		Min	Max	Min	Max
Lab Corp Markers					
Homocysteine (Female)	µmol/L			4.0	10.0
Homocysteine (Male)	µmol/L			4.0	12.0
Sedimentation Rate	mm/hr			0.0	20.0
C-Reactive Protein HS (CRP-hs)	mg/L			0.0	3.0
Apolipoprotein A	mg/dL	110.0	162.0	110.0	162.0
Apolipoprotein B	mg/dL	52.0	109.0	52.0	109.0

Things That Damage Your Cardiovascular System

✓ Sugar and high fructose corn syrup
✓ Processed grains
✓ Fruit juices
✓ Inflammatory foods
✓ Alcohol
✓ Trans and heated fats (mayonnaise, margarine, hydrogenated fats)
✓ Caffeine

Foods & Nutrients That Support the Cardiovascular System

- ✓ B Vitamins, especially B1, B2, B3 (Niacin), B12, folate
- ✓ Vitamin C
- ✓ Vitamin E
- ✓ CoQ10
- ✓ EPA and DHA
- ✓ Hawthorne berry
- ✓ Minerals, especially magnesium and zinc
- ✓ Arginine
- ✓ Natto - Nattokinase
- ✓ Serratopepidase
- ✓ Garlic
- ✓ Ginkgo
- ✓ Turmeric

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Heart-Friendly Diet and Lifestyle

- ✓ Whole foods, antioxidant-rich diet high in greens, fruits, and vegetables
- ✓ Fat balance: omega-3s daily (flax, hemp, chia, purslane, algae) and avoiding heated and processed fats
- ✓ Sugar balance
- ✓ Be wary of medications
- ✓ Manage stress
- ✓ Exercise

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