Cardioprotective Dietary Patterns – Review of the Current Scientific Evidence and Tips for Practical Application

Carol Kirkpatrick, PhD, MPH, RDN, CLS, FNLA
Director and Clinical Associate Professor
Wellness Center
Kasiska Division Of Health Sciences
Idaho State University
Twitter: @carolkirkpat3

Disclosures

▪ No financial relationships to disclose
Overall Learning Outcomes

▪ Review current evidence-based dietary guidelines and recommendations for atherosclerotic cardiovascular disease (ASCVD) prevention
▪ Discuss the different dietary fatty acids and their potential influence on ASCVD risk
▪ Review current evidence-based cardioprotective dietary patterns
▪ Identify practical application of recommendations from various professional organizations

A favor to ask...

▪ Please write down what you expect to learn during this session.

or

▪ Think about what questions you are hoping I answer during this session.

▪ At the half-way point, I will check-in with you to see if I have answered your questions or am meeting your learning expectations.
ASCVD Statistics

- About 92.1 million American adults are living with some form of CVD or the after-effects of stroke
- CVDs claims more lives in the U.S. each year than all forms of cancer and chronic lower respiratory diseases combined.
  - Accounted for nearly 836,546 deaths in the U.S. in 2015
- CVD is the leading global cause of death
  - Accounted for more than 17.9 million deaths per year in 2015
  - Expected to grow to more than 23.6 million deaths per year by 2030


1. The most important way to prevent atherosclerotic vascular disease, heart failure, and atrial fibrillation is to promote a healthy lifestyle throughout life.

4. All adults should consume a healthy diet that emphasizes the intake of vegetables, fruits, nuts, whole grains, lean vegetable or animal protein, and fish and minimizes the intake of trans fats, red meat and processed red meats, refined carbohydrates, and sweetened beverages. For adults with overweight and obesity, counseling and caloric restriction are recommended for achieving and maintaining weight loss.

5. Adults should engage in at least 150 minutes per week of accumulated moderate-intensity physical activity or 75 minutes per week of vigorous-intensity physical activity.

Recommendations for Nutrition and Diet

<table>
<thead>
<tr>
<th>COR*</th>
<th>LOE**</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (Strong)</td>
<td>B-R</td>
<td>1. A diet emphasizing intake of vegetables, fruits, legumes, nuts, whole grains, and fish is recommended to decrease ASCVD risk factors.</td>
</tr>
<tr>
<td>IIa (Mod)</td>
<td>B-NR</td>
<td>2. Replacement of saturated fat with dietary monounsaturated and polyunsaturated fats can be beneficial to reduce ASCVD risk.</td>
</tr>
<tr>
<td>IIa (Mod)</td>
<td>B-NR</td>
<td>3. A diet containing reduced amounts of cholesterol and sodium can be beneficial to decrease ASCVD risk.</td>
</tr>
<tr>
<td>IIa (Mod)</td>
<td>B-NR</td>
<td>4. As a part of a healthy diet, it is reasonable to minimize the intake of processed meats, refined carbohydrates, and sweetened beverages to reduce ASCVD risk.</td>
</tr>
<tr>
<td>III- Harm (Strong)</td>
<td>B-NR</td>
<td>5. As a part of a healthy diet, the intake of trans fats should be avoided to reduce ASCVD risk.</td>
</tr>
</tbody>
</table>

*Class (Strength) of Recommendation: Strong = Benefit >>> Risk; Moderate = Benefit >> Risk; Harm = Risk > Benefit

**Level of Evidence: B-R = moderate LOE from RCTs; B-NR = moderate level of evidence from well designed non-randomized trials, observational studies, trial registries, or meta-analyses

Overall Learning Outcomes

- Review current evidence-based dietary guidelines and recommendations for ASCVD prevention
- Discuss the different dietary fatty acids and their potential influence on ASCVD risk
- Review current evidence-based cardioprotective dietary patterns
- Review the typical eating pattern of the U.S. population
- Identify practical application of recommendations from various professional organizations
Saturated Fatty Acids and CV Health

- There is strong evidence that saturated fatty acids (SFAs) adversely influence cardiovascular health.
  - Increased total cholesterol (total-C) and low-density lipoprotein cholesterol (LDL-C)
  - Increased coagulation
  - Increased inflammation
  - Increased insulin resistance
  - Increased risk of CVD and type 2 diabetes (T2D)
- Research examining individual saturated fatty acids suggests there is more to the story.
  - Chain length of SFAs influences biological activity

Saturated Fatty Acids and CV Health

Short-chain SFAs—less than 6 carbons in length

- Acetate (2:0), propionate (3:0), and butyrate (4:0)
- Produced by bacteria in the gut primarily via fermentation of soluble and insoluble fiber
- Recent research indicates beneficial effects of short-chain fatty acids for CV health
  - Regulate fatty acid and glucose metabolism for energy production in cells
  - Inhibit production and secretion of pro-inflammatory cytokines—TNF-a, IL-1b and IL-6
  - Stimulate the production and release of anti-inflammatory cytokine IL-10
Saturated Fatty Acids and CV Health

Medium-chain SFAs—6 – 12 carbons in length

- Caproic (6:0), caprylic (8:0), capric (10:0), and lauric (12:0)
- Caprylic and capric acids are incorporated into medium-chain triglycerides (MCT)
  - 95% of caprylic acid and capric acid are absorbed directly into the portal vein → oxidized by mitochondria for energy production
  - Research using 100% MCT oil = improved body weight and decreased fat mass; increased satiety
- Lauric acid has actions similar to long-chain SFAs
  - 70%–75% of lauric acid is absorbed with chylomicrons
  - Potent total and LDL-C-raising effect
  - Some evidence: increases coagulation, inflammation, and insulin resistance


Coconut Oil ≠ MCT Oil

- Coconut oil claims are based on the reported benefits of MCTs
- Early MCT oil research showing benefit used either 100% or >80% C:8 (caprylic) and C:10 (capric) medium-chain fatty acids
- Minimal to zero C:12 (lauric) in the experimental diets
- Coconut oil cannot be assumed to have the same health effects as MCT oil because its medium-chain fatty acid profile differs
- Only about 58% of the fatty acids in coconut oil are medium-chain fatty acids—caprylic (7.4%), capric (5.9%) and lauric acid (44%)

Saturated Fatty Acids and CV Health

Long-chain SFAs—14 – 20 carbons

▪ Myristic (14:0) and palmitic (16:0)
  ▪ Strong evidence: increase total and LDL-C
  ▪ Some evidence: increase coagulation, inflammation, and insulin resistance
  ▪ In epidemiologic studies—associated with an increased risk of coronary heart disease (CHD), CVD, and T2D
    ▪ Improved insulin sensitivity when SFA is replaced with unsaturated fatty acids in some studies
▪ Stearic (18:0): associated with increased incident T2D, but does not increase total and LDL-C


Odd-chain SFAs—15:0, 17:0, and trans-16:1n-7

▪ Primary dietary sources are dairy foods and lamb and beef
▪ Produced endogenously by gut-derived propionate (3:0)
▪ 15:0 and 17:0 levels—cohort and case-control studies – inverse association between plasma and RBC levels and the risk of CVD and T2D
▪ trans-16:1n-7 levels—mixed results with cohort studies
  ▪ 1 study – inverse relationship between levels of in RBC cell membranes and CVD mortality and sudden cardiac death
  ▪ 1 study – no association between plasma phospholipid levels and incident CVD or CHD
  ▪ 1 study – lower risk of incident diabetes with plasma phospholipid levels
▪ Many questions remain
  ▪ Dose-response patterns
  ▪ Fermented vs. non-fermented dairy products
  ▪ Potential influence of other nutrients in dairy foods

It may be that what replaces the dairy fat is what matters...

**Dairy Fat and Risk of Cardiovascular Disease in 3 Cohorts of US Adults**

**Conclusions**
- Dairy fat was not associated with risk of total CVD (RR was 1.02; 95% CI: 0.98, 1.05 for a 5% increase in energy from dairy fat) or CHD (RR was 1.03; 95% CI: 0.98, 1.09) or stroke (RR was 0.99; 95% CI: 0.93, 1.05).

- However, the replacement of dairy fat with vegetable sources of fat or PUFA was associated with significantly lower risk of CVD, whereas the replacement of dairy fat with other animal sources of fat was associated with slightly higher risk of CVD.

**Polyunsaturated Fatty Acids and CV Health**

**Omega-6 fatty acids – Linoleic acid (18:2 n-6)**
- Lowers total, LDL-C, and non-HDL-C and is associated with lower ASCVD risk when replacing SFA and compared with dietary CHO\(^1\)-\(^4\)
- A pooled analysis of 30 prospective cohort studies of adults without CVD (n = 68,659) showed higher levels of biomarkers of linoleic acid were significantly associated with lower risks of total CVD, CV mortality, and ischemic stroke\(^5\)
- Higher levels of arachidonic acid were associated with lower risk of total CVD
- A pooled analysis of 20 prospective cohort studies of adults without T2D at baseline (n = 39,000) showed higher levels of the biomarkers of linoleic acid were associated with a lower risk of T2D\(^6\)
- Levels of the biomarker arachidonic acid were not significantly associated with T2D
- Dietary intakes are not associated with increased inflammatory markers (CRP, IL-6)\(^2\)-\(^7\)

---

Polyunsaturated Fatty Acids and CV Health

**Omega-3 fatty acids**

- Alpha-linolenic acid (18:3 n-3)—higher intakes are associated with lower lipid levels, reduced vascular inflammation, and reduced blood pressure
- Eicosapentaenoic acid (20:5 n-3) and docosahexaenoic acid (22:6 n-30)—higher intakes are associated with lower triglyceride levels, lower heart rate and blood pressure, alter susceptibility to ventricular arrhythmia, and reduce platelet activation and inflammation


Monounsaturated Fatty Acids and CV Health

**When replacing SFA—**

- Oleic acid (18:1 n-9)—modest decrease in total and LDL-C; limits formation of proatherogenic oxidized LDL
- Palmitoleic acid (16:1 n-7)—emerging evidence for lower total and LDL-C; improved insulin sensitivity and decreased incidence of type 2 diabetes

Monounsaturated Fatty Acids and CV Health

- Researchers examined the association of MUFAs from plant sources (MUFA-Ps) vs. animal sources (MUFA-As) for CHD prevention\(^1\) and total mortality\(^2\)

- When MUFA-Ps were isocalorically (5% energy) replaced for
  - SFAs – associated with a **17% reduced risk** for CHD
  - Refined carbohydrate – associated with a **14% reduced risk** of CHD
  - Trans fats – associated with a **20% reduced risk** of CHD
  - MUFA-As – associated with a **24% reduced risk** of CHD
  - Sum of MUFA-As and SFAs – associated with a **19% reduced risk** of CHD

- When MUFA-As were isocalorically (5% energy) replaced for
  - SFAs or refined carbohydrate – associated with a **4% and 11% increased risk** of CHD, respectively
  - Trans fats – associated with a **12% reduced risk** of CHD

- Higher intake of MUFAs-Ps was associated with **lower mortality risk**
  - Significantly lower mortality risk when SFAs, refined CHO, or trans fats were replaced by MUFA-Ps, but not MUFA-As

- Plant-based MUFAs appear to be beneficial in long-term CHD prevention and lower risk of mortality

---

Check-in Point

- So far, are you learning what you hoped you would learn?

- Any unanswered questions from the content up to this point?

- Any new questions from the content up to this point?
Overall Learning Outcomes

▪ Review current evidence-based dietary guidelines and recommendations for ASCVD prevention
▪ Discuss the different dietary fatty acids and their potential influence on ASCVD risk
▪ Review current evidence-based cardioprotective dietary patterns
▪ Identify practical application of recommendations from various professional organizations

Evidence Supports Reducing SFA

▪ LDL-C is a causal factor for atherosclerotic CVD
Evidence Supports Reducing SFA

- Replacing SFA with other macronutrients decreases LDL-C

![Bar chart showing effects of different macronutrients on LDL-C](image)

Effects of Dietary Fat and CHO on Blood LDL-C in Meta-Regression Analysis


Evidence Supports Reducing SFA

- Replacing SFA with other macronutrients reduces CVD risk

![Bar chart showing isocaloric substitution of SFA](image)

### Dietary Fatty Acid Intake Recommendations

<table>
<thead>
<tr>
<th>Organization</th>
<th>Total fat (%)</th>
<th>PUFA (n-3)</th>
<th>PUFA (n-6)</th>
<th>MUFA</th>
<th>SFA</th>
<th>TFA</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015 DGAs</td>
<td>20-35</td>
<td>Use oils to replace solid fats; increase amount &amp; variety of seafood</td>
<td>Use oils to replace solid fats where possible</td>
<td></td>
<td></td>
<td>&lt;10%</td>
</tr>
<tr>
<td>US Dietary Reference Intake</td>
<td>20-35</td>
<td>AI for ALA=1.1-1.6 g/day or 0.6%-1.2% of intake; up to 10% can be EPA+DHA</td>
<td>5%-10% of intake; AI for LA is 12-17 g/day</td>
<td></td>
<td></td>
<td>As low as possible</td>
</tr>
<tr>
<td>Academy of Nutrition and Dietetics</td>
<td>20-35</td>
<td>0.6%-1.2% of intake as ALA; 500 mg EPA+DHA/d</td>
<td>3%-10% of intake</td>
<td>15%-20% of intake</td>
<td>Goal of &lt;7%; max of 10%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>American Heart Association (2017)</td>
<td>25-35</td>
<td>Eat fish (especially fatty fish) at least 2/wk</td>
<td>LA as 5%-10% of intake; replace SFA</td>
<td>Replace SFA in the diet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WHO/FAO</td>
<td>20-35</td>
<td>0.5%-2% of intake; min 0.5% from ALA; 250 mg EPA+DHA/d</td>
<td>Al for LA is 2%-3% of intake</td>
<td></td>
<td>&lt;10%; replace w/ PUFAs</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>European Food Safety Authority</td>
<td>20-35</td>
<td>AI for ALA=0.5% of intake; 250 mg EPA+DHA/d</td>
<td>AI for LA is 4% of intake</td>
<td></td>
<td>As low as possible</td>
<td>As low as possible</td>
</tr>
<tr>
<td>Int’l Soc. for the Study of Fatty Acids &amp; Lipids</td>
<td>20-35</td>
<td>ALA 0.7% of intake; min 500 mg EPA+DHA/d</td>
<td>AI for LA is 2% of intake</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


---

### Academy of Nutrition and Dietetics Position Statement: Dietary Fatty Acids for Healthy Adults

For the healthy adult population

- **Dietary fat should provide 20% to 35% of total daily energy**
- **Increase** consumption of omega-3 PUFAs
- **Limit** intake of saturated and *trans* fats
- **Recommends a food-based approach with regular consumption of fatty fish, nuts and seeds, lean meats and poultry, low-fat dairy products, vegetables, fruits, whole grains, and legumes**

2017 AHA Presidential Advisory on Dietary Fats & CVD

- Replace saturated fat with PUFAs and MUFAs to lower the incidence of CVD
- Reduction in total dietary fat or a goal for total fat intake is not recommended
- Shift from SFAs to PUFAs and MUFAs should occur simultaneously in an overall healthful dietary pattern
  - Foods high in unsaturated fats and lean protein foods to replace SFA
  - Carbohydrate from whole grains, nuts, seeds, and legumes

Recommendations from Various Organizations to Lower Atherogenic Cholesterol (LDL-C and Non-HDL-C)

<table>
<thead>
<tr>
<th>Organization</th>
<th>SFA</th>
<th>Replacement Macronutrient</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014 International Atherosclerosis Society Global Recommendations for the Management of Dyslipidemia</td>
<td>&lt;7%</td>
<td>MUFA, PUFA, complex CHO</td>
</tr>
<tr>
<td>2015 National Lipid Association Recommendations for Patient-Centered Management of Dyslipidemia: Part 2</td>
<td>&lt;7%</td>
<td>MUFA, PUFA, complex CHO, lean protein</td>
</tr>
<tr>
<td>2016 ESC/EAS Guidelines for the Management of Dyslipidaemias</td>
<td>&lt;7%</td>
<td>MUFA, PUFA, complex CHO</td>
</tr>
<tr>
<td>2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease</td>
<td>-</td>
<td>MUFA, PUFA, complex CHO</td>
</tr>
</tbody>
</table>

- 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
Evidence-Based Cardioprotective Dietary Patterns

High intake of
- Plant-based foods: vegetables, fruits, and whole grain foods; legumes, nuts, and seeds
- Fish or seafood, lean meats, and non-fat or low-fat (1%) dairy products
- Plant-based oils (non-tropical) in place of animal fats

Limit intake of
- High-fat red meat and processed meats, high-fat dairy products, dietary cholesterol, sodium
- Foods with added sugars, sweets, sugar-sweetened beverages


Foods CVD Risk Factor Effects

<table>
<thead>
<tr>
<th>Foods</th>
<th>CVD Risk Factor Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits and vegetables</td>
<td>↓ LDL-C, ↓ BP, ↑ glycemic control, ↓ oxidative stress</td>
</tr>
<tr>
<td>Whole grains vs. refined CHO</td>
<td>↓ LDL-C, ↓ BP, ↑ glycemic control</td>
</tr>
<tr>
<td>Vegetable oils vs. solid fat</td>
<td>↓ LDL-C</td>
</tr>
<tr>
<td>Dairy products (skim/low-fat vs. full-fat)</td>
<td>↓ BP (↓ LDL-C)</td>
</tr>
<tr>
<td>Lean meat, poultry (vs. high-fat)</td>
<td>↓ BP (↓ LDL-C)</td>
</tr>
<tr>
<td>Seafood</td>
<td>↓ TG, ↓ BP, ↓ arrhythmia, ↓ inflammation</td>
</tr>
<tr>
<td>Legumes, soy</td>
<td>↓ LDL-C, ↓ BP</td>
</tr>
<tr>
<td>Nuts, seeds</td>
<td>↓ LDL-C, ↑ HDL-C, ↓ BP, ↓ oxidative stress</td>
</tr>
</tbody>
</table>

“Importantly, food-based recommendations for fatty acids need to be made in the context of their bioactive profile.”

Plant-based Foods and CV Benefits

Viscous fiber

- **Effect on lipids**\(^1,2\)
  - Forms gel to bind bile acids in small intestine leading to increased excretion
  - Effectively lower LDL-C without affecting TG and HDL-C
  - At least 5-10 g/day or more, if acceptable to patient

- **Effect of blood pressure**\(^3\)
  - Reduced systolic and diastolic blood pressure at a median dose of 8.7 g/day

- **Foods rich in viscous fiber**
  - Legumes
  - Foods with beta-glucan (barley, oats), psyllium, pectin, and guar gum
  - Vegetables and fruits

---


Twitter: @carolkirkpat3

---

SPECIAL FOCUS ISSUE: CARDIOVASCULAR HEALTH PROMOTION

THE PRESENT AND FUTURE: COUNCIL PERSPECTIVES

Trending Cardiovascular Nutrition Controversies

Andrew M. Freeman, MD,\(^a\) Pamela B. Morris, MD,\(^b\) Neal Barnard, MD,\(^c\) Caldwell B. Esselstyn, MD,\(^d\)
Emilio Ros, MD,\(^e\) Arthur Agatston, MD,\(^f\) Stephen Devries, MD,\(^g,h\) James O'Keefe, MD,\(^i\) Michael Miller, MD,\(^j\)
Dean Ornish, MD,\(^k\) Kim Williams, MD,\(^l\) Penny Kris-Etherton, PhD\(^m\)
### Clinical Recommendations for Specific Dietary Patterns, Foods, and Nutrients

<table>
<thead>
<tr>
<th>Nutrient/Food Item</th>
<th>Level of Evidence Available and Included in This Paper</th>
<th>Recommendations for Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dietary pattern with added fats, fried food, eggs, organ and processed meats, and sugar-sweetened beverages (Southern diet pattern)</td>
<td>Prospective studies</td>
<td>Avoid ✓</td>
</tr>
<tr>
<td>Dietary cholesterol</td>
<td>RCTs and prospective studies along with meta-analyses</td>
<td>Limit ✓</td>
</tr>
<tr>
<td>Canola oil</td>
<td>RCT meta-analyses show improvement in lipids but no prospective studies or RCTs for CVD outcomes</td>
<td>In moderation ✓</td>
</tr>
<tr>
<td>Coconut oil</td>
<td>RCT meta-analyses and observational studies on adverse lipid effects. No prospective studies or RCTs for CVD outcomes</td>
<td>Avoid ✓</td>
</tr>
<tr>
<td>Sunflower oil</td>
<td>No prospective studies or RCTs for CVD outcomes</td>
<td>In moderation ✓</td>
</tr>
<tr>
<td>Olive oil</td>
<td>RCTs supporting improved CVD outcomes</td>
<td>In moderation ✓</td>
</tr>
<tr>
<td>Palm oil</td>
<td>RCTs and observation studies showing worsened CVD outcomes</td>
<td>Avoid ✓</td>
</tr>
<tr>
<td>Antioxidant-rich fruits and vegetables</td>
<td>RCTs and observational studies showing improved CVD outcomes and improvements in blood lipids</td>
<td>Frequent ✓</td>
</tr>
<tr>
<td>Antioxidant supplements</td>
<td>RCTs and prospective and observational studies show potential harm</td>
<td>Avoid ✓</td>
</tr>
<tr>
<td>Nuts</td>
<td>RCT and large prospective and meta-analysis studies showing improved CVD outcomes</td>
<td>In moderation ✓</td>
</tr>
<tr>
<td>Green leafy vegetables</td>
<td>Large meta-analyses and variably sized observational studies as well as a large prospective study</td>
<td>Frequent ✓</td>
</tr>
<tr>
<td>Protein from plant sources</td>
<td>Large observational and prospective studies</td>
<td>Frequent ✓</td>
</tr>
<tr>
<td>Gluten-containing foods</td>
<td>Observational studies and RCTs</td>
<td>Avoid if sensitive or allergic</td>
</tr>
</tbody>
</table>

**Central Illustration:** Evidence for Cardiovascular Health Impact of Foods Reviewed

<table>
<thead>
<tr>
<th>Summary of heart-harmful and heart-healthy foods/diets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Evidence of harm; limit or avoid</strong></td>
</tr>
<tr>
<td>- Coconut oil and palm oil are high in saturated fatty acids and raise cholesterol</td>
</tr>
<tr>
<td>- Eggs have a serum cholesterol-raising effect</td>
</tr>
<tr>
<td>- Juicing of fruits/vegetables with pulp removal increases caloric concentration*</td>
</tr>
<tr>
<td>- Southern diets (added fats and oils, fried foods, eggs, organ and processed meats, sugar-sweetened drinks)</td>
</tr>
<tr>
<td><strong>Inconclusive evidence; for harm or benefit</strong></td>
</tr>
<tr>
<td>- Sunflower oil and other liquid vegetable oils</td>
</tr>
<tr>
<td>- High-dose antioxidant supplements</td>
</tr>
<tr>
<td>- Juicing of fruits/vegetables without pulp removal*</td>
</tr>
<tr>
<td><strong>Evidence of benefit; recommended</strong></td>
</tr>
<tr>
<td>- Extra-virgin olive oil reduces some CVD outcomes when consumed in moderate quantities</td>
</tr>
<tr>
<td>- Blueberries and strawberries (&gt;3 servings/week) induce protective antioxidants</td>
</tr>
<tr>
<td>- 30 g serving of nuts/day. Portion control is necessary to avoid weight gain.†</td>
</tr>
<tr>
<td>- Green leafy vegetables have significant cardioprotective properties when consumed daily</td>
</tr>
<tr>
<td>- Plant-based proteins are significantly more heart-healthy compared to animal proteins</td>
</tr>
</tbody>
</table>

Dietary Cholesterol and ASCVD Risk

- Systematic reviews and meta-analyses suggest that dietary cholesterol modestly increases total-C and LDL-C—each 100mg/day of dietary cholesterol increases LDL-C by about 2 mg/dL
- Marked variability in the response to dietary cholesterol—hyper- and hypo-responders
- Baseline cholesterol intake may influence the total-C and LDL-C lowering achieved with decreasing dietary cholesterol
- The cardioprotective eating pattern should limit cholesterol intake to <200 mg/day to lower levels of atherogenic cholesterol (LDL-C and non-HDL-C)


Dietary Cholesterol, ASCVD Risk, and Eggs

- Recent epidemiological studies have shown inconsistent results for the association of egg consumption and risk of ASCVD

"Conclusions and Relevance: Among US adults, higher consumption of dietary cholesterol or eggs was significantly associated with higher risk of incident CVD and all-cause mortality in a dose-response manner."1

"Conclusions: Risk for IHD was positively associated with consumption of red and processed meat, and inversely associated with consumption of yogurt, cheese and eggs, although the associations with yogurt and eggs may be influenced by reverse causation bias."2

Interpreting these studies / things to consider

- Observational studies, not intervention studies – cannot determine cause and effect
- Intervention studies - moderate egg consumption does not raise cholesterol levels to a large degree, except in people with T2D or dyslipidemia or hyper-responders to cholesterol intake
- Important to consider replacement foods / associated nutrients / displaced nutrients

Check-in Point #2

- So far, are you learning what you hoped you would learn?

- Any unanswered questions from the content up to this point?

- Any new questions from the content up to this point?
Overall Learning Outcomes

▪ Review current evidence-based dietary guidelines and recommendations for ASCVD prevention
▪ Discuss the different dietary fatty acids and their potential influence on ASCVD risk
▪ Review current evidence-based cardioprotective dietary patterns
▪ Identify practical application of recommendations from various professional organizations

Practical Application-Meal Ideas

BREAKFAST IDEAS

LUNCH AND DINNER IDEAS

SNACK IDEAS

Encourage meals and snacks with whole, less processed foods that balance fats (primarily unsaturated fats), lean proteins, and high-quality carbohydrates.
“A registered dietitian nutritionist plays an important role in counseling the patient to develop and implement an individualized cardioprotective eating plan (i.e., medical nutrition therapy [MNT] for dyslipidemia).”¹

- MNT provided for 6 weeks to 6 months resulted in significant decreases in total-C (6–13%) and LDL-C (7–15%)

- Recent meta-analysis – a pooled analysis (10 studies) – MNT lowered LDL-C, total-C, TG, FBG, HbA1c, and BMI, improved quality adjusted life years, and reduced medication use vs. control groups²

- Multiple MNT sessions by a RDN are clinically effective and cost beneficial

Take Home Message

▪ Replacement of oils and solid fats rich in SFA with plant-based PUFAs and MUFAs is associated with reduced risk of ASCVD

▪ Evidence-based cardioprotective dietary guidelines emphasize replacing SFA with plant-based PUFAs and MUFAs, lean protein foods, and high-quality carbohydrate foods (complex); limiting dietary cholesterol and sodium, and avoiding *trans* fatty acids

▪ Evidence-based dietary patterns are
  ▪ Rich in plant-based foods, non-fat or low-fat dairy products, fish/seafood and lean protein foods, and non-tropical vegetable oils
  ▪ Low in high-fat red meat and processed meats, high-fat dairy products, foods with added sugars, sweets, and sugar-sweetened beverages

▪ RDNs facilitate individuals on following a cardioprotective dietary pattern that promotes successful dyslipidemia management

Thank You!

Carol Kirkpatrick, PhD, MPH, RDN, CLS, FNLA
Director and Clinical Associate Professor
Wellness Center
Kasiska Division of Health Sciences
Idaho State University
Email: felicaro@isu.edu