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Therapeutic Lifestyle Changes

Primary Learning Objectives

- Describe effective diet and lifestyle strategies for long-term obesity and dyslipidemia management
- Describe the association of specific dietary patterns such as increased sodium and sugar intake, and the increased risk for cardiovascular disease associated morbidity and mortality.
- Compose a clinical care plan for reducing risk of CVD in patients with dyslipidemia

Presentation Outline

Part 1: Summary of 2013 ACC/AHA Lifestyle Recommendations

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***

2013 ACC/AHA Lifestyle Guideline

- Critical Questions
 - CQ1: Among adults, what is the effect of dietary patterns and macronutrient composition on CVD risk factors?
 - CQ2: Among adults, what is the effect of dietary intake of sodium and potassium on CVD risk factors?
 - CQ3: Among, adults, what is the effect of physical activity on BP and 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)

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)
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Components of the DASH Diet (based on 2000 kcal daily)

Food Group	Daily Servings
Grains (whole grains recommended)	6-8 [$\frac{1}{2}$ cup servings]
Vegetables	4-5
Fruits	4-5
Fat-Free or Low-Fat Dairy	2-3
Lean Meat, Poultry, and Fish	6 or less [1oz lean meat/fish or 1 egg]
Nuts, Seeds, and Legumes	4-5 weekly
Fats and Oils	2-3
Sweets and Added Sugars	5 or less weekly

National Heart, Lung, and Blood Institute. *Your Guide to Lowering Your Blood Pressure with DASH*. Bethesda, MD: National Heart, Lung, and Blood Institute, National Institutes of Health; 1998, rev 2006. NIH Publication No. 06-4082.

Available at: http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new_dash.pdf

Prevalence of DASH Style Diet is Low in US

- In 1999 to 2004, only 19.4% of hypertensive US adults were following a DASH-type diet (based on intake of fiber, magnesium, calcium, sodium, potassium, protein, total fat, saturated fat, and cholesterol).
- This represented a decrease from 26.7% of hypertensive US adults in 1988 to 1994.

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)
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 - Reduce percent of calories from trans fat (IA)

“Need to Know” Info Regarding the Effects of Various MacroNutrients on Lipid Parameters

- Dietary Cholesterol
- Fats
 - Saturated
 - *Trans*
 - MUFA
 - PUFA

MUFA = monounsaturated fatty acids

PUFA = polyunsaturated fatty acids

Dietary Education 101 for Patients

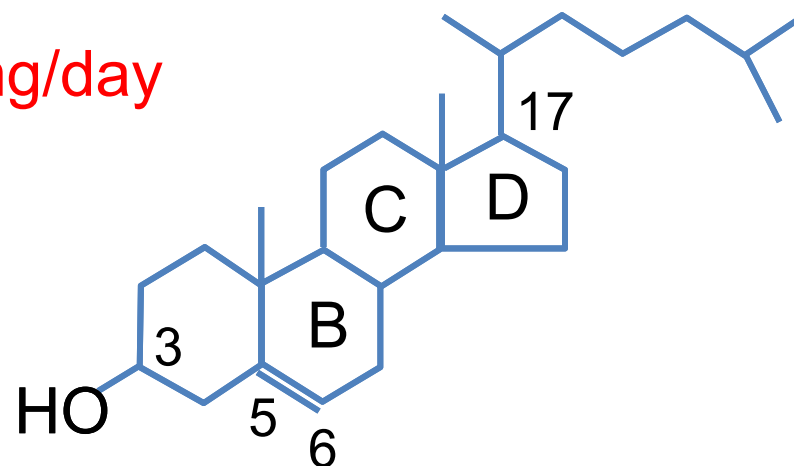
- CHOLESTEROL
 - Always in animals
 - Only in animals
 - Never in plants

2013 ACC/AHA Guidelines:

“There is insufficient evidence to determine whether lowering dietary cholesterol reduces LDL-C”

Cholesterol Absorption

- Most of cholesterol absorbed in upper part of small intestine at the brush border
- **Diet: Approximately 200-300 mg/day**
- Mixed micelle
 - Dietary fat
 - Monoglycerides
 - Fatty acids
 - Phospholipids (biliary lecithin)
 - Cholesterol
- **Bile acid reabsorption: 600 mg/day**
- **Total: Approximately 800 mg/day** reabsorbed intestinal cholesterol to hepatic cholesterol



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?

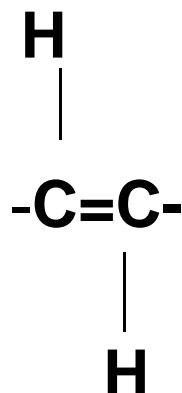
NCEP ATP III Recommends Avoiding High and Low Fat Intakes

- Avoid very high fat intake
 - Can lead to excess calories → obesity
 - Difficult to meet SFA goal
 - Concerns about some cancers
- Avoid very low fat intake
 - Poor compliance
 - → low HDL-C and high TG

SFA = saturated fatty acids

Trans Fatty Acids (TFAs)

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



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

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

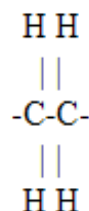
- MUFA
 - LDL-C lowered by 1.5 mg/dl
 - HDL-C raised by 0.4 mg/dl
 - Triglycerides lowered by 1.2 mg/dl
- PUFA
 - LDL-C lowered by 2.0 mg/dl
 - HDL-C raised by 0.5 mg/dl
 - Triglycerides lowered by 1.3 mg/dl

Level of Evidence: Moderate

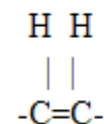
Types of Saturated Fat

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

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



**Carbon-Carbon
Single Bond**



**Carbon-Carbon
Double Bond**

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

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

Eckel RH, et al. Circulation 2013; published online November 12, 2013

<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

Gillingham LG, et al. *Lipids*. 2011;46:209-228.

American Heart Assoc. *Circulation*. 2010;121:e46-e215.

US Dept of Agriculture 2010 <http://www.cnpp.usda.gov/dietaryguidelines.htm>

Kris-Etherton PM, et al. *J Am Diet Assoc*. 2007;107:1599-1611.

FAO/WHO 2010 <http://www.fao.org/ag/agn/nutrition/docs>

Poly-Unsaturated Fatty Acids (PUFAs)

- Fatty acids that contain more than one double bond in their backbone
- Some omega 3 (linoleic acid) and omega 6 (linolenic 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
 - ↓ TG
 - Can ↑ LDL-C in combined hyperlipidemia
 - Associated with ↓ sudden death
- Marine:
 - Eicosapentaenoic Acid (EPA) C20:5
 - Docosahexaenoic Acid (DHA) C22:6
- Plant:
 - Linolenic Acid (C18:3;N-3)

AHA Science Advisory 2002: Summary for Omega-3 Fatty Acids

Population	Recommendation
Patients without documented CHD	Eat a variety of (preferably oily) fish at least 2X a week. Include oils and foods rich in α -linolenic acid (flaxseed, canola, soybean oils; flaxseeds and walnuts)
Patients with documented CHD	Consume ~ 1g of EPA+DHA per day, preferably from oily fish. EPA+DHA supplements could be considered in consultation with physician
Patients needing triglyceride lowering	Two to four grams of EPA+DHA per day provided as capsules under a physician's care

Content of EPA + DHA (mg/3 oz serving) in 37 Commonly Consumed Types of Fish

• Orange Roughy	26	• Blue Crab	403
• Tilapia	115	• Flat Fish	426
• Mahi-Mahi	118	• Pollock	460
• Cod	134	• Sea Bass	648
• Catfish (farmed)	151	• Swordfish	696
• Catfish (wild)	201	• Shark (raw)	711
• Lt. Chunk Tuna	230	• White Tuna	733
• Yellowfin Tuna	237	• Sardines	835
• Clams	241	• Coho Salmon (wild)	900
• Mixed Shrimp	267	• Rainbow Trout (farmed)	981
• Skipjack Tuna	278	• Chum Salmon (canned)	999
• Scallops	310	• Mackerel (canned)	1046
• Dungeness Crab	335	• Sockeye Salmon (wild)	1046
• Walleye	338	• Coho Salmon (farmed)	1087
• King Crab	351	• Pink Salmon (wild)	1094
• Oysters (farmed)	374	• Bluefin Tuna	1279
• Halibut	395	• Atlantic Salmon (wild)	1564
		• Atlantic Salmon (farmed)	1825

Harris WS, et al. *Curr Atheroscler Rep*. 2008;10:503-509.

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

Part 3

The Impact of Exercise on Lipids



Used with permission from John Foreyt, PhD.

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 week¹
 - 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/week²
 - Males more active than females
 - 40% of adults report no leisure time physical activity (probably an underestimate)³

1. Manson JE, et al. *Arch Intern Med.* 2004;164:249-258.

2. Troiano RP, et al. *Med Sci Sports Exerc.* 2008; 40:181-188.

3. www.winl.niddk.nih.gov/statidstics/index.htm. Accessed 04/11/2010.

PA = Physical Activity

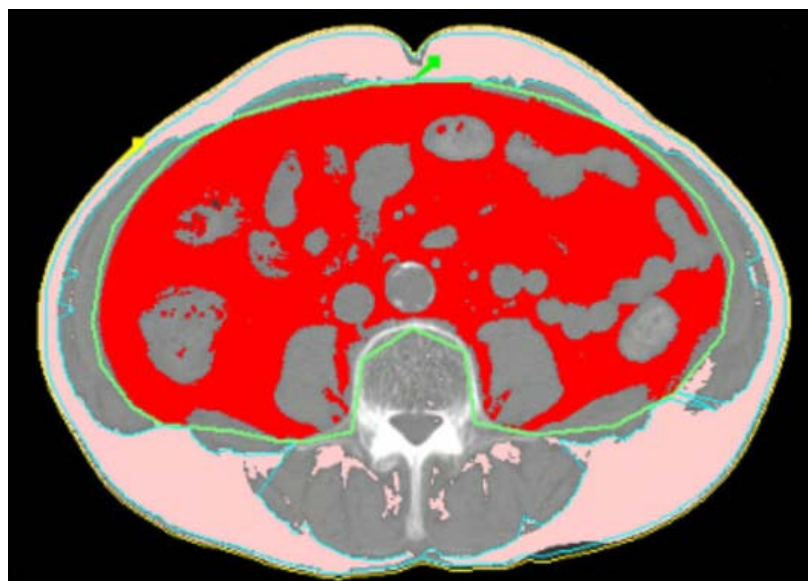
Effect of Physical Activity on Lipids

- 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



Yates T, et al. *Diabetes Care* 2009;32:1404; Velthuis MJ, et al. *Menopause* 2009;16:777; van der Heijden, et al. *J Clin Endo Met.* 2009;94:4292; Carey AL, et al. Exercise Mimetics, *Diabetologia*, 9/09; Hansen D. *Diabetologia* 2009; 52:1789–1797; Brown R. *Med Sci Sports Ex* 2009;41:497; Ribeiro ICD *Med Sci Spts Ex* 2008;40:779; Despres JP SYNERGIE Trial EAS 2008; Misra A, et al. *Diabetes Care* 2008;31:1282-1287; Bell LM, et al. *J Clin Endo Met* 2007;92:4230; Ekelund U, et al. *Diabetes Care* 2007;30:2101; Dekker M. *Metabolism* 2007;56:332; DiPietro L, et al. *JAP* 2006; Lee SJ & Ross *JAP* 2005;99:1220; Wong SL, et al. *Med Sci Sports Ex* 2004;36:286; Duncan GE *Diabetes Care* 2003;26:557; Ross R, et al. *Obes Res.* 2004;12:789-798; Ross R, et al. *Relat Met Dis* 2003;27:204; Mourier A, et al. *Diabetes Care* 1997;20:385; Ross R, et al. *Ann Intern Med* 2000;133:92.

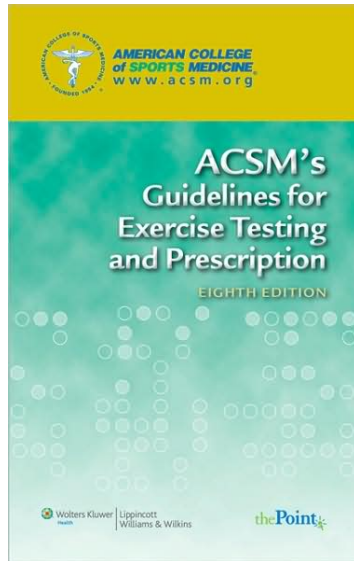
Moderate vs. Vigorous Exercise

- ✓ Health care professionals who work with high CMR patients should have an understanding of what activities constitute moderate and vigorous physical activity
- ✓ Prediabetic, metabolic syndrome, obese, and diabetic patients will almost exclusively require activities in the moderate intensity range (i.e., 40-60% of aerobic capacity) and in many cases lower intensity activities
- ✓ When you definitively recommend (in writing or personal verbal instruction) activities in the vigorous intensity range requiring >60% of aerobic capacity, factor this into the ACSM decision tree for pre-exercise program screening and possible GXT evaluation

ACSM = American College of Sports Medicine

CMR = Cardiometabolic Risk

GXT = Graded Exercise Test



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 $\geq 2,000$ kcal/wk). This may be accumulated with repeated exercise bouts of ≥ 10 minutes.

ACSM, Guidelines for Exercise Testing and Prescription, 8th Ed, Lippincott Williams & Wilkins, 2009.

2013 ACC/AHA Summary Recommendations for Exercise

- In general, 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

Strategies for Exercise

- Specific counseling advice such as a detailed exercise prescription may help¹
 - Frequency
 - Intensity
 - Time (duration)
 - Use acronym FIT with patients
- Suggest incorporating lifestyle activities
 - Climbing stairs
 - Walking
 - Gardening
 - Housework
- View as ongoing process in behavioral change²

1. Swinburn BA, et al. *Am J Public Health*. 1998;88:288-291.

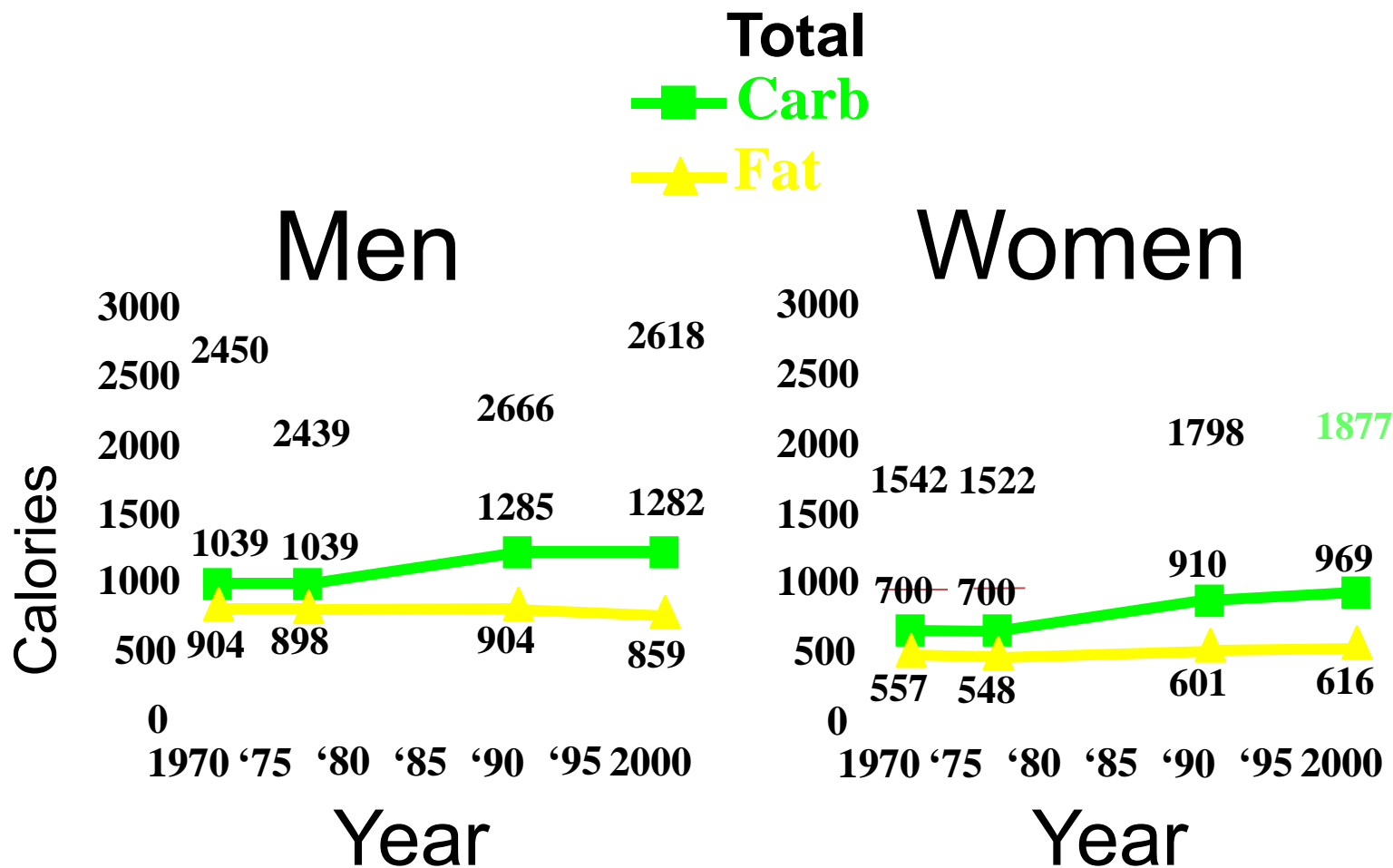
2. Wee CC. *JAMA*. 2001;286:717-719.

FIT = Frequency Intensity Time

Part 4

Practical Approach to Weight Loss

200-300 kcal Increase in Mean Caloric Intake in U.S. Since 1970's (Mostly carbohydrates)



<http://www.cdc.gov.revproxy.brown.edu/nchs/data/hus/hus05.pdf#027>

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

NHLBI. Expert Panel. Clinical Guidelines on the Identification, Evaluation and Treatment of Overweight and Obesity in Adults: Evidence Report (NIH Pub No. 98-4083);1998.

NDEP Caloric Targets for Steady Sustained Weight Loss

Overweight/Obese Patient Often Have Unrealistic Expectations and Goals for Weight Loss

Caloric Targets for Weight Loss of Goal of 1-2 lb Per Week	
Current Weight	Calories and Fat
120 –170 pounds	1,200 calories/day
175 – 215 pounds	1,500 calories/day
220 – 245 pounds	1,800 calories/day
250 – 300 pounds	2000 calories/day

Adapted from www.ndep.nih.gov/campaigns/SmallSteps/gameplan/gp_booklet.htm#overview

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

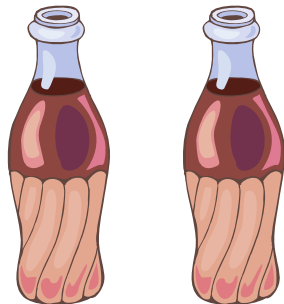
Reduce intake by:

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 CHO, High Protein, High Fat Diets
- Low Fat, High CHO
- 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
 - Atkins8 (very low in carbohydrate)
 - Zone9 (low in carbohydrate)
 - LEARN18 (Lifestyle, Exercise, Attitudes, Relationships, and Nutrition; low in fat, high in carbohydrate, based on national guidelines), and
 - Ornish19 (very high in carbohydrate)

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

= 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

= 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

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 Energy (Caloric) Balance

- Very low calorie diets (800-1200 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
 - Sibutramine, phentermine, and orlistat all approved for weight loss
 - Each can be associated with significant tolerability issues and risk of adverse events
 - Other medications have been used off label
- Bariatric Surgery
 - Indicated for BMI ≥ 40 kg/m² or ≥ 35 kg/m² in setting of significant co-morbidities

Part 5

The Effect of Nutritional Supplements on Lipids

Antioxidant Vitamins for the Prevention of CVD

- Meta-Analysis of 7 Trials of Vitamin E
 - Dose range: 50-800 IU
 - 81,788 subjects
 - No effect on mortality
- Meta-Analysis of 8 Trials of Beta-Carotene
 - Dose range 15-50 mg
 - Small increase in all-cause mortality

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 → CV benefits via ↓ LDL oxidation, ↑ nitric acid, or by changes in thrombogenicity, ischemia, or vascular tone¹
- Observational data

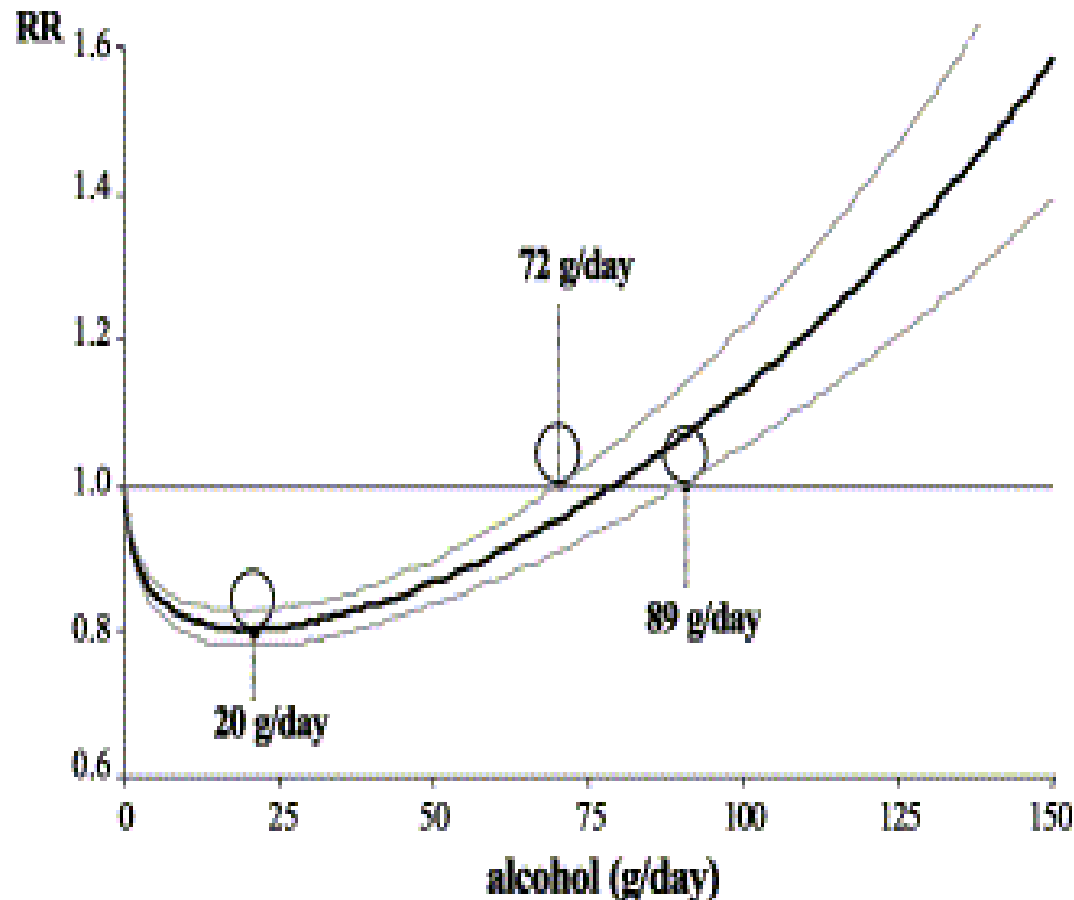
Alcohol intake may be causally related to lower risk of CHD through changes in lipids (HDL-C, Apo AI, TG) and hemostatic factors²

1. Opie LH, et al. *Eur Heart J*. 2007;28:1683-1693.

2. Rimm EB, et al. *BMJ*. 1999;319:1523-1528.

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/Stanol

- 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^{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^{3,4}

1. Katan MB, et al. *Mayo Clinic Proc.* 2003;78:965-978.

2. Demonty I, et al. *J Nutr.* 2009;139:271-284.

3. Miettinen TA, Gylling H. *Curr Opin Lipidol.* 1999;10:9-14.

4. Gylling H, et al. *J Lipid Res.* 1999;40:593-600.

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 fibers¹
- 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-C²
- 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.

2. Brown L, et al. *Am J Clin Nutr*. 1999;69:30-42.

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

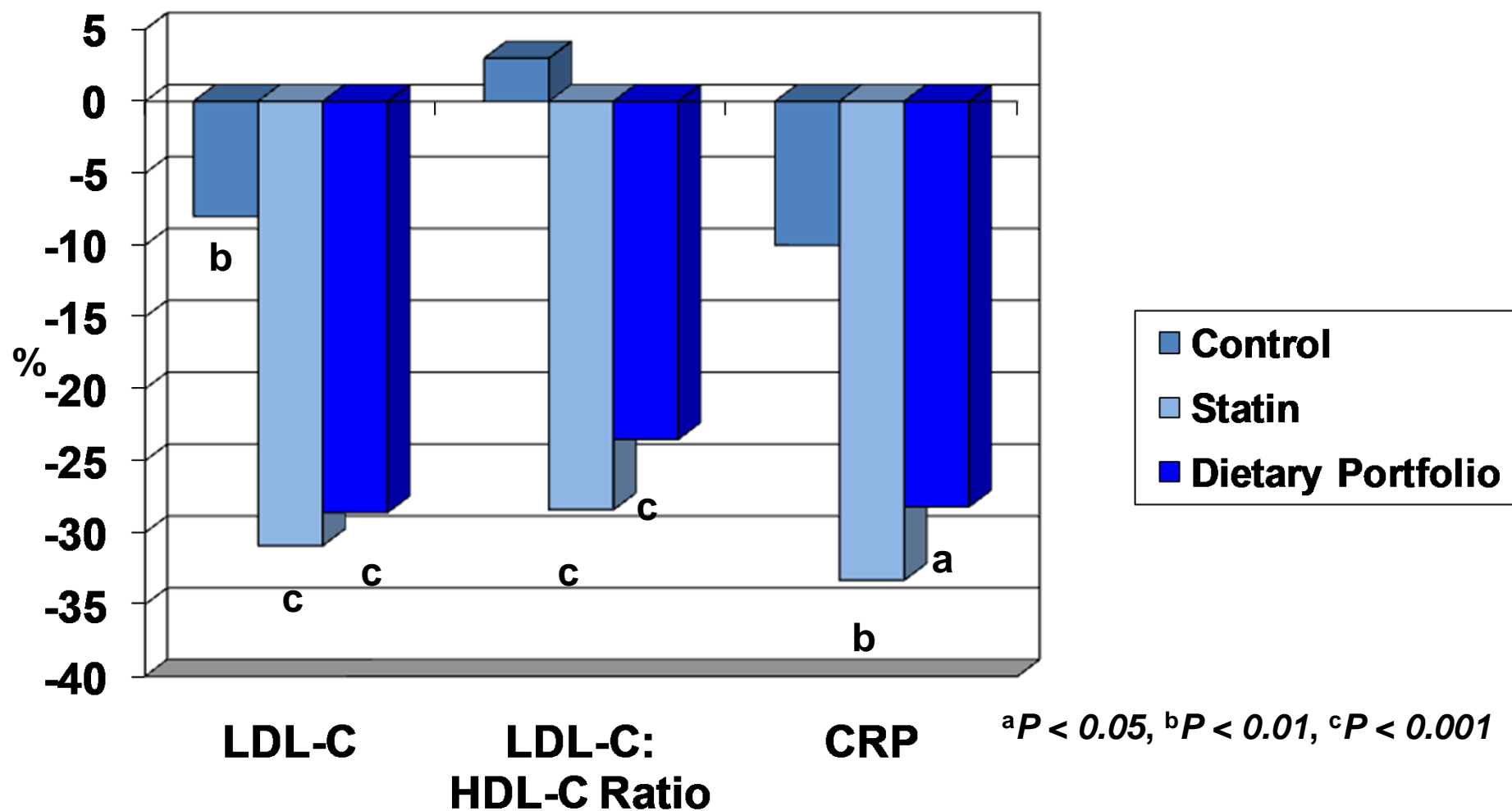
2. Control Diet + Lovastatin 20 mg/day

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)

Jenkins DJ, et al. *JAMA*. 2003;290:502-510.

Results of Portfolio Diet: Lipids and CRP



Jenkins DJ, et al. *JAMA*. 2003;290:502-510.

Omega-3 Polyunsaturated Fat Supplements

- Types:
 - Eicosapentaenoic acid (EPA): fish-based
 - Docosahexaenoic acid (DHA): fish-based
 - Alpha-linolenic acid (ALA): plant-based
- Clinical Indications for EPA and DHA Supplements:
 - Post-MI: 1 gram/day (AHA recommendation)
 - May be reconsidered after other studies were not able to replicate (? Effect of baseline dietary intake and statin use)
 - Severe Hypertriglyceridemia: much higher doses required (including prescription strength)
 - Clinical trial data demonstrating reduction of CV events with high dose omega 3s in patients with high triglycerides are lacking

1. Balk E et al. Agency for Healthcare Research and Policy. <http://www.ahrq.gov/clinic/epcsums/o3cardrisksum.htm>.

2. Kris-Etherton PM. *Circulation*. 2002;106(21):2747-2757. 3. Hooper L, et al. *BMJ*. 2006;332(7544):752-760. Rauch et al, *Circulation* 2010;122:2152-59

Omega 3's Hypothetical Effects

Effect	Relative Dose	Time Course
Anti-Arrhythmic	High	Weeks
Triglyceride Lowering	Moderate-High	Months
Heart Rate Lowering	Moderate	Months
Anti-Thrombotic	Low	Days - Weeks

Adapted from Mozaffarian, D. et al. JAMA 2006;296:1885-1899.

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**
 - Nutrition Facts - <http://www.americanheart.org/presenter.jhtml?identifier=855>
 - Fat Calculator - <http://www.myfatstranlator.com/>
 - Healthy Lifestyle Page - <http://www.americanheart.org/presenter.jhtml?identifier=1200009>
 - AHA – My Life Check TM - <http://mylifecheck.heart.org/>
- **NHLBI**
 - 10-year Risk Calculator - <http://hp2010.nhlbihin.net/atpiii/calculator.asp?usertype=pub>
 - Your Guide to a Healthy Heart - http://www.nhlbi.nih.gov/health/public/heart/other/your_guide/healthyheart.htm
- **ADA**
 - Find a Registered Dietitian - <http://www.eatright.org/cps/rde/xchg/ada/hs.xsl/index.html>
- **USDA/HHS**
 - MyPyramid.Gov - <http://www.mypyramid.gov/>

ADA = American Dietetic Association; HHS = Health and Human Services