Therapeutic Lifestyle Changes
Primary Learning Objectives

• Describe effective diet and lifestyle strategies for long-term management of obesity and dyslipidemia
• Describe the association of specific dietary components and patterns with both an increased risk, and a reduced risk, for cardiovascular disease events.
• Compose a clinical lifestyle care plan for reducing CVD risk in patients with dyslipidemia
Background

- Data from INTERHEART, MRFIT, and the NHS suggest that ≥80% of cardiovascular events can be attributed to potentially modifiable or preventable risk factors\textsuperscript{1-3}

INTERHEART = A Study Of Risk Factors For First Myocardial Infarction In 52 Countries And Over 27,000 Subjects,
MRFIT = Multiple Risk Factor Intervention Trial,
NHS = Nurses Health Study

Presentation Outline


Part 2: Impact of Dietary Patterns and Macronutrients on Lipids

Part 3: Impact of Exercise on Lipids

Part 4: Practical Approach to Weight Loss

Part 5: Effect of Nutritional Supplements on Lipids
2013 AHA/ACC Guideline on Lifestyle Management to Reduce Cardiovascular Risk
A Report from the ACC/AHA Task Force on Practice Guidelines

Endorsed by the American Association of Cardiovascular and Pulmonary Rehabilitation, American Pharmacists Association, American Society for Nutrition, American Society for Preventive Cardiology, American Society of Hypertension, Association of Black Cardiologists, Preventive Cardiovascular Nurses Association, and WomenHeart: The National Coalition for Women with Heart Disease

NLA Recommendations for Patient-Centered Management of Dyslipidemia

Part 2
2013 ACC/AHA Lifestyle Guideline: Dietary Pattern and Lipids

• Advise adults who would benefit from LDL-C lowering to:
  – Consume a dietary pattern that emphasizes intake of vegetables, fruits, and whole grains, includes low-fat dairy products, poultry, fish, legumes, non-tropical vegetable oils and nuts; and limits intake of sweets, sugar sweetened beverages, and red meats (IA)
  – Aim for dietary pattern that achieves 5-6% of calories from saturated fat (IA)
  – Reduce percent of calories from saturated fat (IA)
  – Reduce percent of calories from trans fat (IA)

2013 ACC/AHA Lifestyle Guideline: Dietary Pattern and BP

• Advise adults who would benefit from BP lowering to:
  – Consume a dietary pattern that emphasizes intake of vegetables, fruits, and whole grains, includes low-fat dairy products, poultry, fish, legumes, non-tropical vegetable oils and nuts; and limits intake of sweets, sugar sweetened beverages, and red meats (IA)
  – Lower sodium intake (IA)
  – Consume no more than 2400 mg of sodium/day (IIaB)
  – Combine the DASH dietary pattern with lower sodium intake (IA)
2013 ACC/AHA Lifestyle Guideline: Physical Activity

• For Lipids (to reduce LDL-C and non-HDL-C) and BP
  – In general, advise adults to engage in aerobic physical activity to reduce LDL-C and non-HDL-C 3-4 sessions a week lasting on average 40 min per session and involving moderate to vigorous intensity (IIaA)
Part 2

The Impact of Dietary Patterns and Macronutrients on Lipids
2013 ACC/AHA Lifestyle Guideline: Dietary Pattern and Lipids

• Advise adults who would benefit from LDL-C lowering to:
  – Consume a dietary pattern that emphasizes intake of vegetables, fruits, and whole grains, includes low-fat dairy products, poultry, fish, legumes, non-tropical vegetable oils and nuts; and limits intake of sweets, sugar sweetened beverages, and red meats (IA)
  – Aim for dietary pattern that achieves 5-6% of calories from saturated fat (IA)
  – Reduce percent of calories from saturated fat (IA)
  – Reduce percent of calories from trans fat (IA)
Components of the DASH Diet (based on 2000 kcal daily)

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Daily Servings</th>
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</thead>
<tbody>
<tr>
<td>Grains (whole grains recommended)</td>
<td>6-8 [½ cup servings]</td>
</tr>
<tr>
<td>Vegetables</td>
<td>4-5</td>
</tr>
<tr>
<td>Fruits</td>
<td>4-5</td>
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<tr>
<td>Fat-Free or Low-Fat Dairy</td>
<td>2-3</td>
</tr>
<tr>
<td>Lean Meat, Poultry, and Fish</td>
<td>6 or less [1oz lean meat/fish or 1 egg]</td>
</tr>
<tr>
<td>Nuts, Seeds, and Legumes</td>
<td>4-5 weekly</td>
</tr>
<tr>
<td>Fats and Oils</td>
<td>2-3</td>
</tr>
<tr>
<td>Sweets and Added Sugars</td>
<td>5 or less weekly</td>
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</tbody>
</table>

DASH Diet and Lipids

• As compared to typical 1990’s American diet, DASH diet
  – Lowered LDL-C by 11 mg/dl
  – Lowered HDL-C by 4 mg/dl
  – Had no effect on triglycerides
  – Changes similar in all subgroups
  – Strength of Evidence: Low
DASH Diet Variations and Lipids

• Modifying DASH diet by replacing 10% of carbohydrates with same amount of protein
  – Lowered LDL-C an additional 3 mg/dl
  – Lowered HDL-C by an additional 1 mg/dl
  – Lowered triglycerides by 15 mg/dl

• Modifying DASH diet by replacing 10% of carbohydrates with same amount unsaturated fat
  – Led to no additional LDL lowering
  – Lowered HDL-C by an additional 1 mg/dl
  – Lowered triglycerides by 10 mg/dl

Mediterranean Diet: PREDIMED Trial

- 7447 Spanish men and women without h/o CVD with h/o either T2DM or at least 3 traditional risk factors
- Randomized to
  - 1) Med Diet + extra virgin olive oil
  - 2) Med Diet + nuts
  - 3) low fat diet
- Results – Med diets led to fewer CV events than low-fat diet with no difference in mortality
- Caveat – Subjects randomized to Med diets were given free provisions of olive oil or nuts

2013 ACC/AHA Lifestyle Guideline: Dietary Pattern and Lipids

• Advise adults who would benefit from LDL-C lowering to:
  – Consume a dietary pattern that emphasizes intake of vegetables, fruits, and whole grains, includes low-fat dairy products, poultry, fish, legumes, non-tropical vegetable oils and nuts; and limits intake of sweets, sugar sweetened beverages, and red meats (IA)
  – Aim for dietary pattern that achieves 5-6% of calories from saturated fat (IA)
  – Reduce percent of calories from saturated fat (IA)
  – Reduce percent of calories from trans fat (IA)
2015-2020 Dietary Guidelines for Americans

• Key recommendations:
  1. Follow a healthy eating pattern
  2. This pattern focuses on: vegetables, whole fruits, grains, fat-free/low fat diary, and protein (lean meat, seafood, poultry, eggs, nuts/seeds, soy)
  3. This pattern reduces saturated and trans fat, sugar and sodium
  4. Saturated fat < 10% of total calories
  5. Sugar < 10% of total calories
  6. Sodium < 2300 mg/day
  7. Specific dietary patterns examples given:
     Mediterranean and vegetarian
Dietary Education 101 for Patients

- CHOLESTEROL
  - Always in animals
  - Only in animals
  - Never in plants

2013 ACC/AHA Guidelines and 2015 Dietary Guidelines for Americans:

“There is insufficient evidence to determine whether lowering dietary cholesterol intake reduces LDL-C”
Dietary Education 101 for Patients

• FATS
  – Different types of fat affect blood cholesterol differently
  – All fats have same effect on weight
  – OIL = FAT (regardless of type)

Should We Concentrate on Amount of Total Fat or the Type of Fat?
Trans Fatty Acids (TFAs)

*Trans Fat* (i.e., *trans* fatty acids)

\[ \text{H} \quad -\text{C}=\text{C}- \quad \text{H} \]

Hydrogen atoms are on opposite sides of the chain of carbon atoms at the carbon-carbon double bond.

Adapted from http://www.cfsan.fda.gov/~dms/qatrans2.html#s1q2
TFAs

- Facts About TFA
  - More densely packed than the cis mono fatty acids
  - ~ 2-3 % of energy intake is TFA

- If TFA Are Consumed in High Amounts
  - ↑ LDL-C
  - ↓ HDL-C

- Major Sources of Dietary TFA
  - Baked goods (cookies, donuts, biscuits, pies)
  - Snack foods (crackers, chips)
  - Stick margarine, shortening (fries, fried foods)
Effect of Reducing TFAs on Lipids

In controlled feeding trials, for every 1% of energy from TFAs replaced by similar amount of

• MUFA
  • LDL-C lowered by 1.5 mg/dl
  • HDL-C raised by 0.4 mg/dl
  • Triglycerides lowered by 1.2 mg/dl

• PUFA
  • LDL-C lowered by 2.0 mg/dl
  • HDL-C raised by 0.5 mg/dl
  • Triglycerides lowered by 1.3 mg/dl

Level of Evidence: Moderate

### Types of Saturated Fat

- Lauric acid (12:0)
- Myristic acid (14:0)
- Palmitic acid (16:0)
- Stearic acid (18:0)*

*Effect is neutral as it is converted to monounsaturated fat in the body

Current intake of saturated fat in US  
= 11% of calories

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**Saturated Fat** (i.e., saturated fatty acid)  
**Unsaturated Fat** (i.e., unsaturated fatty acid)

<table>
<thead>
<tr>
<th>Saturated Fat</th>
<th>Unsaturated Fat</th>
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<tbody>
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<td>H H</td>
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</table>

**Carbon-Carbon**  
Single Bond  
Double Bond

[http://www.cfsan.fda.gov/~dms/qatrans2.html#s1q2](http://www.cfsan.fda.gov/~dms/qatrans2.html#s1q2)
Saturated Fat and Lipids

As compared to control diet, limiting saturated fat to 5-6% of calories
• Lowered LDL-C by 11-13 mg/dl without significant effect on other lipid parameters

(Strength of Evidence: High)
Mono-Unsaturated Fatty Acids (MUFAs)

- National dietary guidelines increasingly recommend MUFAs*
- Consumption of MUFA
  - Promotes healthy lipid profiles
  - Mediates blood pressure
  - Improves insulin sensitivity
  - Regulates glucose levels

* Enhancing MUFA intakes up to 25% of energy

Poly-Unsaturated Fatty Acids (PUFAs)

• Fatty acids that contain more than one double bond in their backbone
• Some omega 3 (alpha-linolenic acid) and omega 6 (linoleic acid) are ‘Essential’ in diet since mammals lack ability to add double bonds in fatty acids beyond carbon 9 and 10
Omega-3 Fatty Acids

- Named for Placement of the 1st Double Bond
  - Favorably affect platelet function
  - $\downarrow$ TG
  - Can $\uparrow$ LDL-C in combined hyperlipidemia
  - Associated with $\downarrow$ sudden death

- **Marine:**
  - Eicosapentaenoic Acid (EPA) C20:5
  - Docosahexaenoic Acid (DHA) C22:6

- **Plant:**
  - $\alpha$-Linolenic Acid (C18:3;N-3)
## Content of EPA + DHA (mg/3 oz serving) in 37 Commonly Consumed Types of Fish

<table>
<thead>
<tr>
<th>Fish Type</th>
<th>EPA + DHA (mg)</th>
</tr>
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<tbody>
<tr>
<td>Orange Roughy</td>
<td>26</td>
</tr>
<tr>
<td>Tilapia</td>
<td>115</td>
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<tr>
<td>Mahi-Mahi</td>
<td>118</td>
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<tr>
<td>Cod</td>
<td>134</td>
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<tr>
<td>Catfish (farmed)</td>
<td>151</td>
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<tr>
<td>Catfish (wild)</td>
<td>201</td>
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<tr>
<td>Lt. Chunk Tuna</td>
<td>230</td>
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<tr>
<td>Yellowfin Tuna</td>
<td>237</td>
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<tr>
<td>Clams</td>
<td>241</td>
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<tr>
<td>Mixed Shrimp</td>
<td>267</td>
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<tr>
<td>Skipjack Tuna</td>
<td>278</td>
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<tr>
<td>Scallops</td>
<td>310</td>
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<tr>
<td>Dungeness Crab</td>
<td>335</td>
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<tr>
<td>Walleye</td>
<td>338</td>
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<tr>
<td>King Crab</td>
<td>351</td>
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<tr>
<td>Oysters (farmed)</td>
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<tr>
<td>Halibut</td>
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<td>Blue Crab</td>
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<td>Flat Fish</td>
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<td>Pollock</td>
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<td>Sea Bass</td>
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<td>Swordfish</td>
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<td>Shark (raw)</td>
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<td>White Tuna</td>
<td>733</td>
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<td>Sardines</td>
<td>835</td>
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<td>Coho Salmon (wild)</td>
<td>900</td>
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<tr>
<td>Rainbow Trout (farmed)</td>
<td>981</td>
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<tr>
<td>Chum Salmon (canned)</td>
<td>999</td>
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<tr>
<td>Mackerel (canned)</td>
<td>1046</td>
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<tr>
<td>Sockeye Salmon (wild)</td>
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<tr>
<td>Coho Salmon (farmed)</td>
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<td>Pink Salmon (wild)</td>
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<td>Bluefin Tuna</td>
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<td>Atlantic Salmon (wild)</td>
<td>1564</td>
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<tr>
<td>Atlantic Salmon (farmed)</td>
<td>1825</td>
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</tbody>
</table>

Effect of Dietary MUFA and PUFA on Lipids

In controlled feeding trials for every 1% of energy from carbohydrates replaced by similar amount of

• MUFA
  • LDL-C lowered by 0.3 mg/dl
  • HDL-C raised by 0.3 mg/dl
  • Triglycerides lowered by 1.7 mg/dl

• PUFA
  • LDL-C lowered by 0.7 mg/dl
  • HDL-C raised by 0.2 mg/dl
  • Triglycerides lowered by 2.3 mg/dl

Level of Evidence: Moderate

NLA Lifestyle Therapies: Nutrition

• The National Lipid Association (NLA) Expert Panel supports a cardioprotective eating pattern for the management of dyslipidemia and overall cardiovascular health that includes *<7% of energy from saturated fat, with minimal intake of trans fatty acids* to lower levels of atherogenic cholesterol (low-density lipoprotein cholesterol [LDL-C] and non-high-density lipoprotein cholesterol [non-HDL-C]).

• The cardioprotective eating pattern should **limit cholesterol intake to <200 mg/day** to lower levels of atherogenic cholesterol (LDL-C and non-HDL-C).

• There are individuals who are hyper-responders to dietary cholesterol because of genetic or other reasons. For known or suspected hyper-responders, further reduction in dietary cholesterol beyond the <200 mg/day that is recommended as part of the cardioprotective eating pattern for the management of dyslipidemia may be considered. Consumption of very low intakes of dietary cholesterol (near 0 mg/day) may be helpful for such individuals.
NLA Lifestyle Therapies: Nutrition

• The NLA Expert Panel recommends any of the following **healthy dietary patterns, including an emphasis on a variety of plant foods and lean sources of protein** for managing dyslipidemia: Dietary Approaches to Stop Hypertension (DASH), United States Department of Agriculture (USDA) (healthy U.S.-style), American Heart Association (AHA), Mediterranean-style, and vegetarian/vegan. However, the dietary pattern should be individualized based on the patient’s specific dyslipidemia. Also, patients’ cultural and food preferences are important for guiding food selection to maximize dietary adherence. Nutritional counseling and follow-up/monitoring by a registered dietitian nutritionist is recommended whenever possible to individualize a patient’s dietary pattern. Nutrition therapy should be included in those with other medical conditions, including diabetes.

• **If alcohol is consumed as part of a healthy dietary pattern, this should be in moderation** (≤7 drinks per week for women and ≤14 drinks per week for men; consumed in a non-binge pattern). One drink is equivalent to 12 oz. beer, 5 oz. wine, or 1.5 oz. distilled spirits.
NLA Lifestyle Therapies: Nutrition

• **Dietary saturated fat may be partially replaced with unsaturated fats ( mono- and polyunsaturated fats),** as well as proteins, to reach a goal of <7% of energy from saturated fats. This can be achieved, in part, by incorporating foods high in unsaturated fats, such as liquid vegetable oils and vegetable oil spreads, nuts and seeds, as well as lean protein foods, such as legumes, seafood, lean meats, and non- or low-fat dairy products, into the diet as replacements for foods high in saturated fats.

• **Weight loss of 5-10% body weight is generally recommended for overweight or obese individuals** to lower atherogenic lipoprotein lipids and improve other atherosclerotic cardiovascular disease (ASCVD) risk factors. A variety of dietary approaches can be implemented for weight loss. Any dietary approach will result in weight loss if energy intake is reduced. An energy-reduced healthy dietary pattern that meets nutrient needs is recommended for patients who are overweight or obese. Several healthy dietary patterns, such as the Mediterranean-style, DASH, USDA, and vegetarian diets, can be tailored to personal and cultural food preferences and appropriate calorie needs for weight control.
NLA Lifestyle Therapies: Nutrition

• Eating patterns that contain a moderate quantity of carbohydrate, lower glycemic index and load, and higher protein, have been associated with modest benefits for weight loss and maintenance.

• **Plant sterols and stanols (~2 g/day)** are recommended for cholesterol lowering, as well as viscous fibers (5 to 10 g/day or even greater, if acceptable to the patient), as adjuncts to other lifestyle changes. However, individuals with phytosterolemia (sitosterolemia) should avoid foods that are fortified with stanols and sterols.

• **For patients with triglyceride (TG) levels ≥150 mg/dL,** lifestyle therapy is indicated, including weight loss, if overweight or obese, physical activity, and restriction of alcohol, and sugars and refined starches. Partial replacement of sugars and refined starches with a combination of unsaturated fats, proteins, and high-fiber foods may help to reduce TG and non-HDL-C concentrations.
NLA Lifestyle Therapies: Nutrition

- For patients with TG levels ≥1000 mg/dL (and selected patients with TG 500-999 mg/dL), a low-fat diet (<15% of energy) and alcohol abstinence are recommended initially to minimize chylomicronemia. In patients with hypertriglyceridemia and diabetes, dietary carbohydrate should not be substantially increased to avoid worsening glycemia when reducing fat intake. Medium-chain TG oil may be used as a source of energy that will not induce chylomicron production. For patients without lipoprotein lipase deficiency, dietary fat may be liberalized with monitoring of the TG response once the TG concentration is <500 mg/dL.

- Therapeutic dosages of eicosapentaenoic acid (EPA) + docosahexaenoic acid (DHA) for TG reduction are 2.0 to 4.0 g/day. Use of these dosages of long-chain omega-3 fatty acids for TG-lowering should be done only under the supervision of a qualified clinician. Clinicians are encouraged to educate patients on the importance of the amount of EPA + DHA in each capsule of dietary supplement or prescription products, and to take the appropriate number of capsules daily to achieve therapeutic levels. At present, prescription forms of EPA and EPA + DHA concentrates are only indicated for treatment of very high TG (≥500 mg/dL) to reduce the risk of pancreatitis.
NLA Lifestyle Therapies: Nutrition

• For primary and secondary prevention of ASCVD, consuming ≥2 servings/week of fish/seafood (preferably oily) is recommended. One serving is equal to 3.5 to 4 oz. and should ideally not be prepared using deep-frying.

• For patients with known ASCVD, suggestive, but not conclusive, evidence from randomized controlled trials is available for a benefit of long-chain omega-3 fatty acid supplementation at ~1 g/day EPA + DHA on cardiac mortality, but not non-fatal ASCVD events. EPA + DHA supplements may be considered for such patients, especially those who do not consume the recommended intakes of EPA + DHA from dietary sources.

• For patients with heart failure, 1 g/day of EPA + DHA is recommended as an adjunct to heart failure therapy.

• An alpha-linolenic acid intake of 0.6 to 1.2% of energy is recommended.
NLA Lifestyle Therapies: Nutrition

- Consumption of at least three 1-oz. equivalent servings per day of fiber-rich whole grains is recommended.

- Consumption of ≥4 servings/week (1 oz. per serving) of nuts (including the legume, peanuts) is recommended, because nut consumption has been consistently associated with reduced ASCVD risk. Nuts may be included in the diet as a protein food and as a source of healthy fat (predominantly unsaturated fatty acids).

- Soy protein foods are one source of plant protein, among others (e.g., nuts, legumes), that may be used as a substitute for protein foods high in saturated fat as part of a cardioprotective eating pattern.
Part 3

The Impact of Exercise on Lipids
Physical Activity (PA) in the United States

• PA is difficult to measure, therefore it is difficult to assess changes in the population over time

• According to recent estimates:
  – Although 26.2% of adults in the USA report being physically active (>30 min) on most days of the week\(^1\)
  – When PA was measured by a device that detects movement, only 3-5% of adults obtained ±30 min of moderate or greater intensity PA ≥5 days/week\(^2\)
    • Males more active than females
  – 40% of adults report no leisure time physical activity (probably an underestimate)\(^3\)


PA = Physical Activity
Effect of Physical Activity on Lipids

• Aerobic
  – Reduces LDL-C by 3.0-6.0 mg/dl
  – Reduces non-HDL-C by 6 mg/dl
  – No consistent effect on HDL-C or triglycerides

• Resistance Training
  – Reduces LDL-C by 6-9 mg/dl
  – Reduces non-HDL-C by 6-9 mg/dl
  – Reduces triglycerides by 6-9 mg/dl
  – No consistent effect on HDL-C

Exercise and Lipids: Dose Response

• Study: overweight adults with mild-moderate dyslipidemia; 84 randomized to 1 of 3 treatment groups

• Results:
  – More exercise improved more lipid variables than lower amounts, e.g., improved lipid triad, not LDL-C
    • Small, dense LDL
    • HDL-C
    • TG
  – Both lower-amount exercise groups always had better responses than the control group

• Conclusions:
  – The highest amount of weekly exercise, with minimal weight change, had widespread beneficial effects on the lipoprotein profile.
  – The improvements were related to the amount of activity and not to the intensity of exercise or improvement in fitness.

Increasing Physical Activity Significantly Reduces Abdominal Adipose Tissue and Improves Insulin Sensitivity *Without Significant Changes in Body Weight and/or BMI*

American College of Sports Medicine Recommendations for Persons With Dyslipidemia*

Primary activity: aerobic exercise

Intensity: 40-75% aerobic capacity

Frequency: 5 or more days a week

Duration: 30-60 minutes

* This amount of physical activity is consistent with recommendations for long-term weight control (200-300 minutes/wk mod. PA or ≥2,000 kcal/wk). This may be accumulated with repeated exercise bouts of ≥10 minutes.

2013 ACC/AHA Summary
Recommendations for Exercise

• Advise adults to engage in aerobic physical activity to reduce LDL-C and non-HDL-C:
  – 3-4 sessions per week
  – 40 minutes per session
  – Moderate to vigorous in intensity
NLA Lifestyle Therapies: Exercise/Physical Activity

• The recommended minimal quantity of exercise for supporting cardiovascular health and improving the lipid profile (lowering TG and sometimes raising HDL-C) is **150 min per week of moderate to higher intensity aerobic activity**. This level of physical activity is consistent with public health recommendations.

• **To enhance the effects on TG and HDL-C, and produce reductions in LDL-C, as well as loss of body fat and weight, ≥2000 kcal per week of energy expenditure (generally 200 to 300 min per week)** of moderate or higher intensity physical activity is recommended.

• Resistance exercise is also recommended to play a supportive role in maintaining strength, balance, and bone density.
Strategies for Exercise

- Specific counseling advice such as a detailed exercise prescription may help\(^1\)
  - Frequency
  - Intensity
  - Time (duration)
  - Use acronym FIT with patients
- Suggest incorporating lifestyle activities
  - Climbing stairs
  - Walking
  - Gardening
  - Housework
- View as ongoing process in behavioral change\(^2\)


FIT = Frequency Intensity Time
Part 4

Practical Approach to Weight Loss
Potential Factors Contributing to Obesity

Evolutionary
• Early ancestors had to adapt to caloric scarcity
• Women with a more active metabolism lost fat reserves in times of caloric scarcity and were unable to procreate

Current Environmental Factors
• Network phenomenon
• Marketing of high caloric density food items
• Cycle of stress, eating and reward
• Low cost of high caloric density compared to low caloric density foods
• Possible epigenetic phenomenon or endocrine disrupters
NIH Overall Goals of Weight Loss

Reduce Body Weight in the Short-term
Maintain a Lower Body Weight for the Long Term
Prevent Further Weight Gain – Minimum Goal

Rate of Weight Loss
• 10% reduction in body weight in 6 months of therapy
• Rate is 1-2 lb per week

Maintenance of Weight
• Requires regular physical activity

Exercise or Caloric Restriction for Weight Loss?: Achieving 300 kcal Negative Energy Balance

Reduce intake by:

- Eliminating 2 oz potato chips

Or

- Substituting 2 diet sodas for 2 regular sodas

Or increase activity by:

- Running 3 miles in 30 min

Or

- Bicycling 8 miles in 30 min
Common Weight Loss Diets

- Low Carb, High Protein, High Fat Diets
- Low Fat, High Carb
- Mediterranean Diet

Does the macronutrient profile affect weight loss?
Weight Changes During 2 years According to Diet Group (n = 227)

• 2 year study of three diets:
  – Low fat diet (calorie restricted)
  – Mediterranean diet (calorie restricted)
  – Low carbohydrate diet (not calorie restricted)
• The low-carbohydrate diet provided more protein and fat, and perhaps was associated with greater satiety, seemed to be more beneficial in terms of weight loss.
• There were initial weight losses in the early months, but
• Weight crept back up over time in all groups

POUNDS Lost Trial: Diets

These diets with target nutrient levels:
1. Low fat (20%), average protein (15%), highest carbohydrate (65%)
2. Low fat (20%), high protein (25%), carbohydrate (55%)
3. High fat (40%), average protein (15%), carbohydrate (45%)
4. High fat (40%), high protein (25%), lowest carbohydrate (35%)

Similar foods used for all diets but in different proportions
All dietary approaches adhered to healthful guidelines to prevent cardiovascular disease

POUNDS = Preventing Overweight Using Novel Dietary Strategies

POUNDS Diet
Prevention of Obesity Using Novel Dietary Strategies Completers, N=645

- Weight and Waist Circumference Change 2 years
  - 20 or 40% fat
  - 15 or 25% protein
  - 65, 55, 45 or 35% Carbohydrate

- At 6 months, participants assigned to each diet had lost an average of 6 kg, which represented 7% of their initial weight; they began to regain weight after 12 months.

- By 2 years, weight loss remained similar in those who were assigned to any diet

- In general, trends in weight loss favored the high protein diet

- Satiety, hunger, satisfaction with the diet

- Attendance at group sessions was strongly associated with weight loss (0.2 kg per session attended)

A to Z Trial: Comparison of Four Popular Diets on Weight Loss

- 4 diets—3 popular and substantially different diets and 1 diet based on national guidelines—representing a spectrum of carbohydrate intake
  - **Atkins** (very low in carbohydrate, high protein)
  - **Zone** (low in carbohydrate)
  - **LEARN** (Lifestyle, Exercise, Attitudes, Relationships, and Nutrition; low in fat, high in carbohydrate), and
  - **Ornish** (very high in carbohydrate, very low fat)

A to Z Trial: Comparison of Four Popular Diets on Weight Loss

• Primary objective was to examine the effects of diets and gradations of carbohydrate intake on weight loss and related metabolic variables in overweight and obese premenopausal women

• Results:
  – Weight loss was greater in the Atkins diet group compared at 12 months
  – Weight loss was not statistically different among the Zone, LEARN, and Ornish groups
  – At 12 months, secondary outcomes for the Atkins group were comparable with or more favorable than the other diet groups

Breakfast Makeover: Replace Simple Carbohydrates with Fiber, MUFA/PUFA

Original Breakfast:
- 12 oz café mocha: 270 Calories
- Blue Berry Muffin 120 g: 460 calories
- 16 oz juice: 204 calories

Total: 934 cal

Breakfast Makeover:
- Coffee with 2 oz skim milk: 40 calories
- 2 medium slices of Turkey bacon: 80 calories
- 1 small Bran muffin (66g): 180 calories
- Small banana: 120 calories

Total: 420 cal
NWCR Database: Behaviors Associated With Successful Long-Term Weight Management

• Characteristics of NWCR members
  – 78% eat breakfast every day
  – 75% weigh themselves at least once/week
  – 62% watch less than 10 hr TV/week
  – 90% exercise, on average about 1 h/day

NWCR = National Weight Control Registry

Address the Obesity Epidemic via Small Changes Approach*

- Small changes are more feasible to achieve and maintain than large changes
  - 2000 more steps/day (expends extra 100 kcal)
  - Simple food substitutions (Replace regular 12-oz soda with diet soda, ↓ caloric intake 150 kcal)
- Small changes can impact body weight regulation
  - Slight energy discrepancy (higher intake + lower output) has created an “energy gap” → weight gain
  - Average energy gap in adults is ~ 100-200 kcal/day

*Report of the Joint Task Force of the American Society for Nutrition, Institute of Food Technologists, and International Food Information Council; Endorsed by the American Dietetics Association, the American Heart Association and the American Cancer Society


Practical Approach to Maximize Satiety and Achieve Meaningful Weight Loss and Weight Management

1. Individualized balance of Carbs / Fats / Protein for sustained adherence—Focus on FOOD
   - Right Fats (mono- and poly- unsaturated, omega 3’s)
   - Right Carbs (high fiber, low glycemic index, complex)
   - Right Protein (plant, marine, and lean animal sources)
2. Limit or eliminate sugar, high fructose corn syrup, and refined starches and snack foods
3. Reduce or eliminate all calories from beverages
4. Smaller portions, low energy density, high nutrient density
5. Consider book-keeping of calories, points, etc
6. Drink (and eat) water
7. Exercise for life
8. Get adequate sleep
More Intensive Approaches to Managing Obesity

• Very low calorie diets (800-1000 calories)
  – Commonly employed at ‘weight loss centers’
  – Often include use of meal replacements
  – Require careful laboratory monitoring and vitamin supplementation
  – Should be used only under strict medical supervision
  – Maintenance phase, rather than initiation phase, most important in picking a plan

• Weight loss medications
  – Liraglutide, locaserin, bupropion/naltrexone, phentermine/topiramate, phentermine, and orlistat all approved for weight loss
  – Each can be associated with significant tolerability issues and risk of adverse events

• Bariatric Surgery
  – Indicated for BMI $\geq 40$ kg/m$^2$ or $\geq 35$ kg/m$^2$ in setting of significant co-morbidities
  – RNY and gastric sleeve are most commonly performed
Part 5

The Effect of Nutritional Supplements on Lipids
Alcohol and CHD

• There is a “U-shaped” curve
  – One drink lowers CHD risk vs. risk in teetotalers
  – Increasing amounts lead to increasing total mortality

• No difference between red and white wine in ecological, epidemiological studies
  – Resveratrol in red wine may have CV benefits via ↓ LDL oxidation, ↑ nitric acid, or by changes in thrombogenicity, ischemia, or vascular tone

• Observational data
  Alcohol intake may be causally related to lower risk of CHD through changes in lipids (HDL-C, Apo AI, TG) and hemostatic factors

If You Consume Alcohol, Do So in Moderation

Relative risk alcohol consumption and the risk of CHD

One drink equals:
- 12 oz beer
- 4 oz wine
- 1.5 oz 80 proof spirits

10 g alcohol equates to:
- 1 shot liquor
- 1 regular can beer
- 1 glass table wine

• 1 drink/day females
• 2 drink/day males

• With meals

Smoking Cessation

• Raises HDL-C
• Decreases CV risk
Plant Sterols

• Occur naturally
• Are structurally similar to cholesterol
• ~150-400 mg/d provided by typical western diet
• Higher intakes (1-3 g/d) are needed to ↓ atherogenic lipoproteins
• >40 (also called phytosterols) identified
  • Most common: sitosterol, campesterol & stigmasterol
• Have been identified in cholesterol plaque
  • Unclear significance
Plant Stanols

• Similar to sterols but have no double bonds
  – i.e., they are saturated sterols

• Less abundant in foods than sterols

• Most common stanols found naturally are sitostanol and campestanol

• Not found in cholesterol plaque
Plant Sterols/Stanols

• Efficacy
  – 2 g/d of plant sterols/stanols is equivalent to 3.3 g/d of sterol or stanol esters and associated with mean ↓ LDL-C of 13.1 mg/dL\textsuperscript{1,2}
  – Can lower LDL-C by 10-15%
  – TG and HDL-C are generally unchanged
  – LDL-C lowering may be greater in older adults
  – No fat malabsorption\textsuperscript{3,4}

Stanols vs. Sterols
Summary of Clinical Trial Data

• In 27 studies testing a mean dose of 2.5 g/d stanols, LDL-C decreased 10.1%
  – 4.0% LDL-C reduction per gram

• In 21 studies testing a mean dose of 2.3 g/d sterols, LDL-C decreased 9.7%
  – 4.2% LDL-C reduction per gram

Viscous Fibers for Lowering Atherogenic Lipoproteins

- TC, LDL-C, Apo B, and non-HDL-C are lowered by viscous fibers
- Insufficient evidence available to determine if the type of viscous fiber has a material impact on clinical response
- Meta-analysis from 55 studies of oat fiber, psyllium, pectin, and guar gum indicates that each gram of viscous fiber in the “practical” range of 2-10 g/d → ↓1.7 mg/dL in LDL-C
- Adding 5-10 g/d of viscous fiber to the diet would be expected to → ↓ LDL-C by ~6.5-13%

Apo B = apolipoprotein B

1. FDA. 2008.
Foods Containing Viscous Fibers

- Oats
- Barley
- Legumes
- Prunes
- Apples
- Some whole grain breads
Viscous Dietary Fiber Supplements

- Usual daily dose: 10-25 g/d
- Not all fiber laxatives contain ingredients proven to lower cholesterol, so patients should be provided with a list of such products.
- Examples of fibers which ↓ atherogenic lipoproteins:
  - Psyllium (*Plantago avata*) seeds
  - Beta-glucan from oats and barley
  - Pectin (found in many fruits)
  - Guar gum
  - Modified cellulose fibers
    - (e.g., hydroxypropylmethylcellulose)
  - Glucomannan
Effect of a Dietary Portfolio of Cholesterol Lowering Foods vs. Lovastatin on Serum Lipids and CRP

- **Design:** Randomized controlled trial
- **Who:** 46 healthy hyperlipidemic adults
  - 25 men
  - 21 postmenopausal women
- **Methods:** Compared control diet, control diet plus lovastatin 20 mg/day, and dietary portfolio

Interventions in Dietary Portfolio Study

1. Control Diet
   - Very low in saturated fat
   - Whole wheat cereals
   - Low-fat dairy foods

2. Control Diet + Lovastatin 20 mg/day

3. Portfolio Diet (high in 4 components)
   - Plant sterols (1 g/1000 kcal)
   - Soy protein (21.4 g/1000 kcal)
   - Viscous fibers (9.8 g/1000 kcal)
   - Almonds (14 g/1000 kcal)

# Rationale for Portfolio of Choices

<table>
<thead>
<tr>
<th>Dietary Choices</th>
<th>Mechanism</th>
<th>Lowering of LDL-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscous Fibers</td>
<td>Increase bile acid losses</td>
<td>6-7% for 10 g of psyllium</td>
</tr>
<tr>
<td>Soy Proteins</td>
<td>Reduce hepatic cholesterol synthesis, increase LDL receptor messenger RNA</td>
<td>12.5% for 45 g of soy proteins</td>
</tr>
<tr>
<td>Plant Sterols</td>
<td>Reduce cholesterol absorption</td>
<td>13% for 1-2 g of plant sterols</td>
</tr>
<tr>
<td>Almonds (MUFA and plant-sterol-rich oil)</td>
<td>Shown to lower LDL-C</td>
<td>1% for 10 g of almonds</td>
</tr>
</tbody>
</table>

Results of Portfolio Diet: Lipids and CRP

Summary
Essential Components of TLC for LDL-C

• Decrease consumption of saturated fats and *trans* fatty acid
• Increase dietary intake of MUFA and PUFA
• Increased dietary and supplemental fiber
  – High-fiber breakfast cereals, supplements, and so forth
• Plant sterols and stanols (2 g/d)
  – Spreads, pills, or combined with aspirin
• Soy protein
• Flavonoids (nuts)
• Weight loss
• Exercise
Essential Components of TLC for HDL-C and TGs

- Weight loss and exercise are key components
- Lower TG
  - Consume low-carbohydrate/sugar diet
    - Avoid sugar, high-fructose corn syrup, simple starches
  - Avoid excess fat in diet
  - Add omega-3 supplements
- Raise HDL-C
  - Exercise
  - Stop smoking
  - Moderate alcohol intake (1-2 glasses of red wine/d)
Resources

• **AHA**
  • Healthy Lifestyle Page - [http://www.americanheart.org/presenter.jhtml?identifier=1200009](http://www.americanheart.org/presenter.jhtml?identifier=1200009)
  • AHA – My Life Check™ - [http://mylifecheck.heart.org/](http://mylifecheck.heart.org/)

• **NHLBI**

• **AND**
  • Find a Registered Dietitian - [http://www.eatright.org/cps/rde/xchg/ada/hs.xsl/index.html](http://www.eatright.org/cps/rde/xchg/ada/hs.xsl/index.html)

• **USDA/HHS**

AND = Academy of Nutrition and Dietetics; HHS = Health and Human Services