Mediterranean, DASH & TLC Dietary Patterns: Mechanism of Action for CVD Protection

Geeta Sikand, MA, RD, CLS, FNLA
Director of Nutrition: UC Irvine Preventive Cardiology Program
Associate Clinical Professor of Medicine: Cardiology
University of California Irvine
Disclosures

None
Today’s Goals
Review

• 2013 lifestyle AHA/ACC recommendations to reduce CVD Risk.
• Clinical outcomes of heart healthy dietary patterns e.g. DASH (Dietary Approaches to Stop Hypertension) & Mediterranean dietary patterns
• Mechanisms of action for components of heart healthy dietary patterns
Dietary Patterns: Research and Public Guidance

- Recent shift towards an increase in attention to Dietary Patterns rather than single nutrients or food groups or supplements.

- Reason: Dietary components are consumed in combination and correlated with one another.
Comparison of Consumption to Recommendations: U.S.

**FIGURE 5-1. How Do Typical American Diets Compare to Recommended Intake Levels or Limits?**

Usual intake as a percent of goal or limit

**Eat more of these:**
- Whole grains: 15%
- Vegetables: 42%
- Fruits: 44%
- Dairy: 52%
- Seafood: 44%
- Oils: 61%
- Fiber: 40%
- Potassium: 56%
- Vitamin D: 28%
- Calcium: 75%

**Goal**

**Eat less of these:**
- Calories from SoFAS*: 280%
- Refined grains: 110%
- Sodium: 200%
- Saturated fat: 149%

**Limit**

Percent of goal or limit
Lifestyle management remains the cornerstone for cardiovascular risk reduction


2013 Lifestyle Guidelines for CVD Prevention

- 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 sodium, sweets, sugar-sweetened beverages and red meats.
2013 Lifestyle Guidelines for CVD Prevention

- Achieve this pattern by following the DASH, USDA or AHA Dietary pattern.
- Referral to a nutrition professional e.g. RD to adapt this dietary pattern to appropriate calorie requirements, personal & cultural food preferences, and nutrition therapy for co-morbidities (DM, Met S).
2013 Lifestyle Guidelines for CVD Prevention

- Limit saturated fat intake to 5 to 6 % of kcal.
- Reduce percent of calories from saturated fat and trans fat.
- Keep sodium intake to < 2,400 mg per day; 1,500 milligrams per day for those with hypertension and/or at high risk for ASCVD; or at least decrease sodium intake by 1,000 mg per day.
The DASH, Mediterranean, AHA, USDA & TLC Diets Are NOT diets! They are evidence based Healthy Dietary Patterns. Recommended by the IAS, AHA/ACC 2013 Lifestyle Guidelines & 2010 US Dietary Guidelines.

A healthy, fad-free way of eating whole foods to decrease risk of chronic disease e.g. CHD & stroke.
Case 1. DASH Does It

- Can diet lower BP in a middle-aged African American woman? And by how much?
  - 11 mm Hg
  - 6.9 mm Hg
  - 5.3 mm Hg
  - <2 mm Hg
DASH Dietary Pattern

- Emphasis: whole grains, fruits, veggies, low fat dairy, nuts, fish, poultry, legumes
- Low in sodium, red meats, sugars
- BP 11.4/5.5
  Sacks 2001
- CHD, stroke
  in 80,000 women
  on diet x 24 yrs F Up
  Fung 2008
DASH Trial
Effects of Dietary Patterns on Blood Pressure

Systolic Blood Pressure (mm Hg)

Diastolic Blood Pressure (mm Hg)

Intervention Week

Control Diet
Fruits & Vegetables Diet
Combination Diet

Base 1 2 3 4 5 6 7 and 8

DASH Diet and Hypertension

**Figure 3** Blood pressure changes on the DASH combination diet in race/blood pressure groups. SBP = systolic blood pressure.
Omni-Heart Study

3 Modified DASH DIETS

- N=164 randomized to 3 period crossover trial 6 weeks each
- All Diets Low in Saturated Fat
  - 6% calories
  - Traditional DASH diet plus versions in which some carbohydrate was replaced by protein or unsaturated fat
- Higher Protein
  - Half plant sources; 6 oz of chicken fish, meat, egg product substitutes all low in saturated fat
  - Better at lowering TG, also reduced HDL-C
- Higher Unsaturated Fat
  - Better at raising HDL-C

Omni Heart Diets and Blood Pressure

Change in SBP, mm Hg

- CARB: -12.9
- PROT: -16.1
- UNSAT: -15.8

Δ = -3.5
Δ = -2.9

*P < 0.05
†P < 0.01
OmniHeart: Mean or Median Changes in Lipid Variables from Baseline Diet

<table>
<thead>
<tr>
<th>Lipid Variables, mg/dL</th>
<th>Carbohydrate Rich Diet</th>
<th>Protein Rich Diet</th>
<th>Unsaturated Fat Rich Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDL-C</td>
<td>-11.6</td>
<td>-14.2</td>
<td>-13.1</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>0.1</td>
<td>-16.4</td>
<td>-9.3</td>
</tr>
<tr>
<td>HDL-C</td>
<td>-1.4</td>
<td>-2.6</td>
<td>0.3</td>
</tr>
</tbody>
</table>
## Evidence Based Diet Plans to Lower CHD Risk

<table>
<thead>
<tr>
<th>Food Group</th>
<th>TLC: NCEP servings</th>
<th>AHA servings</th>
<th>DASH servings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit</td>
<td>3-4</td>
<td>4-5</td>
<td>4-5</td>
</tr>
<tr>
<td>Vegetables</td>
<td>3-5</td>
<td>4-5</td>
<td>4-5</td>
</tr>
<tr>
<td>Whole Grains</td>
<td>6-11</td>
<td>6-8</td>
<td>7-8</td>
</tr>
<tr>
<td>Food Groups</td>
<td>TLC-NCEP servings daily</td>
<td>AHA servings daily</td>
<td>DASH servings daily</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------------</td>
<td>-------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Lean meat/beans</td>
<td>≤ 6 oz</td>
<td>≤ 6 oz</td>
<td>≤ 6 oz</td>
</tr>
<tr>
<td>Low fat Dairy</td>
<td>2-3</td>
<td>2-3</td>
<td>2-3</td>
</tr>
<tr>
<td>Oils/spreads</td>
<td>2-3</td>
<td>2-3</td>
<td>2-3</td>
</tr>
<tr>
<td>Extras</td>
<td>Adjust to calorie level</td>
<td>5 svgs/week</td>
<td>5 TBS/week</td>
</tr>
</tbody>
</table>
Mediterranean Dietary Pattern

- Primarily plant-based: high intake of vegetables, fruits, whole grains, beans, nuts & seeds, herbs, spices
- Olive oil: primary source of fat
- Moderate to high intake of fish
- Low intake of dairy products, poultry, and red meat
- Low to moderate consumption of wine
Health Benefits of Mediterranean Diet

• Ischemic Stroke Risk Lower with Mediterranean Diet
• Mediterranean Diet Benefits Age-Related Cognitive Change
• Less Inflammation, Oxidative Stress with Mediterranean Diet
• Improved Heart Function and the Mediterranean Diet
• Mediterranean Diet More Effective than Low-Fat Diet (for weight loss and lipids)
• Mediterranean Diet Trumps Weight Loss in Reducing LDL
• Metabolic Syndrome Factors Improve with Mediterranean Diet
• Risk of Diabetes Reduced with Greater Med Diet Adherence
PREDIMED Study Spain


- n=7,447 at high risk for CVD Age 55-80 yrs. Randomized to 3 groups, advised to follow:
  1. Mediterranean diet plus provided extra-virgin olive oil (rich in polyphenols and monounsaturated fat)
  2. Mediterranean diet plus provided mixed nuts (rich in polyphenols, monounsaturated fat & polyunsaturated fat, including alpha-linolenic acid)
  3. Low fat diet (control diet)
Difference Between MeDiet + EVOO and MeDiet + Unsalted Nuts

**MeDiet + EVOO**
- EVOO (1L/week/family)
- 50 g/d

**MeDiet + unsalted Nuts**
- Walnuts 15 g/d
- Almonds 7.5 g/d
- Hazelnuts 7.5 g/d
## Food Recommendations for the MeDiet Groups and Control Diet Group

<table>
<thead>
<tr>
<th>Mediterranean Diet</th>
<th>Lower Fat Diet (Control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MeDiet + EVOO (1L/week)</td>
<td></td>
</tr>
<tr>
<td>MeDiet + Nuts (30 g/d)</td>
<td></td>
</tr>
<tr>
<td>Olive Oil</td>
<td>Low Fat Dairy</td>
</tr>
<tr>
<td>Tree Nuts &amp; Peanuts</td>
<td>Bread, Potatoes, Pasta, Rice</td>
</tr>
<tr>
<td>Fresh Fruits</td>
<td>Fresh Fruits</td>
</tr>
<tr>
<td>Vegetables</td>
<td>Vegetables</td>
</tr>
<tr>
<td>Fish (fatty) &amp; Seafood</td>
<td>Lean Fish &amp; Seafood</td>
</tr>
<tr>
<td>Legumes</td>
<td></td>
</tr>
<tr>
<td>Sofrito</td>
<td></td>
</tr>
<tr>
<td>White Meat</td>
<td></td>
</tr>
<tr>
<td>Wine w/ Meals</td>
<td></td>
</tr>
</tbody>
</table>

PREDIMED Results

- Interim analyses prompted early termination of the trial. Mean follow up: 5 yrs
- As compared with control group, the two groups that received advice on a Mediterranean diet plus EV olive oil or nuts reduced the risk of CVD by 30% & stroke by 50%.
- 3 months after randomization, both MeDiet groups (extra-virgin olive oil & the mixed nuts) substantially lowered blood pressure.
Mediterranean Dietary Pattern

Lyon Heart Study
- 605 pts South France hx prior MI
- 46 months randomized to Mediterranean vs standard diet
- Controlled: smoking, activity, wt, entry lipids, age, gender, FH

De Lorgeril: Circulation 1999

- ↓ 72% Cardiac Deaths, Non Fatal MI
- ↓ 66% All Cause Mortality
- ↓ 61% incidence of Cancer
Mediterranean Dietary Pattern

- **Greek Study** 22,000 adults,
- Randomized, prospective study 44 months
- Rigorously controlled multiple CV risk factor
- ↓ 33% CVD deaths
- ↓ 15% Cancer
- ↓ 25% all cause mortality
“Among individuals aged 70-90 years, adherence to a Mediterranean diet and healthful lifestyle is associated with a more than 50% lower rate of all cause and cause specific mortality”

JAMA 2004;292:1423
Mediterranean Dietary Pattern

- NIH- AARP Diet and Health Study
- 214,000 men, 166,000 women without CVD over 10 yrs
- Prospective, Observational: adherence to Mediterranean Diet, controlled risk factors
- ↓ 21% All Cause Mortality
- ↓ 22% CVD Mortality
- ↓ 17% Cancer Mortality Men/12% women

Arch Intern Med. 2007;167(22):2461-2468.
High-\textit{cis}-MUFA diet Associated with Favorable Blood Pressure Changes Versus High-Carbohydrate Diet

\begin{itemize}
  \item \textbf{(A) Net change in systolic blood pressure (mmHg)}
  \item \textbf{(B) Net change in diastolic blood pressure (mmHg)}
\end{itemize}

Shah et al., \textit{Am J Clin Nutr.} 2007;85:1251-1256.
Risk of CVD mortality associated with two point increase in adherence score for Mediterranean diet: meta-analysis (1.5 million patients 4 – 10 yr follow up)

9% decrease CVD mortality: each 2 point increase in adherence

Sofi F et al. BMJ 2008;337:bmj.a1344
Mechanisms of Whole Food Dietary Patterns
Mediterranean Diet

- Emphasis: whole foods, not single diet components
- Synergism: begins at base of pyramid
  - Vegetables
  - Fruits
  - Whole Grains
  - Legumes/Beans
  - Nuts/Seeds
  - Herbs/Spices
  - Olive Oil
Mediterranean Diet

Improved Health Outcomes

↑ Monosat FA

↑ OM3 FA

↓ Saturated Fats

↑ Healthy Spices

↑ Fiber

↑ Magnesium

↑ Phyto-Nutrients

↓ Inflammation

Low Glycemic Load CHO’s
Flavonoids are Phyto-chemicals

Earlier focus: Antioxidants

- Fruits & vegetables
- Scavenge “free radicals” that damage cells.

New focus: Polyphenols

- largest sub-group: flavonoids
- > 6000 compounds with potential health benefits
  - apples, berries, tea, cocoa, red wine
  - Reduce chronic dz: heart dz & cancer, improve blood vessel elasticity, inhibit an enzyme that reduces nitric oxide levels (dilates blood vessels)

Rodriguez-Mateos et al
AJCN Sept 4 2013
Phyto-nutrients: Vags & Fruits

- Flavonoids: artichokes, asparagus, green tea, apples
  - ↓ LDL, BP, ↑ endothelial vasodilation
  - Free radical scavengers,
    anti-inflammatory, ↓ plt aggreg

Indoles & Isothiocyansates (Cruciferous veg: broccoli, kale, brussel sprouts, cauliflower

- 1 cup cruciferous veg/day ➔ 40% ↓ Breast CA
- 3 servings /wk ➔ 40% ↓ Prostate CA
- Also ↓ Lung, stomach, Colo-rectal CA
**Phyto-nutrients: Veggies & Fruits**

- **Anthocyanins**: Red and blue berries, grapes, peppers, cherries, wine
  - Highest measured antioxidant activity
- **Carotenoids**
  - Alpha (carrots, red peppers)
  - Beta (apricots, cantaloupe, sweet pot, chard)
- **Lycopene**: Tomatoes, watermelon
  - Antioxidant ↓ MI risk 48% Men
  - 2 servings/wk (1/2 c)
- **Lutein**: Apples, greens, spinach
  - Immunity, anti-inflammatory
Phyto-nutrients: Powerful for Vascular Health

- Inflammation
  - ↓ CRP, IL-6, 7,18
- ↓ Oxidative Stress (LDL)
- Rise in flavonoid-derived compounds increased flow-mediated dilation (FMD)
- Free Radical Scavenging
- ↑ Endothelial function
- ↓ Fibrinogen, Plt aggregation
Low Glycemic Load Carbs Contain Polyphenols

- Legumes / Beans
  - Chickpeas, lentils, split peas
- Whole Grains
  - Bulgar, brown rice, barley
  - Quinoa
- Vegetables
- Whole Fruits (many)
Low Glycemic Load Carbs: Beans & Legumes

- Decrease inflammation
  - ↓ CRP, Fibrinogen, other inflammatory markers
- Lower Insulin resistance
  - ↓ FBS, Hgb A1c
- Improve Lipid profiles
  - ↓ TG’s, ↑ HDL

- High Fiber / High Nutrient / Low calorie density ➔ promote satiety
  - ↓ CAD risk 20-30%
  - ↓ progression to DM, Metabolic syndrome, total mortality
  - ↓ Associated cancer: prostate, breast, colorectal
Healthy Fats

• Oils from Plant Sources are more than just Fats
• Contain many antioxidants and phyto-nutrients
• Overall effects on health can't be predicted just by the changes in LDL and HDL.
Healthy Fats

- Olive Oil
  - Extra virgin, expeller pressed
  - Highest phytonutrients: polyphenols, carotenoids, alpha tocopherol (Vit E)
  - Free radical scavengers, antioxidants
  - ↑ HDL, ↓ TG’s, LDL, TC
- Monosaturated Fatty acids
  - ↓ insulin resistance
  - ↑ arterial elasticity
“A statin a day keeps the Doctor away: A comparative proverb assessment modelling study.”

“Our data suggest that offering a daily statin to 17.6 million more adults would reduce the annual number of vascular deaths by 9,400, but offering a daily apple to 70% of the total UK population aged over 50 years (22 million people) would avert 8,500 vascular deaths without any statin side effects.”

Take Aways: What it mostly boils down to

- Eat whole foods
- Not too much, mostly plants
- Replace SFA with PUFA and MUFA
- There are many cardio-metabolic benefits of MUFA & PUFA
- Eat what your Great-Grandparents would recognize as food
Synergism of Whole Food Dietary Patterns

- **Whole Grains, vegetables, and fruits** eaten at most meals: vitamins, minerals, energy, antioxidants, fiber & phytonutrients
- **Olives & EV olive oil:** MUFA, polyphenols, carotenoids, tocopherols
- **Nuts, beans, legumes, seeds:** healthy fats, protein, phytonutrients, fiber, magnesium, potassium.
- **Herbs and spices:** phyto-nutrients, antioxidants, add flavors and aromas to foods, reduce need to add salt or fat in cooking.
- **Cheese and yogurt:** proteins, calcium, B vitamins, vitamin D, potassium. Eaten regularly in the traditional Mediterranean diet, but low to moderate amounts.
- **Fish and shellfish:** protein, healthy fats, vitamins, minerals
- **Eggs:** protein, iron, vitamins, minerals
Resources

Choose my plate
www.choosemyplate.gov

- Recommendations for each USDA Food Group, based on the 2010 Dietary Guidelines for Americans (DGA)
  http://www.health.gov/dietaryguidelines/
- Meal plans for individual calorie and nutrient needs
- Sample menus, interactive tools
  https://www.supertracker.usda.gov/default.aspx
Helping Your Patients: Resources

- Eating patterns should be personalized
- Referral to a RDN (Registered Dietitian Nutritionist)

To find a RDN in your area: www.eatright.org
Some practical guides

1. *The Mediterranean Heart Diet: Why it Works and How to Reap the Health Benefits, with Recipes to Get You Started* by Helen V. Fisher with Cynthia Thomson, Ph.D., R.D.

2. *Everyday Cooking with Dr. Dean Ornish* by Dean Ornish, M.D.
Thank You