Lipid Logic: Nutrition Therapy

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@braun_lynne
Disclosures

- UpToDate: Author
Objectives

• Present a patient case that illustrates a primary prevention patient who opts for lifestyle therapy for dyslipidemia management

• Discuss 2018 AHA/ACC Multisociety Cholesterol Guideline as it pertains to patient case

• Invite 3 expert registered dietitian nutritionists (RDNs) to discuss different dietary patterns that may facilitate ASCVD risk reduction in this patient
Patient Case:

• Maria Rosa is a 61-year-old Mexican-American woman who self refers to cardiology for a heart-health evaluation

• PMHx:
  • GERD, HTN
  • Chest pain for the past 10 years; describes the pain as a 5-6/10 pressure like sensation in the retrosternal area; pain occasionally moves to the left chest and neck and becomes sharp in nature; feels she gets the pain most frequently at night when lying down, and it is relieved by sitting up; pain is rarely triggered by exercise
  • Has had extensive cardiac workup in the past, including multiple stress tests and a coronary angiogram in 2018 that was normal
Patient Case (con’t):

• Risk factors:
  • HTN on treatment (BP 144/88)
  • Dyslipidemia
    • TC   220 mg/dL
    • TG   200 mg/dL
    • HDL-C  42 mg/dL
    • LDL-C  138 mg/dL
    • Non HDL-C  178 mg/dL
  • Prediabetes (fasting glucose 110 mg/dL, A1C 6.3%)
  • Obesity (BMI 31.5 kg/m²); waist circumference 38.5 in.
  • Sedentary lifestyle
  • Father had MI at age 59, CABG at age 62
  • 3 children, preeclampsia with last pregnancy
2018 AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/AGS/APhA/ASPC/NLA/PCNA

Guideline on the Management of Blood Cholesterol

Lifestyle Counseling

• In all individuals, emphasize a heart-healthy lifestyle across the life course.

A healthy lifestyle reduces atherosclerotic cardiovascular disease (ASCVD) risk at all ages. In younger individuals, healthy lifestyle can reduce development of risk factors and is the foundation of ASCVD risk reduction.
In adults evaluated for primary ASCVD prevention, have a clinician-patient risk discussion before starting statin therapy.

Risk discussion should include:
- Review of major risk factors
- Estimated 10-year risk for ASCVD
- Presence of risk enhancing factors
- Potential benefit of statin and lifestyle therapies
- Potential for adverse drug effects and drug-drug interactions
- Consideration of cost of drug therapy
- Patient preferences and values in shared decision-making

### Current Age
- **Current Age**: 61

*Important Note: Lifetime Risk Calculator only provides lifetime risk estimates for individuals 40 to 59 years of age.*

**Age must be between 20-79**

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### Sex
- **Sex**: Female

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### Race
- **Race**: Other

*Important Note: See the Estimate Warning below*

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### Systolic Blood Pressure (mm Hg)
- **Value**: 144

*Value must be between 90-200*

### Diastolic Blood Pressure (mm Hg)
- **Value**: 88

*Value must be between 60-130*

### Total Cholesterol (mg/dL)
- **Value**: 220

*Value must be between 130 - 320*

### HDL Cholesterol (mg/dL)
- **Value**: 42

*Value must be between 20 - 100*

### LDL Cholesterol (mg/dL)
- **Value**: 138

*Value must be between 30-300*

### History of Diabetes?
- **Option**: No

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### Smoker?
- **Current**: No
- **Former**: No
- **Never**: Yes

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*Note: These estimates may underestimate the 10-year and lifetime risk for persons from some race/ethnic groups, especially American Indians, some Asian Americans (e.g., of south Asian ancestry), and some Hispanics (e.g., Puerto Ricans), and may overestimate the risk for others, including some Asian Americans (e.g., of east Asian ancestry) and some Hispanics (e.g., Mexican Americans). Because the primary use of these risk estimates is to facilitate the very important discussion regarding risk reduction through lifestyle change, the imprecision introduced is small enough to justify proceeding with lifestyle change counseling informed by these results.*
Primary ASCVD Prevention

In adults without diabetes and a 10-year ASCVD risk of $\geq 7.5\%$, start a moderate-intensity statin if a discussion of treatment options favors statin therapy.

- The presence of risk-enhancing factors especially favors initiation of statin therapy.

Risk Enhancing Factors

- Family history of premature ASCVD;
- Persistently elevated LDL-C levels $\geq 160$ mg/dL;
- Metabolic syndrome;
- Chronic kidney disease;
- History of preeclampsia or premature menopause (age <40 yrs);
- Chronic inflammatory disorders (e.g., rheumatoid arthritis, psoriasis, or chronic HIV);
- High-risk ethnic groups (e.g., South Asian);
- Persistent elevations of triglycerides $\geq 175$ mg/dL.

If measured in selected individuals:

- Apolipoprotein B $\geq 130$ mg/dL;
- High-sensitivity C-reactive protein $\geq 2.0$ mg/L;
- Ankle-brachial index $<0.9$;
- Lipoprotein (a) $\geq 50$ mg/dL or 125 nmol/L, especially at higher values of lipoprotein (a).


**Primary Prevention:** Assess ASCVD Risk in Each Age Group

**Emphasize Adherence to Healthy Lifestyle**

- **Age 0-19 y**
  - Lifestyle to prevent or reduce ASCVD risk
  - Diagnosis of Familial Hypercholesterolemia → statin

- **Age 20-39 y**
  - Estimate lifetime risk to encourage lifestyle to reduce ASCVD risk
  - Consider statin if family history premature ASCVD and LDL-C ≥160 mg/dL (≥4.1 mmol/L)

- **Age 40-75 y and LDL-C ≥70-<190 mg/dL (≥1.8-<4.9 mmol/L)**
  - 10-year ASCVD risk percent begins risk discussion

**ASCVD Risk Enhancers:**
- Family history of premature ASCVD
- Persistently elevated LDL-C ≥160 mg/dL (≥4.1 mmol/L)
- Chronic kidney disease
- Metabolic syndrome
- Conditions specific to women (e.g., preeclampsia, premature menopause)
- Inflammatory diseases (especially rheumatoid arthritis, psoriasis, HIV)
- Ethnicity (e.g., South Asian ancestry)

**Lipid/Biomarkers:**
- Persistently elevated triglycerides ≥175 mg/dL (≥2.0 mmol/L)

In selected individuals if measured:
- hs-CRP ≥2.0 mg/L
- Lp(a) levels >50 mg/dL or >125 nmol/L
- apoB ≥130 mg/dL
- Ankle-brachial index (ABI) <0.9

**Risk Assessment Flowchart:**

- **LDL-C ≥190 mg/dL (≥4.9 mmol/L)**
  - No risk assessment; High-intensity statin (Class I)

- **Diabetes mellitus and age 40-75 y**
  - Moderate-intensity statin (Class I)

- **Diabetes mellitus and age 40-75 y**
  - Risk assessment to consider high-intensity statin (Class IIa)

- **Age >75 y**
  - Clinical assessment, Risk discussion

**Risk Categories:**

- **<5%**
  - “Low Risk”
  - Risk discussion: Emphasize lifestyle to reduce risk factors (Class I)

- **5% - <7.5%**
  - “Borderline Risk”
  - Risk discussion: If risk enhancers present then risk discussion regarding moderate-intensity statin therapy (Class IIb)

- **≥7.5% - <20%**
  - “Intermediate Risk”
  - Risk discussion: If risk estimate + risk enhancers favor statin, initiate moderate-intensity statin to reduce LDL-C by 30% - 49% (Class I)

- **≥20%**
  - “High Risk”
  - Risk discussion: Initiate statin to reduce LDL-C ≥50% (Class I)

If risk decision is uncertain:
- Consider measuring CAC in selected adults:
  - CAC = zero (lowers risk; consider no statin, unless diabetes, family history of premature CHD, or cigarette smoking are present)
  - CAC = 1-99 favors statin (especially after age 55)
  - CAC = 100+ and/or ≥75th percentile, initiate statin therapy
**Checklist for Clinician–Patient Shared Decision-Making for Initiating Therapy**

<table>
<thead>
<tr>
<th>Checklist Item</th>
<th>Recommendation</th>
</tr>
</thead>
</table>
| ASCVD risk assessment           | - Assign to statin treatment group; use ASCVD Risk Estimator Plus.*  
|                                 |   - In lower-risk primary-prevention adults 40-75 y of age with LDL-C $\geq$ 70 mg/dL (≥1.8 mmol/L).  
|                                 |   - Not needed in secondary prevention, in those with LDL-C $\geq$ 190 mg/dL (≥4.9 mmol/L), or in those 40-75 y of age with diabetes mellitus.  
|                                 |   - Assess other patient characteristics that influence risk. See Risk-Enhancing Factors (Section 4.4.1.3. and Table 6)  
|                                 |   - Assess CAC (Section 4.4.1.4.) if risk decision is uncertain and additional information is needed to clarify ASCVD risk.  
|                                 |   - Use decision tools to explain risk (e.g., ASCVD Risk Estimator Plus,* Mayo Clinic Statin Choice Decision Aid).                                                                                         |
| Lifestyle modifications         | - Review lifestyle habits (e.g., diet, physical activity, weight or body mass index, and tobacco use).  
|                                 | - Endorse a healthy lifestyle and provide relevant advice, materials, or referrals. (e.g., CardioSmart, AHA Life’s Simple 7, NLA Patient Tear Sheets, PCNA Clinicians’ Lifestyle Modification Toolbox, cardiac rehabilitation, dietitian, smoking cessation program). |

Checklist for Clinician–Patient Shared Decision-Making for Initiating Therapy

<table>
<thead>
<tr>
<th>Checklist Item</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential net clinical benefit of pharmacotherapy</td>
<td>• Recommend statins as first-line therapy.</td>
</tr>
<tr>
<td></td>
<td>• Consider the combination of statin and nonstatin therapy in selected patients.</td>
</tr>
<tr>
<td></td>
<td>• Discuss potential risk reduction from lipid-lowering therapy.</td>
</tr>
<tr>
<td></td>
<td>• Discuss the potential for adverse effects or drug–drug interactions.</td>
</tr>
</tbody>
</table>

Checklist for Clinician–Patient Shared Decision-Making for Initiating Therapy

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<tr>
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<th>Recommendation</th>
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<tbody>
<tr>
<td>Cost considerations</td>
<td>• Discuss potential out-of-pocket cost of therapy to the patient (e.g., insurance plan coverage, tier level, copayment).</td>
</tr>
<tr>
<td>Shared decision-making</td>
<td>• Encourage the patient to verbalize what was heard (e.g., patient’s personal ASCVD risk, available options, and risks/benefits).</td>
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<tr>
<td></td>
<td>• Invite the patient to ask questions, express values and preferences, and state ability to adhere to lifestyle changes and medications.</td>
</tr>
<tr>
<td></td>
<td>• Refer patients to trustworthy materials to aid in their understanding of issues regarding risk decisions.</td>
</tr>
<tr>
<td></td>
<td>• Collaborate with the patient to determine therapy and follow-up plan.</td>
</tr>
</tbody>
</table>

Case Continued

- Clinician-patient risk discussion included:
  - Review of traditional risk factors: HTN, dyslipidemia, obesity, sedentary lifestyle
  - 10-year estimated ASCVD risk: 7.8% (intermediate risk)
  - Discussion of risk enhancing factors: family history of premature ASCVD, metabolic syndrome, history of preeclampsia, TG elevation
  - Benefits vs. risk of statin and lifestyle therapies
  - Patient values and preferences

- Patient verbalized her dislike of medications. She requested a 6 mo. trial of lifestyle intervention, although she agreed to intensification of antihypertensive drug regimen.

- Referral to RDN.
Hold the Meat, Pass the Fruits, Vegetables, and Legumes: Healthy Plant-Based Dietary Pattern

KATHY RHODES, PHD, RDN
CARDIOVASCULAR DIETITIAN, RETIRED
MICHIGAN MEDICINE
Disclosures

None
Goal: Recommend a healthy plant-based eating pattern as underlying treatment for this patient

- Review the range of definitions of plant-based food patterns
- Differentiate between healthy and less healthy plant-based eating
- Review the evidence for plant-based eating patterns in reducing risk of **atherosclerotic cardiovascular disease (ASCVD)**
- Describe how to counsel this patient on plant-based eating
- Provide resources on cardioprotective plant-based eating **patterns**
### Plant-Based Eating Patterns

<table>
<thead>
<tr>
<th>Mediterranean diet</th>
<th>Pescatarian</th>
<th>Lacto-ovo vegetarian</th>
<th>Lacto-veg</th>
<th>Ovo-veg</th>
<th>Vegan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Flexitarian</td>
<td>Ornish</td>
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</tbody>
</table>

- Not all plant-based dietary patterns are equal in quality
- When evaluating research, it is important to understand the dietary patterns included in the studies
- Clearly define the eating plan you are prescribing for the patient
- Understand what the patient is eating

- Esselstyn
- McDougall
- WFPB
- Portfolio Diet
- Eco-Atkins
- Nutritarian-Fuhrman
- Raw foods
Low-Fat Vegetarian Diet as Part of Lifestyle Intervention for Regression of Cardiovascular Disease

Can lifestyle changes reverse coronary heart disease?
The Lifestyle Heart Trial


Affiliations + expand
PMID: 1973470 DOI: 10.1016/0140-6736(90)91656-u

Abstract
In a prospective, randomised, controlled trial to determine whether comprehensive lifestyle changes affect coronary atherosclerosis after 1 year, 28 patients were assigned to an experimental group (low-fat vegetarian diet, stopping smoking, stress management training, and moderate exercise) and 20 to a usual-care control group. 195 coronary artery lesions were analysed by quantitative coronary angiography. The average percentage diameter stenosis regressed from 40.0 (SD 16.9) to 37.8 (16.5) in the experimental group yet progressed from 42.7 (15.5) to 46.1 (18.5) in the control group. When only lesions greater than 50% stenosed were analysed, the average percentage diameter stenosis regressed from 61.1 (8.8) to 55.8 (11.0) in the experimental group and progressed from 61.7 (9.5) to 64.4 (16.3) in the control group. Overall, 82% of experimental-group patients had an average change towards regression. Comprehensive lifestyle changes may be able to bring about...
Provegetarian Food Pattern and Mortality in PREDIMED

416,104 adults, median age 62.0 yrs.

**Findings:** Higher plant protein intake versus animal protein was associated with small reductions in risk of overall and CV mortality.

Replacement of 3% energy from animal protein with plant protein was inversely associated with overall mortality (risk decreased 10% in both men and women) and CVD mortality (11% lower risk in men and 12% lower risk in women).

The lower overall mortality was attributable primarily to substitution of plant protein for egg protein (24% lower risk in men and 21% lower risk in women) and red meat protein (13% lower risk in men and 15% lower risk in women).

Forest Plot Summary of All-cause Mortality, Incidence and Mortality from Cardio-cerebrovascular Diseases and Total Cancer

<table>
<thead>
<tr>
<th>Outcome</th>
<th>n of studies (n of cohorts)</th>
<th>n of participants</th>
<th>Risk Ratio (Random, 95% CI)</th>
<th>P</th>
<th>P (Heter)</th>
<th>I² (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vegetarians</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All-cause mortality</td>
<td>5 (7)</td>
<td>66 018</td>
<td>0.94 (0.86, 1.04)</td>
<td>0.24</td>
<td>&lt;0.001</td>
<td>83</td>
</tr>
<tr>
<td>Cardiovascular diseases</td>
<td>4 (5)</td>
<td>47 757</td>
<td>0.93 (0.86, 1.00)</td>
<td>0.07</td>
<td>0.91</td>
<td>0</td>
</tr>
<tr>
<td>Ischemic heart disease</td>
<td>5 (7)</td>
<td>65 058</td>
<td>0.75 (0.66, 0.85)</td>
<td>&lt;0.001</td>
<td>0.16</td>
<td>35</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>3 (6)</td>
<td>45 616</td>
<td>0.93 (0.78, 1.10)</td>
<td>0.29</td>
<td>0.13</td>
<td>44</td>
</tr>
<tr>
<td>Cancer incidence</td>
<td>2 (3)</td>
<td>38 033</td>
<td>0.92 (0.87, 0.98)</td>
<td>0.002</td>
<td>0.35</td>
<td>0</td>
</tr>
<tr>
<td>Cancer mortality</td>
<td>3 (4)</td>
<td>21 676</td>
<td>0.98 (0.86, 1.11)</td>
<td>0.76</td>
<td>0.24</td>
<td>29</td>
</tr>
<tr>
<td>Breast cancer incidence</td>
<td>2 (3)</td>
<td>24 789</td>
<td>0.94 (0.84, 1.06)</td>
<td>0.31</td>
<td>0.54</td>
<td>0</td>
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<tr>
<td>Breast cancer mortality</td>
<td>2 (5)</td>
<td>26 618</td>
<td>0.94 (0.86, 1.02)</td>
<td>0.81</td>
<td>0.03</td>
<td>62</td>
</tr>
<tr>
<td>Colorectal cancer mortality</td>
<td>2 (6)</td>
<td>46 368</td>
<td>0.90 (0.76, 1.03)</td>
<td>0.18</td>
<td>0.52</td>
<td>0</td>
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<tr>
<td>Prostate cancer mortality</td>
<td>2 (5)</td>
<td>28 618</td>
<td>0.90 (0.83, 1.02)</td>
<td>0.56</td>
<td>0.41</td>
<td>0</td>
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<tr>
<td>Lung cancer mortality</td>
<td>2 (4)</td>
<td>27 515</td>
<td>0.86 (0.62, 1.19)</td>
<td>0.36</td>
<td>0.73</td>
<td>0</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome</th>
<th>n of studies (n of cohorts)</th>
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<tbody>
<tr>
<td><strong>Vegans</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>All-cause mortality</td>
<td>2 (9)</td>
<td>6 301</td>
<td>0.88 (0.75, 1.02)</td>
<td>0.10</td>
<td>0.42</td>
<td>0</td>
</tr>
<tr>
<td>Cancer incidence</td>
<td>2 (3)</td>
<td>7 168</td>
<td>0.85 (0.75, 0.95)</td>
<td>0.006</td>
<td>0.71</td>
<td>0</td>
</tr>
</tbody>
</table>

Not All Plant-Based Eating Plans are Equal

Diet Scores

Plant-based Diet Index (PDI) -------

Healthful Plant-based Diet Index (hPDI) _______
-whole grains, fruits, vegetables, nuts, legumes, tea, coffee

Unhealthful PDI (uPDI) ________
-refined grains, potatoes, sugar-sweetened beverages, sweets, salty foods

Satija et al. J Am Coll Cardiol. 2017;70(4):411-422
<table>
<thead>
<tr>
<th>Genetic risk strata to dietary patterns</th>
<th>Incident cases/PYs</th>
<th>Incidence rate per 1000 PYs</th>
<th>Age-sex-ethnicity-adjusted HR</th>
<th>Multivariate-adjusted HR, model 1</th>
<th>Multivariate-adjusted HR, model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High GRS-MI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low adherence (healthful PDI quintile, Q: Q1)</td>
<td>236/75,043</td>
<td>3.14</td>
<td>1.00 (Reference)</td>
<td>1.00 (Reference)</td>
<td>1.00 (Reference)</td>
</tr>
<tr>
<td>Intermediate adherence (Q2–Q4)</td>
<td>595/236,803</td>
<td>2.51</td>
<td>0.81 (0.70, 0.94)</td>
<td>0.85 (0.73, 0.99)</td>
<td>0.89 (0.76, 1.04)</td>
</tr>
<tr>
<td>High adherence (Q5)</td>
<td>162/76,574</td>
<td>2.12</td>
<td>0.71 (0.58, 0.87)</td>
<td>0.77 (0.63, 0.95)</td>
<td>0.83 (0.68, 1.02)</td>
</tr>
<tr>
<td><strong>Low GRS-MI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low adherence (Q1)</td>
<td>191/76,489</td>
<td>2.50</td>
<td>0.81 (0.67, 0.98)</td>
<td>0.81 (0.67, 0.98)</td>
<td>0.82 (0.68, 0.99)</td>
</tr>
<tr>
<td>Intermediate adherence (Q2–Q4)</td>
<td>471/236,935</td>
<td>1.99</td>
<td>0.63 (0.54, 0.74)</td>
<td>0.66 (0.56, 0.77)</td>
<td>0.70 (0.59, 0.82)</td>
</tr>
<tr>
<td>High adherence (Q5)</td>
<td>134/75,618</td>
<td>1.77</td>
<td>0.60 (0.48, 0.74)</td>
<td>0.65 (0.52, 0.80)</td>
<td>0.70 (0.57, 0.87)</td>
</tr>
<tr>
<td><strong>High GRS-stroke</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Low adherence (Q1)</td>
<td>237/75,939</td>
<td>3.12</td>
<td>1.00 (Reference)</td>
<td>1.00 (Reference)</td>
<td>1.00 (Reference)</td>
</tr>
<tr>
<td>Intermediate adherence (Q2–Q4)</td>
<td>565/236,358</td>
<td>2.39</td>
<td>0.76 (0.65, 0.89)</td>
<td>0.80 (0.69, 0.93)</td>
<td>0.83 (0.71, 0.97)</td>
</tr>
<tr>
<td>High adherence (Q5)</td>
<td>152/76,398</td>
<td>1.99</td>
<td>0.67 (0.54, 0.82)</td>
<td>0.72 (0.59, 0.89)</td>
<td>0.77 (0.63, 0.95)</td>
</tr>
<tr>
<td><strong>Low GRS-stroke</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low adherence (Q1)</td>
<td>190/75,594</td>
<td>2.51</td>
<td>0.80 (0.66, 0.96)</td>
<td>0.79 (0.66, 0.96)</td>
<td>0.79 (0.66, 0.96)</td>
</tr>
<tr>
<td>Intermediate adherence (Q2–Q4)</td>
<td>501/237,380</td>
<td>2.11</td>
<td>0.67 (0.57, 0.78)</td>
<td>0.70 (0.60, 0.82)</td>
<td>0.73 (0.62, 0.85)</td>
</tr>
<tr>
<td>High adherence (Q5)</td>
<td>144/75,793</td>
<td>1.90</td>
<td>0.63 (0.51, 0.78)</td>
<td>0.69 (0.56, 0.85)</td>
<td>0.74 (0.60, 0.91)</td>
</tr>
</tbody>
</table>

Cox regression models were performed to calculate HRs and 95% CIs.
Age-sex-ethnicity-adjusted model included age, sex, ethnicity, and the top 5 ancestry principal components.
Multivariate-adjusted model 1 included age, sex, ethnicity, education, Townsend Deprivation Index, smoking habit, multivitamin use, total energy intake, alcohol consumption, and physical activity.
Multivariate-adjusted model 2 included covariates in model 1 + BMI, hypertension, dyslipidemia, and type 2 diabetes.
Adherence to dietary patterns: high adherence was indicated by the highest quintile (Q5) of healthful-PDI; intermediate adherence was indicated by Q2–Q4 of healthful-PDI; low adherence was indicated by Q1 of healthful-PDI.
GRS, genetic risk score; MI, myocardial infarction; PDI, plant-based diet index; PYs, person-years; Q, quintile.
Plant-Based Vegetarian Food Pattern

- Vegetables
- Legumes (beans, peas, and lentils)
- Fruit
- Whole Grains
- Nuts
- Seeds
- Egg whites and nonfat dairy, optional
- Oils, optional

Tangy Spinach Salad with Fresh Fruit

Mexican-Style Beans and Rice

Mhealthy.umich.edu/recipes
Case Continued

Clinician-patient risk discussion included:
- Review of traditional risk factors: HTN, dyslipidemia, obesity, sedentary lifestyle
- 10-year estimated ASCVD risk: 7.8% (borderline risk)
- Discussion of risk enhancing factors: family history of premature ASCVD, metabolic syndrome, history of preeclampsia, TG elevation
- Benefits vs. risk of statin and lifestyle therapies
- Patient values and preferences

Patient verbalized her dislike of medications. She requested a 6 mo. trial of lifestyle intervention, although she agreed to intensification of antihypertensive drug regimen.

Referral to RDN.
Pooled Estimates of Effects on CVD Risk Factors in Vegetarians and Vegans Compared with Omnivores

<table>
<thead>
<tr>
<th>Outcome</th>
<th>N studies</th>
<th>Vegetarians (n)</th>
<th>Omnivores (n)</th>
<th>WMD</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI (kg/m²)</td>
<td>71</td>
<td>57 724</td>
<td>199 230</td>
<td>-1.49</td>
<td>-1.72 to -1.25</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Total cholesterol (mg/dL)</td>
<td>64</td>
<td>5 561</td>
<td>23 573</td>
<td>-28.16</td>
<td>-31.22 to -25.10</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>LDL-cholesterol (mg/dL)</td>
<td>46</td>
<td>5 583</td>
<td>22 934</td>
<td>-21.27</td>
<td>-24.27 to -18.27</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>HDL-cholesterol (mg/dL)</td>
<td>51</td>
<td>6 194</td>
<td>23 660</td>
<td>-2.72</td>
<td>-3.40 to -2.04</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Triglycerides (mg/dL)</td>
<td>55</td>
<td>4 008</td>
<td>22 083</td>
<td>-11.39</td>
<td>-17.42 to -5.37</td>
<td>0.02</td>
</tr>
<tr>
<td>Blood glucose (mg/dL)</td>
<td>27</td>
<td>2 256</td>
<td>2 192</td>
<td>-5.08</td>
<td>-5.98 to -4.19</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome</th>
<th>N studies</th>
<th>Vegans (n)</th>
<th>Omnivores (n)</th>
<th>WMD</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI (kg/m²)</td>
<td>19</td>
<td>8 376</td>
<td>123 292</td>
<td>-1.72</td>
<td>-2.21 to -1.22</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Total cholesterol (mg/dL)</td>
<td>19</td>
<td>1 272</td>
<td>12 213</td>
<td>-31.02</td>
<td>-34.82 to -27.21</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>LDL-cholesterol (mg/dL)</td>
<td>13</td>
<td>728</td>
<td>11 670</td>
<td>-22.87</td>
<td>-29.92 to -15.82</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>HDL-cholesterol (mg/dL)</td>
<td>15</td>
<td>1 175</td>
<td>12 114</td>
<td>-1.54</td>
<td>-2.96 to -0.12</td>
<td>0.61</td>
</tr>
<tr>
<td>Triglycerides (mg/dL)</td>
<td>13</td>
<td>483</td>
<td>10 110</td>
<td>-9.35</td>
<td>-20.28 to 1.57</td>
<td>0.09</td>
</tr>
<tr>
<td>Blood glucose (mg/dL)</td>
<td>4</td>
<td>83</td>
<td>125</td>
<td>-6.38</td>
<td>-12.35 to -0.41</td>
<td>0.04</td>
</tr>
</tbody>
</table>
**Summary effect estimates of meta-analyses of RCTs examining the effects of vegetarian diets on cardiovascular risk factors**

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Types of control diets</th>
<th>Endpoint</th>
<th>Summary effect estimate comparing vegetarian with control diets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wang (2015) (22)</td>
<td>Usual diet, ADA diet, Prudent diet with lean meat, low-fat diet, Diabetic diet</td>
<td>Total cholesterol</td>
<td>$-0.36 \text{ mmol/L (}-0.55, -0.17)$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LDL cholesterol</td>
<td>$-0.34 \text{ mmol/L (}-0.57, -0.11)$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HDL cholesterol</td>
<td>$-0.10 \text{ mmol/L (}-0.14, -0.06)$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Triglycerides</td>
<td>$0.04 \text{ mmol/L (}-0.05, 0.13)$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-HDL cholesterol</td>
<td>$-0.30 \text{ mmol/L (}-0.50, -0.10)$</td>
</tr>
<tr>
<td>Yokoyama (2014) (23)</td>
<td>Usual diet, Prudent diet with lean meat, low-fat diet</td>
<td>Systolic blood pressure†</td>
<td>$-4.8 \text{ mmHg (}-6.6, -3.1)$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diastolic blood pressure†</td>
<td>$-2.2 \text{ mmHg (}-3.5, -1.0)$</td>
</tr>
<tr>
<td>Huang (2015) (24)</td>
<td>Usual diet, Diabetic diet, low-fat diet, NCEP diet, low-carb diet, high-carb diet, high-protein (from meat) diet</td>
<td>Body weight</td>
<td>$-2.02 \text{ kg (}-2.80, -1.23)$</td>
</tr>
<tr>
<td>Yokoyama (2014) (25)</td>
<td>Usual diet, ADA diet, low-fat diet, Diabetic diet</td>
<td>HbA1c††</td>
<td>$-0.39% (-0.62, -0.15)$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fasting blood glucose</td>
<td>$-0.36 \text{ mmol/L (}-1.04, 0.32)$</td>
</tr>
</tbody>
</table>

*P value$<0.05$
†1 trial out of 7 trials was non-randomized
††2 trials out of 5 trials were non-randomized

Vegan Diet, Weight Loss, and Insulin Resistance

16 week Randomized controlled trial
A low-fat vegan diet consisting of vegetables, grains legumes, fruits, no animal products or added oils versus Control current diets, which included meat and dairy

Also see:
Kahleova et al. JAMA Network Open. 2020;3(11):e2025454

Kahleova et al. Nutrients. 2018;10:1302
The CARDIVEG Study: Low-calorie Lacto-ovo Vegetarian Diet versus Low-calorie Mediterranean Diet

Randomized, open, crossover 3-month dietary trial in a low-risk population

n =118, mean age 51.1 y, 78% female

Both diets had similar effects ($P>0.05$) on weight, BMI, fat mass, oxidative profile.

Vegetarian diet

- was more effective in lowering LDL-C ($-5.4\%, P<0.05$)
- lowered Vitamin B12; B12 remained within normal limits
- lowered uric acid

Mediterranean diet

- was more effective in lowering TG ($-5.9\%, P<0.05$).
- improved interleukin-17 levels ($-8.4\%, P<0.05$).

46 participants in Vegetarian period and 35 in the Mediterranean period reached target values for $\geq 1$ CV risk factors

Sofi et al. *Circulation*.2018;1103-1113
The Portfolio Diet: Maximizing Lipid-lowering Power of a Vegetarian Diet

Low saturated fat vegetarian diet plus:
- Plant sterols
  - 1.0 g per 1000 kcal
- Viscous fibers
  - 9.8 g per 1000 kcal
- Soy protein
  - 21.4 g per 1000 kcal
- Nuts
  - 14 g per 1000 kcal

Gigleux et al. *Brit J of Nutr* (2007);98:1229-1236
Vegetarian Diet (VD) versus Meat Diet (MD) in Secondary Prevention

MD = Meat diet
VD = Vegetarian diet
Vegetarian Diet versus Meat Diet in Secondary Prevention (continued)

There were differences between the Vegetarian and Meat Diets in:

- the relative abundance of microbe genera within the families Ruminococcaceae, Lachnospiraceae, Akkermansiaaceae.
- plasma metabolites: l-carnitine, acylcarnitine metabolites, phospholipids.

Reduction of oxidized LDL-C on Vegetarian Diet compared to Meat Diet was associated with baseline gut microflora composition dominated by several genera of Ruminococcaceae.

“The VD favorably changed levels of several lipotoxic lipids that have previously been associated with increased risk of coronary events in CAD patients.”

Patient Values and Preferences: The Patient Conversation

Listen to how a vegetarian eating plan is consistent with her values
- Health, environment, ethical, avoid/reduce medications

Assess her understanding and ability to adopt a healthy plant-based meal plan

Assess adequacy of food choices and need for supplements

Explore how changing her eating impacts family

Honor her cultural heritage

Plan for support and assessing progress
Heart-Healthy Eating Vegetarian Style

Advice from the National Lipid Association Clinician’s Lifestyle Modification Toolbox

Why Choose a Vegetarian or Vegan, Plant-Based Eating Pattern?
A vegetarian and vegan eating patterns are a way to eat heart-healthy. This pattern of eating can help decrease your LDL (“bad”) cholesterol level and reduce your blood pressure. In fact, research studies have shown that vegetarians and vegans have an overall lower risk for heart disease, diabetes, high blood pressure, obesity, and some types of cancer.

The Basics of Vegetarian or Vegan Eating Patterns
Vegetarian and vegan eating patterns include meat and poultry. Vegetarians eat legumes, soy proteins, vegetables, fruits, whole grains, dairy alternatives (soy or almond milk and yogurt) and healthy fats in liquid vegetable oil, avocado, nuts and seeds. Some vegetarians eat eggs, low-fat (1%) or fat-free dairy products referred to as lacto-ovo vegetarians and others eat fish and are known as pescatarians. Those who eat only plant-based foods are vegans. Vegans eat legumes, soy proteins, vegetables, fruits, whole grains, dairy alternatives and healthy fats and avoid dairy, eggs and fish.

Tips for Eating More Plant-Based Foods

Eat lots of vegetables. Fill at least ½ of your plate with a variety of brightly colored vegetables — think colors of the rainbow.

Choose plant-based protein. Fill ¼ of your plate with soy (tofu, edamame, textured soy protein) or legumes (kidney, pinto, and black beans) and lentils. Choose a soy burger or veggie burger instead of a hamburger or turkey burger. Use beans and lentils in casseroles, pasta dishes, soups, and salads instead of meat.

Asenst foods with healthy fats, like extra virgin olive oil in cooking and with salads, avocado slices on salads or tofu wraps, and 1 oz. a day of many kinds of unsalted nuts or seeds with meals and as snacks.

Vegetarian/Vegan Meal Ideas

There are many ways to make vegetarian meals. Some ideas are:

- **Breakfast**: Oatmeal with berries and raw nuts or whole-wheat toast with almond butter, and berries; soy milk with no added sugar; coffee or tea with no sugar; and water to drink.
- **Lunch**: Baked tofu in a whole-wheat wrap with arugula, olives, mustard, and cucumber; navy bean soup; fresh apples; and water or other calorie-free beverage to drink.
- **Snacks**: Raw almonds and seeds; fresh, raw cut-up vegetables; fresh fruit and water to drink.
- **Dinner**: Vegan pumpkin and black bean chili with onions, low-sodium diced tomatoes and spices, whole-grain roll, seasonal fresh fruit, and fortified almond milk with no added sugar or water to drink.

A registered dietitian nutritionist (RDN) can help you make a heart-healthy meal plan that works best for your lifestyle and support you in your nutrition journey. Talk with an RDN for the answers to your nutrition questions.

Provided as part of the Clinician’s Lifestyle Modification Toolbox on Lipid.org. Visit LearnYourLipids.com to learn more.
Protein in Vegetarian and Vegan Diets

Protein is a nutrient made of amino acids, which are the building blocks for many of your body’s structures, including muscles, bones, skin, and hair. Amino acids also play an important role in the creation of many substances (such as hormones and enzymes) that you need to live a healthy life.

There are nine amino acids that our bodies cannot make on their own. These are called “essential amino acids.” This means we must consume proteins containing these essential amino acids from the food we eat. Contrary to popular belief, it is not difficult to meet your protein needs on a vegetarian or vegan diet. Studies show that most vegetarians and vegans meet or exceed their daily protein requirements. Focusing on a variety of protein-rich foods throughout the day will ensure you get the needed amounts of amino acids in your diet.

Plant Proteins

Most plant foods (with the exception of soy, quinoa, and spinach) may be low in one or two essential amino acids. However, you can get enough of the essential amino acids by including a variety of whole plant foods in your diet. It was once thought that plant proteins needed to be combined within a meal by mixing grains and legumes to create a “complete” protein, also called complementary proteins. Modern science has recently revealed that our liver can store amino acids long-term, meaning we do not have to combine them in one meal.

Legumes (or pulses), which include beans, lentils, and dried peas are rich sources of protein. Other sources of plant-based protein include whole grains, vegetables, nuts, and seeds.

Certain whole grains, such as wheat varieties like farro, Kamut®, and wheat berries provide up to 11 grams of protein per cup. Protein-rich vegetables include spinach (3 grams per cup, cooked) and peas (8 grams per cup, cooked).

A variety of easy-to-use meat alternatives can be found in most supermarkets, such as veggie burgers, meatless bacon, hot dogs, and “beef” crumbles, as well as faux chicken nuggets, sausage, and “beef” strips. Meat alternatives can help ease the stress of meal planning or be a great item to bring to a friend’s cookout. However, you’re better off choosing minimally processed plant food sources of protein that have lower levels of sodium and no artificial additives.

Plant proteins are naturally packed with other beneficial nutrients like fiber, vitamins, minerals, healthy fat, and antioxidants. They typically contain very little saturated fat, sodium and cholesterol. This may be one reason why vegetarian and vegan diets are linked with a lower risk of disease.

Lacto-Ovo Vegetarian Proteins

Animal protein, such as that found in meat, dairy and eggs, is considered “high quality” protein because it has high amounts of all nine essential amino acids. Meeting your protein needs may be more easily accessed on a vegetarian (versus vegan) diet, because you can include high quality animal protein sources such as milk, cheese, cottage cheese, and eggs to help meet protein needs. Some vegetarians choose to use these animal proteins, however, it’s important to eat dairy and eggs in moderation—about 3 servings of dairy products per day and 3 eggs per week for the average adult—to avoid excess intake of saturated fat.

How Much Protein Does a Body Need?

The overall daily protein recommendation for vegetarians is the same as for every healthy person:

0.4 grams per pound of body weight.

For example, if you weigh 150 pounds, you would multiply 150 x 0.4 = 60 grams of protein for your daily need.

Vegans (due to plant proteins being slightly less digestible) and older adults may benefit from a slightly higher amount of protein—approximately 0.5 grams per pound of body weight.

The Bottom Line

While many people think protein can be a challenge for vegetarians and vegans, it’s easier than you think to meet your needs. Focus on choices that include plenty of whole, minimally processed plant foods (see Protein-rich Plant Foods) at each meal and snack, and avoid relying on highly processed, low-nutrient foods, such as chips, cookies, sweets, and refined grain products, which can crowd out protein in your diet.

A registered dietitian nutritionist (RDN) can help you develop a healthy vegetarian eating plan that meets your needs. To find an RDN in your area, visit https://vegetariannutrition.net/find-a-registered-dietitian/

<table>
<thead>
<tr>
<th>Protein-rich Plant Foods</th>
<th>Food</th>
<th>Serving</th>
<th>Calories</th>
<th>Protein (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lentils</td>
<td>½ cup</td>
<td>101</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Black Beans</td>
<td>½ cup</td>
<td>114</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Lima Beans</td>
<td>½ cup</td>
<td>123</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Red Kidney Beans</td>
<td>½ cup</td>
<td>112</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Black-eyed Peas</td>
<td>½ cup</td>
<td>100</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Chickpeas</td>
<td>½ cup</td>
<td>134</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Soy Foods</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tempeh</td>
<td>½ cup</td>
<td>100</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Veggie burger (averagea)</td>
<td>1-70 g</td>
<td>124</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Tofu</td>
<td>½ cup</td>
<td>84</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Soy milk</td>
<td>1 cup</td>
<td>152</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roasted, cooked</td>
<td>½ cup</td>
<td>37</td>
<td>5</td>
<td></td>
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<tr>
<td>Artichoke, cooked</td>
<td>1 medium</td>
<td>100</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Spinach, cooked</td>
<td>½ cup</td>
<td>41</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Legumes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kamut</td>
<td>½ cup</td>
<td>136</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Wheat Berries</td>
<td>½ cup</td>
<td>151</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Quinoa</td>
<td>½ cup</td>
<td>111</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Garbanzo</td>
<td>½ cup</td>
<td>79</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Seeds</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pumpkin Seeds</td>
<td>1 ounce</td>
<td>159</td>
<td>9</td>
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<tr>
<td>Flax Seeds</td>
<td>1 ounce</td>
<td>140</td>
<td>6</td>
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</tr>
<tr>
<td>Sunflower Seeds</td>
<td>1 ounce</td>
<td>140</td>
<td>8</td>
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</tr>
<tr>
<td>Chia Seeds</td>
<td>1 ounce</td>
<td>158</td>
<td>8</td>
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<tr>
<td>Nuts</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Peanut Butter</td>
<td>2 tablespoon</td>
<td>185</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Almonds</td>
<td>1 ounce</td>
<td>103</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Hazelnuts</td>
<td>1 ounce</td>
<td>100</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Macadamia</td>
<td>1 ounce</td>
<td>181</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Walnuts</td>
<td>1 ounce</td>
<td>185</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

*Nutrition information varies by brand.

Chart provided by Sharon Palmer, The Plant-Powered Diet, New York, New York: The Experiment, 2012
A Sample of Vegetarian Handouts from https://www.vndpg.org/resources/

- Eating Disorders (NEW!)
- Plant-Based Diets to Combat Climate Change (NEW!)
- Omega-3 Fatty Acids and Vegetarian Diets (NEW!)
- Vegetarian Diets in Pregnancy (Spanish) (NEW!)
- Soy Safety and Health Effects of Isoflavones (NEW!)
- B12 in Vegetarian Diets
- Choline in Vegetarian Diets
- Eat More Plant-based Meals
- Sports Nutrition for Vegetarians
- Eat More Plant-Based Meals
- Healthy Tips for Meatless Meals
- Iron in Vegetarian Diets
- Meeting Calcium Recommendations on a Vegan Diet
- Therapeutic Use of Vegetarian/Vegan Diets in Chronic Disease
Special Considerations

**Vitamin B 12**

B12 fortified foods 3 Xs a day or B12 supplement 2-3 times a week

Fermented foods (such as tempeh), nori, spirulina, chlorella algae, and unfortified nutritional yeast are not reliable sources of B-12

**Omega 3**

Food sources ALA: flax, chia, canola, hemp, walnuts, and their oils; 2–4 g ALA/d

Low-dose microalgae-based DHA supplements are available; 100–300 mg/d.

**Vitamin D**

Supplement as needed
Special Considerations

Iodine

Iodized salt or sea vegetables (dulse or kombu flakes). Recommend women of childbearing age following vegan diet supplement with 150 mcg/day iodine.

Calcium

Food sources: leafy green vegetables (kale, turnip greens, Chinese cabbage, bok choy), broccoli, tofu made with calcium salts, tempeh, white beans, almonds, tahini, figs, black beans, oranges, seeds, blackstrap molasses, calcium fortified plant-based milk alternatives (check Nutrition Facts label)
What’s for Breakfast?

Fruit, Nut and Seed Breakfast Muffins

Chickpea Scramble

Cooked Oatmeal with Fruit, Nuts and Almond or Soy milk

Tofu Scramble

Apple Cinnamon Baked Oatmeal Squares

Mhealthy.umich.edu/recipes
What's for Lunch?

Best Bean Burgers with Whole Grain Bun
Southwest Style Veggie, Grain, and Protein Bowl
Southwestern Succotash
Smashed White Bean and Avocado Club

Mhealthy.umich.edu/recipes
What’s for Dinner?

Easy Black Bean and Corn Salad

Three Bean Very Veggie Chili

Chili Maple Roasted Butternut Squash, Black Bean and Quinoa Salad with Lime Vinaigrette

Latin Style Black Bean Soup

Jackfruit Fajitas by
  ◦ Chef Jocelyn Ramirez
  https://wearecocina.com/recipe-chef/jocelyn-ramirez/

Mhealthy.umich.edu/recipes
Some Web Resources

Oldways Cultural Food Traditions  https://oldwayspt.org/traditional-diets/vegetarian-vegan-diet
Happy Cow (find restaurants nearby)  https://www.happycow.net/
Your Online Guide to Vegetarian Dining Around the World  www.vegdining.com
The Vegetarian Resource Group: simple low-cost menus  www.vrg.org
Meatless Mondays  https://www.mondaycampaigns.org/meatless-monday
The Vegan RD Nutrition 101/food guide:  https://www.theveganrd.com/
The American College of Lifestyle Medicine: Free resources  https://www.lifestylemedicine.org/ACLM/Tools_and_Resources/Print_Resources.aspx
Vegan Health  https://veganhealth.org/
The Physicians Committee for Responsible Medicine: free patient educational materials.  www.PCRM
Video clips and articles on vegetarian nutrition  www.nutritionfacts.org
**Take Home Messages**

1. A healthy plant-based eating plan meets the goals for this patient.

<table>
<thead>
<tr>
<th>High nutrient low energy density</th>
<th>High dietary fiber</th>
<th>Healthy fat composition</th>
<th>Antioxidant nutrients</th>
<th>Rich source of micronutrients</th>
<th>Low levels of certain factors</th>
</tr>
</thead>
</table>

- Lipids
- Weight management
- Vascular Health
- Blood pressure
- Glycemic Control
- Inflammation
- Gut Microflora

Adapted from Satija and Hu. *Trends Cardiovasc Med.* 2018;28(7):437-441
Take Home Messages (continued)

2. When evaluating the research, understand the eating pattern being studied.
3. Understand what the patient is eating in order to individualize the meal pattern.
4. Provide specific information on plant-based eating to your patient.

Think quality and variety and color
Hold the Meat - Pass the Fat

- VS -

Hold the Fat - Pass the Meat

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Graduate Programs in Human Nutrition
School of Medicine
Associate Director
Bob & Charlee Moore Institute for Nutrition & Wellness
Oregon Health & Science University
Portland, OR
Conflicts of Interest/Disclosures

I have no conflicts of interest to disclose

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Crucial Conversations about Food

“What do you say when a patient asks you for nutritional advice?”

“What if they ask about low-carb, ketogenic diets?”

“I change the subject!”

Conversation between Kent Thornburg, PhD, Director, OHSU Bob & Charlee Moore Institute and physician colleague
“If you ask just one question...”

“Do you use a seat belt when you’re driving?”

“What type of car seat do you use?

“When you ride a bike, do you wear a helmet?”

“Are you planning to become pregnant in the next year?”
We need to use the same strategy to provide anticipatory guidance to people about the foods they eat...

• *Tell me about the foods you usually eat?*

• “*What foods do you avoid?*”

• “*What do you like to drink?*”

• “*What are your favorite go-to meals?*”
First Seek to Understand

“My husband is following a low-carb diet... He’s been doing this for 2 years. He says he feels great...

I’m concerned...He won’t talk with his physician... I don’t know what to do.”

“Why did they contact you?”

“What do they think you’re going to do for them?”
The Power of Active Listening and Empathy

“Obese..., he told me I was obese...and his only advice was to each more celery!”

“He didn’t ask what I thought contributed to my weight gain.”

“And, he wants to see me back in 6 months...6 months, what good is that gonna do?”

“I don’t even like celery!”
64% of people **worldwide** follow a diet that prohibits certain ingredients or foods

50% of people in North America report following a restrictive diet
Find common ground...

<table>
<thead>
<tr>
<th>Diet Style</th>
<th>Eating Habits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-Carb</td>
<td>Eating fewer simple sugars</td>
</tr>
<tr>
<td>Paleo</td>
<td>Eating more home cooking</td>
</tr>
<tr>
<td>Gluten-Free</td>
<td>Eating more ancient grains</td>
</tr>
<tr>
<td>Raw-Foods</td>
<td>Eating more nuts &amp; seeds</td>
</tr>
<tr>
<td>Clean-Labels</td>
<td>Eating less processed foods</td>
</tr>
<tr>
<td>Juicing</td>
<td>Eating more fruits &amp; veggies</td>
</tr>
<tr>
<td>Longevity</td>
<td>Good at counting calories</td>
</tr>
</tbody>
</table>

“Tell me more about this...”

Adapted from a slide by Robyn Flipse, MS, RDN
Restrictive Dietary Patterns & Food Trends can Circumvent Public Health Efforts to improve Nutritional Status through Food Fortification

- Salt
- Fluid milk
- Flour and Bread
- Cereals, Grains
- Orange Juice
- Breads, flour, rice, corn meals, noodles, macaroni other grain products
- Corn Masa
- Iodine (1924)
- Vitamin D (1933), Vitamin A
- Thiamin, niacin, riboflavin, and iron (1940, 1952)
- B-vitamins, folic acid, iron
- Calcium, Vitamin D
- Folic acid (1998)
- Folic acid (2016)

Paleo Diet – higher protein, moderate fat (a.k.a., Caveman, Stone-age Diet)

“Eating like our prehistoric ancestors leads to weight loss & lower risk of developing diabetes, heart disease, cancer other health conditions”

Nutrients of concern for deficiency: Calcium, B-vitamins, Iodine, Vitamin D

Foundational Foods:
• Lean meats, fish, eggs
• Nuts, seeds
• Fruits, vegetables
• Oils

Foods to avoid:
• Processed foods
• Wheat, other grains, legumes
• Dairy
• Potatoes
• Refined sugar
• Salt
• Refined oils
Lower-Carb Diets

• Low carbohydrate, high fat (LCHF)

• 40-60-100 g carbohydrate; 12-15 g from “foundational vegetables”

• Beef, pork, poultry, fish, eggs, cheese, sources of fat
  • 4-6 oz protein at each meal

• Limits starchy vegetables, grains, legumes, simple sugars, fluid milk

• “Nutrients of concern for deficiency: Vitamin C, B-vitamins including folate, calcium, magnesium, fiber"
Ketogenic Diets

- Extreme carbohydrate restriction to induce ketosis
  - 20 – 50 g metabolizable carbohydrate/day
  - > 1 g protein per Kg body weight
  - 60-80% fat of total calories
- “Skin-on” poultry, fattier beef, poultry, pork, fish
- Green leafy vegetables
- Oils & solid fats
- Avoid starchy root vegetables, bread, pasta, other grains, fruit, fluid milk
- Nutrients of concern for deficiency: Vitamin C, B-vitamins including folic acid, calcium, fiber
Typical substrate utilization

Links CHO and PRO metabolism
(glycolysis & AA conversion)
to
FAT metabolism
(β-oxidation)
(via Acetyl CoA)
at the Krebs Cycle

Acetyl CoA
What are low-carbohydrate ketogenic diets?

• A diet that results in the production of ketones
  • Bi-products of FA oxidation
  • Produced when glucose is limited

• Ketone synthesis:
  • Occurs in the liver
  • Transferred to other tissues
  • Reduced to B-OH-butyrate
  • Spontaneously decomposes to acetone

![Diagram showing the metabolic pathway of ketone bodies]

- Acetyl CoA → Acetoacetate → Acetone → Blood, Urine
- Acetoacetate → β-Hydroxybutyrate → Blood, Urine
- Acetone → To lungs
Ketones as Fuel (Diabetes, Starvation, VLCDs)

- $\downarrow$ CHO metabolism $\rightarrow$ $\uparrow$ ketone use by heart, muscle, and kidney
- $\uparrow$ ketone use by the brain
- $\uparrow$ Ketone use $\rightarrow$ $\downarrow$ PRO degradation for gluconeogenesis
A Randomized Trial Comparing a VLCD and a LCal/LFD on Body Weight and Cardiovascular Risk Factors in Healthy Women

- 53 healthy women
- BMI: 33.6 (30-35)
- 6 mo RTC
- 21% attrition at 6 mo
- LC lost more weight & body fat
- Similar changes in BP & fasting lipids, glucose, insulin
A Randomized Trial of a Low-Carbohydrate Diet for Obesity

- Obese men and women
  - 22% attrition at 3 mo
  - 33% attrition at 6 mo
  - 41% attrition at 12 mo
  - Baseline values carried forward
- Low CHO group given Atkins book
- Conventional group told to follow a low calorie, low fat diet
  - Women: 1200-1500 kcal/d
  - Men: 1500-1800 kcal/d
  - 25% FAT
- Minimal professional contact to mimic typical dieting approach
- Low CHO group lost more weight at 3 and 6 mo but not different at 12 mo.
The A TO Z Weight Loss Study: A Randomized Trial

Weight Change by Diet Type

$r = 0.07, P = .40$

Weight Change by Dietary Adherence

$r = -0.60, P < .001$

Assigned Diet Group
- Atkins
- Zone
- Weight Watchers
- Ornish

Mean Dietary Adherence Score Over 1 Year

Atkins, Zone, Weight Watchers, Ornish
### Energy Balance Design

<table>
<thead>
<tr>
<th></th>
<th>Energy Matched</th>
<th>Ad Lib</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low CHO N=13</td>
<td>High PRO/CHO N=12</td>
</tr>
<tr>
<td>Estimated Energy</td>
<td>3106 ± 431</td>
<td>3079 ± 455</td>
</tr>
<tr>
<td>Requirement (EER, kcal/d)</td>
<td>3640 ± 527</td>
<td>2150 ± 306</td>
</tr>
<tr>
<td>Energy Content of Diet</td>
<td>2090 ± 665</td>
<td>2083 ± 322</td>
</tr>
<tr>
<td>(kcal/d)</td>
<td>67 ± 16</td>
<td>68 ± 2</td>
</tr>
<tr>
<td>Energy Intake (kcal/d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(kcal/d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Intake (% EER)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Loss after 6</td>
<td>-6 ± 3</td>
<td>-5 ± 2</td>
</tr>
<tr>
<td>weeks (lb)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mean ± SD
Study Design

- Randomized controlled feeding study
- 3-intervention groups
  - Low CHO ad lib
  - High PRO/CHO ad lib
  - High PRO/CHO energy-restricted to match Low CHO ad lib intake (% EER)
- 9-week enrollment
Enrollment Criteria

Healthy men & women:

• BMI: 30-50 kg/m²
• Age ≥ 21 yr
• Stable weight
• Willing to eat either a low or high CHO diet
• Willing to stop taking vitamins, minerals, or other dietary supplements for the duration of the study.
• Willing to refrain from alcohol consumption

Without:

• Major debilitating mental or physical illness
• Renal or hepatic disease, diabetes
• History of gallbladder disease or heart disease
• Hyperthyroidism or untreated hypothyroidism
• Poorly controlled hypertension
• Iron deficiency anemia
• Food allergies or dietary restrictions
• History of smoking
## Energy and Nutrient Intake—Standard Diet

<table>
<thead>
<tr>
<th>Dietary Component</th>
<th>Low CHO (n=10)</th>
<th>High PRO/CHO (n=13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Intake (kcal)</td>
<td>2885 ± 243</td>
<td>2833 ± 385</td>
</tr>
<tr>
<td>(% EER)</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>PRO (g)</td>
<td>105 ± 9</td>
<td>103 ± 13</td>
</tr>
<tr>
<td>FAT (g)</td>
<td>114 ± 10</td>
<td>112 ± 16</td>
</tr>
<tr>
<td>CHO (g)</td>
<td>375 ± 33</td>
<td>369 ± 50</td>
</tr>
<tr>
<td>Fiber (g)</td>
<td>28 ± 4</td>
<td>28 ± 4</td>
</tr>
</tbody>
</table>

Mean ± SD

![Energy and Nutrient Intake Pie Chart](image)

- PRO: 14 ± 1%
- FAT: 35 ± 1%
- CHO: 51 ± 1%
Subject Characteristics after Randomization
(after 2 week standard diet phase)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Low CHO (n=10)</th>
<th>High PRO/CHO (n=13)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Female</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td><strong>Age (yr)</strong></td>
<td>46 ± 8</td>
<td>48 ± 10</td>
</tr>
<tr>
<td><strong>Weight (kg)</strong></td>
<td>103 ± 13</td>
<td>99 ± 14</td>
</tr>
<tr>
<td><strong>BMI (kg/m²)</strong></td>
<td>36 ± 5</td>
<td>35 ± 5</td>
</tr>
<tr>
<td><strong>Total CHOL (mg/dl)</strong></td>
<td>195 ± 23</td>
<td>192 ± 35</td>
</tr>
<tr>
<td><strong>Total TAG (mg/dl)</strong></td>
<td>126 ± 38</td>
<td>113 ± 37</td>
</tr>
</tbody>
</table>

Mean ± SD
# Energy and Nutrient Intake - Intervention Diet

<table>
<thead>
<tr>
<th>Dietary Component</th>
<th>Intervention Diets</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low CHO (n=10)</td>
<td>High PRO/CHO (n=13)</td>
<td></td>
</tr>
<tr>
<td>Energy (kcal) (% EER)</td>
<td>2209 ± 573</td>
<td>2216 ± 617</td>
<td></td>
</tr>
<tr>
<td>Protein (g)</td>
<td>163 ± 47</td>
<td>106 ± 28</td>
<td></td>
</tr>
<tr>
<td>Fat (g)</td>
<td>160 ± 43</td>
<td>74 ± 21</td>
<td></td>
</tr>
<tr>
<td>Carbohydrate (g)</td>
<td>23 ± 7</td>
<td>298 ± 92</td>
<td></td>
</tr>
</tbody>
</table>

Mean ± SD
## Dietary Fatty Acid Constituents

<table>
<thead>
<tr>
<th>Dietary Variables (g)</th>
<th>Standard Diet</th>
<th>Low CHO</th>
<th>High PRO/CHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturated Fat</td>
<td>36 ± 3 (34)</td>
<td>66 ± 14 (46)</td>
<td>17 ± 5 (25)</td>
</tr>
<tr>
<td>Monounsaturated Fat</td>
<td>39 ± 5 (36)</td>
<td>57 ± 12 (40)</td>
<td>31 ± 6 (45)</td>
</tr>
<tr>
<td>Polyunsaturated Fat</td>
<td>26 ± 3 (24)</td>
<td>19 ± 3 (13)</td>
<td>21 ± 5 (30)</td>
</tr>
<tr>
<td>n-6 Fatty Acids</td>
<td>23 ± 3</td>
<td>17 ± 3</td>
<td>19 ± 5</td>
</tr>
<tr>
<td>n-3 Fatty Acids</td>
<td>3 ± 0.4</td>
<td>2.6 ± 0.4</td>
<td>2.2 ± 0.4</td>
</tr>
<tr>
<td>n-6/n-3 Fatty Acid Ratio</td>
<td>9 ± 0.6</td>
<td>6 ± 0.3</td>
<td>9 ± 0.8</td>
</tr>
</tbody>
</table>

Mean ± SD (%)
Markers of weight regulation

- Glucose & Insulin
- Leptin & Ghrelin (active & total)
- PYY$_{3-36}$ & GLP-1 (active)
- Triglycerides
- Non-esterified Fatty Acids
Weight loss after 6 week dietary intervention

Low CHO Diet
Mean Weight Loss: \(-5 \pm 3\) kg

High PRO/CHO Diet
Mean Weight Loss: \(-3 \pm 2\) kg

P < 0.05
Weight Loss Response Curves

- **Low CHO Ad Lib**
  - Mean ± SD: -2.2 ± 1.4
  - Change at 6 weeks: -2.9 ± 1.9
  - p-value: 0.049

- **High CHO Ad Lib**
  - Mean ± SD: -1.2 ± 1.0
  - Change at 6 weeks: -2.9 ± 1.9
  - p-value: 0.046
Change in fasting lipids 2 & 6 weeks after dietary intervention

![Graphs showing change in lipids levels over 6 weeks with LCHO and HPRO/CHO groups](image)

1Mean ± SDE; * Within group comparison of change from baseline, p<0.05; † † Between group comparison of change from baseline (adjusted for baseline) † p<0.05 and † † p<0.01
Baseline (green) and change from baseline in fasting CRP and IL-6 concentrations

CRP

IL-6

Low CHO  High CHO
24-Hour Insulin Response Curve

Low CHO Ad Lib

- INPATIENT VISIT 1
- INPATIENT VISIT 3

High CHO Ad Lib

- INPATIENT VISIT 1
- INPATIENT VISIT 3

Δ AUC 1; p = 0.001
Δ AUC 3; p = 0.001
Δ AUC 5; p = NS
Δ AUC 7; p = 0.01

Mean ± SEM
Meal or Snack

Insulin (µIU/L)

Time (h)
24-Hour Triglyceride Response Curve

Low CHO

High CHO

Δ AUC 1; p = 0.08
Δ AUC 3; p = NS
Δ AUC 5; p = NS
Δ AUC 7; p = NS

Mean ± SEM
Meal or Snack

Δ AUC 7; p = NS
24-Hour Total Ghrelin Response Curve

Low CHO Ad Lib

- INPATIENT VISIT 1
- INPATIENT VISIT 3

Mean ± SEM

Meal or Snack

High CHO Ad Lib

- INPATIENT VISIT 1
- INPATIENT VISIT 3

Δ AUC 7; p = NS

Δ AUC 5; p = NS

Δ AUC 3; p = NS

Δ AUC 1; p = 0.01

Δ AUC 3; p = NS
24-Hour GLP-1 Response Curve

Low CHO

High CHO

Δ AUC 1; p = 0.003
Δ AUC 3; p = 0.004
Δ AUC 5; p = 0.000
Δ AUC 7; p = 0.001

INPATIENT VISIT 1
INPATIENT VISIT 3

Mean ± SEM
Meal or Snack
Conclusions & Recommendations

- Response to low carbohydrate, higher protein, higher fat and high protein, high carbohydrate, lower fat dietary differs among individuals (e.g., variable inter-individual response). Ability to adhere to the dietary parameters is key to “success” and should be taken into consideration when making recommendations. Ability to achieve weight loss is also critical to improved metabolic markers.

- Low carbohydrate, higher protein, higher fat dietary patterns are associated with lower hunger scores due to impact on hormones known to influence central regulation of appetite and energy balance.

- Weight loss and lower blood glucose and insulin concentrations are associated with both dietary patterns but more significant with consumption of low carbohydrate, higher protein, higher fat dietary pattern.

- Reduction in total cholesterol and LDL-cholesterol concentrations are more pronounced with consumption of high protein, high carbohydrate, lower fat diets; didn’t increase as much as expected with low carbohydrate, high protein, higher fat dietary pattern.

- Change in inflammatory markers varied among individuals consuming either dietary pattern.

- Metabolic monitoring and weight management counseling is critical for long-term weight loss maintenance.
Hold the Meat-Pass the Fat

-vs-

Hold the Fat-Pass the Meat

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Professor & Director
Graduate Programs in Human Nutrition
School of Medicine
Associate Director
Bob & Charlee Moore Institute for Nutrition & Wellness
Oregon Health & Science University
Portland, OR
Pass the Fruits, Vegetables, Nuts, Fish and EVOO, Hold the Red Meat; Mediterranean Dietary Pattern

Connie Diekman, M.Ed., RD, CSSD, LD, FADA, FAND
Food and Nutrition Consultant
Former President of the Academy of Nutrition and Dietetics
Disclosures

- Member of the LEAD Network for Bayer
- Food and Nutrition Consultant
- Honorarium provided for this session
Objectives

Upon completion, the listener will be able to:

1. Identify the key components of a Mediterranean Diet eating pattern

2. Outline cardiovascular benefits of the Mediterranean eating pattern

3. Define first steps in moving patients to a Mediterranean eating pattern
The Components of the Mediterranean Diet
Mediterranean Diet

- Technically the “diet” reflects the eating patterns of the countries that surround the Mediterranean sea.

- Patterns differ per country but commonality is
  - Meals revolve around plant foods
  - Animal foods tend to be fish or seafood with limited red meat and moderate poultry and dairy
  - Fats are plant-based with olive oil being predominant but nuts and seeds, and their oils, also are common
  - Meals are a time for family – quiet, slow eating and stress relieving
  - Current Mediterranean diet is not the same as the diet of the 50's, 60's, 70's,
Mediterranean Diet Nutrient Value

- Food Components
  - High fruit and vegetables intake boosts potassium intake, phytonutrients, folate, B vitamins and fiber
  - Predominate use of plant-based fats - olive oil, canola oil - limits intake of saturated fats providing PUFA’s and MUFA’s instead
  - Higher intake of omega-3’s from fish and seafood helps reduce inflammation, aids platelet function and BP control
  - High plant intake boosts fiber intake helps with cholesterol reduction
  - Use of some whole grains reduces impact of more refined grains on glycemic load
  - Dairy from milk and yogurt provides calcium, phosphorous, potassium and other nutrients that play a role in BP regulation
  - EVOO in traditional diet provides polyphenols
  - Overall plant diversity > overall wider diversity of vitamins, minerals, types of carbohydrates
Phytonutrients in Plant Foods and Heart Health

- Anthocyanins in berries and red wine are associated with lower blood pressure.
- Carotenoids in red, orange, yellow, and green plants may inhibit cancer growth and cardiovascular disease, and boost immunity.
- Flavonoids in berries, apples, citrus, onions, soybeans, and coffee may fight inflammation and tumor growth.
- Isothiocyanates (sulforaphane) in cruciferous vegetables such as broccoli, cabbage, and kale may help protect against cancer and cardiovascular disease.
- Proanthocyanidins and flavanols in grapes, apples, cocoa, and red wine are linked to better function of the lining of the arteries and reduced blood pressure.
- Quercetin in apples, onions, and citrus fruits may help decrease inflammation and blood pressure.
- Sulfides and thiols in onions, garlic, leeks, olives, and scallions may help decrease LDL cholesterol.
Cardiovascular Benefits of the Mediterranean Diet
Mediterranean Diet and Heart Health
Study Outcomes Support Mediterranean Diet

- Studies done thus far have been prospective, observational and RCT
- Outcomes have shown consistent benefit of Mediterranean diet to heart health
- Studies have observed reduction in inflammatory bio markers
- Improvement in BP, lipid levels and reduced mortality
- Multiple studies address the “Pattern” of eating providing synergistic impacts
- Complied evidence supports a 30% reduction on CVD events with Mediterranean Diet
## DGA 2020-2025 Recommended Healthy US, Healthy Vegetarian and Healthy Med-style Patterns (2000 kcals)

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Healthy US Pattern</th>
<th>Healthy Vegetarian Pattern</th>
<th>Healthy Med-Style Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables</td>
<td>2½ c-eq</td>
<td>2½ c-eq</td>
<td>2½ c-eq</td>
</tr>
<tr>
<td>Dark-green vegetables (c-eq/wk)</td>
<td>1½</td>
<td>1½</td>
<td>1½</td>
</tr>
<tr>
<td>Red and orange vegetables (c-eq/wk)</td>
<td>5½</td>
<td>5½</td>
<td>5½</td>
</tr>
<tr>
<td>Legumes (beans and peas) (c-eq/wk)</td>
<td>1½</td>
<td>1½</td>
<td>1½</td>
</tr>
<tr>
<td>Starchy vegetables (c-eq/wk)</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Other vegetables (c-eq/wk)</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Fruits</td>
<td>2 c-eq</td>
<td>2 c-eq</td>
<td>2½ c-eq</td>
</tr>
<tr>
<td>Grains</td>
<td>6 oz-eq</td>
<td>6½ oz-eq</td>
<td>6 oz-eq</td>
</tr>
<tr>
<td>Whole grains (oz-eq/day)</td>
<td>3</td>
<td>3½</td>
<td>3</td>
</tr>
<tr>
<td>Refined grains (oz-eq/day)</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Dairy</td>
<td>3 c-eq</td>
<td>3 c-eq</td>
<td>2 c-eq</td>
</tr>
<tr>
<td>Protein Foods</td>
<td>5½ oz-eq</td>
<td>3½ oz-eq</td>
<td>6½ oz-eq</td>
</tr>
<tr>
<td>Seafood (oz-eq/wk)</td>
<td>8</td>
<td>Eggs only – 3</td>
<td>15</td>
</tr>
<tr>
<td>Meats, poultry, eggs (oz-eq/wk)</td>
<td>26</td>
<td>Legumes – 6</td>
<td>26</td>
</tr>
<tr>
<td>Nuts seeds, soy products (oz-eq/wk)</td>
<td>5</td>
<td>Nuts - 7 Soy - 8</td>
<td>5</td>
</tr>
<tr>
<td>Oils</td>
<td>27 g</td>
<td>27 g</td>
<td>27 g</td>
</tr>
<tr>
<td>Limit on Calories for Other Uses, calories (% of calories)</td>
<td>240 (12%)</td>
<td>250 (13%)</td>
<td>240 (13%)</td>
</tr>
</tbody>
</table>
Shifting to a Mediterranean Eating Pattern

- Evidence is important but for patients the key is – will I like this and can I stick with it

- Key Patient Positive Points
  - Changes can be made in small steps
  - Start by identifying plant foods patient currently consumes
  - Achieve reduced animal protein intake by combining smaller amounts with vegetables and grains - A beef stir fry on brown rice
  - Shift snacks to nuts and fruit or vegetables and hummus or blended cottage cheese
  - Suggest ways to use oil in place of solid fats Or start with softer, solid fats – tub margarine instead of solid
Conclusion
Shifting to the Mediterranean Diet

1. Offers a variety of foods, flavors and it can meet multiple cultural needs

2. Diet is flexible as a lifestyle choice for the individual and their family

3. Synergistic effects of key nutrients and phytonutrients provides added heart health benefits

4. A wide variety of studies support the benefits of the Mediterranean diet on overall heart health

5. The flexibility of the eating pattern can meet the needs of Maria Rosa and aid in reduction of BP, lipids and weight
Thank You

February 2021
References


