Nutrition in Hypertriglyceridemia
Choosing the “Right” Diet for the “Right” Patient

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Director of Nutrition
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Objectives

• Describe the evidence-based nutrition and lifestyle recommendations for the treatment of hypertriglyceridemia

• Discuss the strategies for the “right” diet for the “right” patient
OUTLINE

- Definition of normal vs elevated triglycerides

- Mild to moderate triglycerides: a risk factor for CVD as a component of the metabolic syndrome
  Management: lifestyle therapy - weight reduction
  Jacobson TA et al Clin Ther 2007:29;763-777

- Very High levels of TG increase the risk for pancreatitis
  Management: reduction of dietary fat, simple carbohydrates, alcohol

- Omega-3 fatty acids and triglycerides
- Fructose intake and triglycerides
- Alcohol - effect on triglycerides
- Glycemic index?
<table>
<thead>
<tr>
<th>Level</th>
<th>NCEP ATP III</th>
<th>The Endocrine Society 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;150 mg/dl 1.7 mmol/liter</td>
<td>Normal &lt;150 mg/dl &lt;1.7 mmol/liter</td>
</tr>
<tr>
<td>Borderline-high triglycerides</td>
<td>150–199 mg/dl 1.7–2.3 mmol/liter</td>
<td>Mild hypertriglyceridemia 150–199 mg/dl 1.7–2.3 mmol/liter</td>
</tr>
<tr>
<td>High triglycerides</td>
<td>200–499 mg/dl 2.3–5.6 mmol/liter</td>
<td>Moderate hypertriglyceridemia 200–999 mg/dl 2.3–11.2 mmol/liter</td>
</tr>
<tr>
<td>Very high triglycerides</td>
<td>≥500 mg/dl ≥5.6 mmol/liter</td>
<td>Severe hypertriglyceridemia 1000–1999 mg/dl 11.2–22.4 mmol/liter</td>
</tr>
<tr>
<td>Very severe hypertriglyceridemia</td>
<td>≥2000 mg/dl ≥22.4 mmol/liter</td>
<td></td>
</tr>
</tbody>
</table>

Berglund L et al
Causes of Hypertriglyceridemia

Primary hypertriglyceridemia
- FCHL – familial combined hypertriglyceridemia
- FHTG - familial hypertriglyceridemia
- Familial dysbetalipoproteinemia
- FHA – familial hypoalpha-lipoproteinemia
- Familial chylomicronemia and related disorders
- Primary genetic susceptibility
- Metabolic syndrome
- Treated type 2 diabetes
  - Secondary hypertriglyceridemia

Secondary hypertriglyceridemia
- Excess alcohol intake
- Drug-induced (e.g. thiazides, β-blockers, estrogens, isotretinoin, corticosteroids, bile acid-binding resins, antiretroviral protease inhibitors, immunosuppressants, antipsychotics)
- Untreated diabetes mellitus
- Endocrine diseases
- Renal disease
- Liver disease
- Pregnancy
- Autoimmune disorders
“Evidence-Based Dietetics Practice is the use of systematically reviewed scientific evidence in making food and nutrition practice decisions by integrating best available evidence with professional expertise and client values to improve outcomes.”

adaevidencelibrary.com/
The Nutrition Prescription for HTG goes Beyond the Realm of Fat Intake
Individualize the Guidelines

Whole Grains

Plant Stanols & Sterols

Oats

Olive oil, Canola oil, Avocado

Fruits & Vegetables

Nuts

Beans

MCT oil

Fish

Omega 3 FAs
Assessment of Food and Nutrient Intake

Assess the food/nutrition intake and related history of disorders of lipid metabolism (DLM) including, but not limited to the following:

- **Food, beverage and nutrient intake including:**
  - Energy intake, serving sizes, meal-snack pattern, fat, types of fat and carbohydrate, fiber, micronutrient intake
  - Bioactive substances (alcohol intake, plant stanols and sterols, soy protein, psyllium, fish oil)

- **Food and nutrient administration (patient's experience with food):**
  - Previous and current diet history, exclusions and experience, cultural and religious preferences
  - Eating environment, eating out

- **Medication and herbal supplement use:**
  - Prescription and over-the-counter medications, herbal and complementary product use (coenzyme Q-10, red yeast rice)

- **Knowledge, beliefs or attitudes:**
  - Motivation, readiness to change, self-efficacy

- **Behavior:**
  - Diet adherence, disordered eating, meal timing and duration

- **Factors affecting access to food:**
  - Psychosocial/economic issues (e.g., social support) impacting nutrition therapy

- **Physical activity and function:**
  - Exercise patterns, functionality for activities of daily living, sleep patterns
Mike U- 50 years
Lab results
Cholesterol: 260mg/dl
TG: 255mg/dl
HDL-C: 37mg/dl
LDL: 172mg/dl
Fasting glucose: 123mg/dl
Waist circumference: 44”
# Metabolic Syndrome Markers

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Defining Level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Triglyceride</strong></td>
<td>≥ 150 mg/dL</td>
</tr>
<tr>
<td><strong>HDL-cholesterol</strong></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>&lt; 40 mg/dL</td>
</tr>
<tr>
<td>Women</td>
<td>&lt; 50 mg/dL</td>
</tr>
<tr>
<td><strong>Blood Pressure</strong></td>
<td>≥ 130/&gt; 85 mm Hg</td>
</tr>
<tr>
<td><strong>Fasting Glucose</strong></td>
<td>≥ 100 mg/dL</td>
</tr>
<tr>
<td><strong>Waist Circumference</strong></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>&gt;102 cm (&gt; 40 in)</td>
</tr>
<tr>
<td>Women</td>
<td>&gt; 88 cm (&gt; 35 in)</td>
</tr>
</tbody>
</table>
### IDF Criteria: Abdominal Obesity and Waist Circumference Thresholds

- **AHA/NHLBI criteria:**
  - ≥ 102 cm (40 in) in men,
  - ≥ 88 cm (35 in) in women

- Some US adults of non-Asian origin with marginal increases should benefit from lifestyle changes. Lower cut points (≥ 90 cm in men and ≥ 80 cm in women) for Asian Americans

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese</td>
<td>≥ 85 cm (33.5 in)</td>
<td>≥ 90 cm (35.4 in)</td>
</tr>
<tr>
<td>Chinese</td>
<td>≥ 90 cm (35.4 in)</td>
<td>≥ 80 cm (31.5 in)</td>
</tr>
<tr>
<td>South Asian</td>
<td>≥ 90 cm (35.4 in)</td>
<td>≥ 80 cm (31.5 in)</td>
</tr>
<tr>
<td>Europe</td>
<td>≥ 94 cm (37.0 in)</td>
<td>≥80 cm (31.5 in)</td>
</tr>
</tbody>
</table>

Metabolic Syndrome

Causes

• Acquired causes
  – Overweight and obesity
  – Physical inactivity
  – High carbohydrate diets (>60% of energy intake) in some persons

• Genetic causes
DLM: Metabolic Syndrome

• A calorie-controlled cardioprotective dietary pattern that avoids extremes in carbohydrate and fat intake, limits refined sugar and alcohol, and includes physical activity at a moderate-intensity level for at least 30 minutes on most (preferably all) days of the week, should be used for individuals with metabolic syndrome. Weight loss of 7 to 10% of body weight should be encouraged if indicated. These lifestyle changes improve risk factors of metabolic syndrome.

Fair

adaevidencelibrary.com/
National Cholesterol Education Program Therapeutic Lifestyle Change (TLC) Diet

- Total fat 25-35% (10%-35%)
- <7% saturated fat (AHA/ACC guidelines 5-6% and avoid trans-fat)
  - Up to 10% PUFA; up to 20% MUFA
- <200 mg cholesterol
- 20-30 g fiber
- Adjust total calories for weight goals
- Physical activity: expend at least 200 Kcal/day

- Options: plant sterols/stanols (2-3g) and soluble fiber (10-25g)

Moderate evidence indicates that increased MUFA intake, rather than high carbohydrate intake, may be beneficial for persons with T2D. High MUFA intake, when replacing a high carbohydrate intake, results in improved biomarkers of glucose tolerance and diabetic control.
DASH PYRAMID

Grains (preferably whole) (7-8 per day)

What's a Serving
1 cup lettuce
1/2 cup other vegetables

Low-Fat Dairy (2-3 per day)

What's a Serving
1 slice bread
1/2 cup dry cereal
1/2 cup cooked rice, pasta, or cereal

Oils, Salad Dressing, Mayo (2-3 per day)

What's a Serving
1 tsp. oil or soft margarine
1 tsp. regular mayonnaise
1 Tbsp. low-fat mayonnaise
1 Tbsp. regular salad dressing
2 Tbsp. light salad dressing

Seafood, Poultry, Lean Meat (0-2 per day)

What's a Serving
3 oz. broiled or roasted seafood, skinless poultry, or lean meat

Beans, Nuts & Seeds (1 per day)

What's a Serving (low-fat or fat-free)
1 cup milk or yogurt
1 1/2 oz. cheese

Sweets (5 per week)

What's a Serving
1/2 cup cooked beans
1/3 cup nuts
2 Tbsp. sunflower seeds

What's a Serving
1 cup low-fat fruit yogurt
1/2 cup low-fat frozen yogurt
1 Tbsp. maple syrup, sugar, or jam

Note: Choose lower-salt foods from all categories.
Recommendations for Omega-3 Fatty Acids

- American Heart Association Scientific Statements: Fish Consumption, Fish Oil, Omega-3 Fatty Acids and Cardiovascular Disease, 2002

<table>
<thead>
<tr>
<th>Population</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients w/o documented CHD</td>
<td>Eat a variety of fish (preferably oily) at least twice a week, include oils and foods rich in ALA</td>
</tr>
<tr>
<td>Patients w/ documented CHD</td>
<td>Consume 1 gm of EPA+DHA per day, preferably from fish, supplements could be used in consultation with a physician</td>
</tr>
<tr>
<td>Patients needing TG lowering</td>
<td>Two – four gm of EPA+DHA per day provided as capsule under a physician’s care</td>
</tr>
</tbody>
</table>

Kris-Etherton et al, Circulation, 2002
What effect does EPA/DHA taken as a fish oil supplement have on triglycerides in hypertriglyceridemic patients who are not taking cholesterol lowering medications?

Conclusion
Subjects with elevated triglycerides (mean values ranged 250-919 mg/dL) taking 2.6-3.6g of commercial EPA/DHA fish oil (approximately 48-60% EPA/33-40% DHA) with varied dietary intakes without cholesterol lowering medicines, for 6 weeks to 1 year* had 22-45% reductions in triglyceride values compared to baseline values. Lower doses of fish oil (1.72g; 59% EPA/41% DHA) also resulted in 22-25% reductions in triglycerides vs. baseline values after 6 months to 1 year.

*One study was of 1 year duration and was a 6-month open label extension of a 6 month study.

Grade II
Omega-3 free fatty acids for the treatment of severe hypertriglyceridemia: the EpanoVa fOr Lowering Very high triglyceridEs (EVOLVE) trial.
Kastelein JJ, Maki KC, Susekov A, Ezhov M, Nordestgaard BG, Machielse BN, Kling D, Davidson MH.

OM3-FFA achieved the primary end point for TG lowering and secondary end point of non-HDL-C lowering at 2, 3, and 4 g/d in persons with severe hypertriglyceridemia
## Sources of Omega-3 Fatty Acids: Seafood

<table>
<thead>
<tr>
<th>3 oz Cooked</th>
<th>Calories</th>
<th>ALA (g)</th>
<th>EPA (g)</th>
<th>DHA (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plaice &amp; Sole</td>
<td>73</td>
<td>0.018</td>
<td>0.143</td>
<td>0.112</td>
</tr>
<tr>
<td>Halibut, Atlantic &amp; Pacific</td>
<td>94</td>
<td>0.011</td>
<td>0.066</td>
<td>0.132</td>
</tr>
<tr>
<td>Herring, Atlantic</td>
<td>173</td>
<td>0.112</td>
<td>0.773</td>
<td>0.939</td>
</tr>
<tr>
<td>Herring, Atlantic, pickled</td>
<td>223</td>
<td>0</td>
<td>0.717</td>
<td>0.464</td>
</tr>
<tr>
<td>Herring, Pacific</td>
<td>212</td>
<td>0.062</td>
<td>1.056</td>
<td>0.751</td>
</tr>
<tr>
<td>King Mackerel</td>
<td>114</td>
<td>n/a</td>
<td>0.148</td>
<td>0.193</td>
</tr>
<tr>
<td>Salmon, Atlantic, farmed</td>
<td>175</td>
<td>0.096</td>
<td>0.586</td>
<td>1.238</td>
</tr>
<tr>
<td>Salmon, Pacific, Sockeye</td>
<td>144</td>
<td>0.073</td>
<td>0.228</td>
<td>0.445</td>
</tr>
<tr>
<td>Trout, mixed species</td>
<td>162</td>
<td>0.169</td>
<td>0.220</td>
<td>0.575</td>
</tr>
<tr>
<td>Tuna, white, canned in water, drained</td>
<td>109</td>
<td>0.060</td>
<td>0.198</td>
<td>0.535</td>
</tr>
<tr>
<td>Tuna, white, canned in oil, drained</td>
<td>155</td>
<td>0.173</td>
<td>0.056</td>
<td>0.151</td>
</tr>
<tr>
<td>Oyster, Eastern, farmed</td>
<td>67</td>
<td>0.054</td>
<td>0.195</td>
<td>0.179</td>
</tr>
<tr>
<td>Sardine, Atlantic, canned in oil, drained</td>
<td>177</td>
<td>0.424</td>
<td>0.402</td>
<td>0.433</td>
</tr>
<tr>
<td>Sardine, Pacific, canned in tomato sauce</td>
<td>157</td>
<td>0.200</td>
<td>0.453</td>
<td>0.735</td>
</tr>
<tr>
<td>Scallop, Bay &amp; Sea</td>
<td>94</td>
<td>0.005</td>
<td>0.061</td>
<td>0.088</td>
</tr>
<tr>
<td>Tilapia</td>
<td>109</td>
<td>0.038</td>
<td>0.004</td>
<td>0.110</td>
</tr>
</tbody>
</table>
Fish safety

- Mercury concerns
- Limit eating large fish that feed on other fish, making them at greater risk of accumulating mercury
  - Swordfish
  - King mackerel
  - Albacore tuna
  - Shark
  - Tile fish
- It is advisable for pregnant women and young children to avoid eating these fish (USFDA/EPA).
Sources of Omega-3 Fatty Acids: Plants

<table>
<thead>
<tr>
<th>Food</th>
<th>Calories</th>
<th>ALA (g)</th>
<th>EPA (g)</th>
<th>DHA (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flax seed, 14g (~2 Tbsp)</td>
<td>75</td>
<td>3.194</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chia seed, 14g (~2 Tbsp)</td>
<td>69</td>
<td>2.527</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Walnuts, 1 oz (14 halves)</td>
<td>185</td>
<td>2.574</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Canola oil, 1 tsp</td>
<td>40</td>
<td>0.411</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Purslane, ½ cup raw*</td>
<td>3</td>
<td>0.011*</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Purslane, ½ cup cooked*</td>
<td>10</td>
<td>0.032*</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Kale, ½ cup cooked</td>
<td>18</td>
<td>0.067</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Spinach, ½ cup cooked</td>
<td>21</td>
<td>0.083</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>


* Nutrition Data System for Research software version 2011, developed by the Nutrition Coordinating Center (NCC), University of Minnesota, Minneapolis, MN.

The DRIs for alpha linolenic acid are:
1.1 g for women; 1.6g for men
A standard serving of beer, distilled spirits and wine each contains the same amount of alcohol.

12 oz = 1 1/2 oz = 5 oz
Whole body effects of chronic fructose consumption.


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### Fructose Content in Selected Foods and Beverages

<table>
<thead>
<tr>
<th>Food</th>
<th>Grams of Fructose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cola with HFCS (12 oz)</td>
<td>22.5</td>
</tr>
<tr>
<td>Lemon-lime soda with HFCS (12 oz)</td>
<td>21.7</td>
</tr>
<tr>
<td>Ginger ale with HFCS (12 oz)</td>
<td>13.5</td>
</tr>
<tr>
<td>Raisins, seedless (1.5-oz box)</td>
<td>13.0</td>
</tr>
<tr>
<td>Power bar (chocolate)</td>
<td>10.9</td>
</tr>
<tr>
<td>Agave nectar (tbsp)†</td>
<td>8.9</td>
</tr>
<tr>
<td>Honey (tbsp)</td>
<td>8.6</td>
</tr>
<tr>
<td>Applesauce, sweetened (3.5 oz)</td>
<td>8.0</td>
</tr>
<tr>
<td>Fruit (apple, pear)</td>
<td>4–10</td>
</tr>
<tr>
<td>Molasses (tbsp)</td>
<td>2.6</td>
</tr>
<tr>
<td>Table sugar (tsp)</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Source: US Department of Agriculture;

What is the evidence from human subject research that consumption of high fructose corn syrup is associated with obesity, metabolic and/or adverse effects in adults?

Conclusion
Four short-term randomized controlled trials (Akhaven 2007, Melanson 2007, Soenen 2008, Stanhope 2008), two longitudinal studies (Monsivais 2007, Streigel-Moore 2006), two cross-sectional studies (Duffey 2008, Mackenzie 2006) and five review articles (Angelopoulos 2009, Bray 2004, Forshee 2007, Melanson 2008, White 2009) examined the effects of high fructose corn syrup (HFCS) compared with other nutritive sweeteners. These studies consistently found little evidence that HFCS differs uniquely from sucrose and other nutritive sweeteners in metabolic effects (circulating glucose, insulin, postprandial triglycerides, leptin and ghrelin), subjective effects (hunger, satiety and energy intake at subsequent meals) and adverse effects such as risk of weight gain. Randomized trials dealing specifically with HFCS were of limited number, short duration and of small sample size; therefore, long-term data are needed.

Grade II
Familial Chylomicronemia Syndrome

Rare Disease affecting 1 in 1,000,000 presents in patients with severe lipemia associated with TG levels greater than 2000mg/dl and recurrent pancreatitis. They have a functional deficiency of lipoprotein lipase, an autosomal recessive disorder.
Nutrition Prescription for Chylomicronemia Syndrome

- Very low-fat diet (10-15% of calories from fat)
- Meet requirements for EFAs- omega 6 and omega 3
- Low in simple carbohydrates; limit total carbs
- Weight management and physical activity
- Eliminate alcohol
- Meet nutrient recommendations
- Instructions for delicious meals
Nutrient Dense and Non-Nutrient Dense Forms of Sample Foods

**FIGURE 5-2. Examples of the Calories in Food Choices That Are Not in Nutrient Dense Forms and the Calories in Nutrient Dense Forms of These Foods**

- **Regular ground beef patty (75% lean) cooked 3 ounces**
  - Calories: 184
  - Beef fat: 52
  - Total: 236

- **Breaded fried chicken strips 3 ounces**
  - Calories: 138
  - Breading and frying fat: 108
  - Total: 246

- **Frosted corn flakes cereal 1 cup**
  - Calories: 90
  - Added sugars: 57
  - Total: 147

- **Curly French fried potatoes 1 cup**
  - Calories: 117
  - Frying fat: 141
  - Total: 258

- **Sweetened applesauce 1 cup**
  - Calories: 105
  - Added sugars: 68
  - Total: 173

- **Fat-free milk 1 cup**
  - Calories: 83
  - Milk fat: 66
  - Total: 149
We Need Fat in the Diet

• Major source of fuel energy
• Aids in the absorption of fat-soluble vitamins
• Essential fatty acids
• Serve other biochemical functions
2000 kcalories Can Include:

- 22-33g of Fat
- 11g/d omega-6
- 1.1-1.6g/d α- linolenic acid
## Fat Content in Foods

<table>
<thead>
<tr>
<th>Food</th>
<th>Total Fat (g)</th>
<th>Saturated Fat (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 oz. cooked leg of lamb, lean</td>
<td>7.8</td>
<td>2.8</td>
</tr>
<tr>
<td>3 oz. cooked beef sirloin</td>
<td>4.3</td>
<td>1.5</td>
</tr>
<tr>
<td>3 oz. cooked pork chops, loin</td>
<td>8.6</td>
<td>3</td>
</tr>
<tr>
<td>3 oz. cooked pork, sirloin cutlet</td>
<td>8.6</td>
<td>3</td>
</tr>
<tr>
<td>3 oz. cooked chicken breast, skin removed</td>
<td>3.8</td>
<td>1</td>
</tr>
<tr>
<td>removed before cooking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 oz. cooked chicken, dark meat, skin removed</td>
<td>8.9</td>
<td>2.8</td>
</tr>
<tr>
<td>removed before cooking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 oz. American cheese, processed</td>
<td>8.9</td>
<td>5.6</td>
</tr>
<tr>
<td>1 oz. Cheddar cheese, processed</td>
<td>8.9</td>
<td>5.6</td>
</tr>
<tr>
<td>1 oz. Swiss cheese, processed</td>
<td>7</td>
<td>4.5</td>
</tr>
<tr>
<td>1 oz. Feta cheese</td>
<td>6</td>
<td>4.2</td>
</tr>
<tr>
<td>1 oz. Mozzarella cheese, part-skim</td>
<td>5.7</td>
<td>3.1</td>
</tr>
<tr>
<td>1 T grated parmesan cheese</td>
<td>1.8</td>
<td>1.1</td>
</tr>
<tr>
<td>3 oz. cooked Atlantic salmon</td>
<td>6.9</td>
<td>1.1</td>
</tr>
<tr>
<td>3 oz. cooked sole</td>
<td>2</td>
<td>0.5</td>
</tr>
<tr>
<td>6 cooked pieces of large shrimp</td>
<td>0.6</td>
<td>0.1</td>
</tr>
</tbody>
</table>
MCT Oil

- For Patients Unable to Digest or Absorb Conventional Fats

  MCTs are more readily hydrolyzed and absorbed than conventional food fat

- MCTs are absorbed directly into the portal circulation and do not require bile salts for emulsification

Medium Chain Triglycerides
HCPCS Code B4155
Price:$399.99 ( 6 one Qt. bottles)
Sound Bytes That Are Confusing to a Patient

- Cut fat
- No red meat
- Exercise
- Increase fiber
- Lose weight
- Don’t eat white foods
Consider Both…

The patient’s risks and therapeutic needs

The patient’s readiness and personal choices

What you think

What your patient thinks
Assess Readiness to Change

Stages of Change for Those Needing Behavior Modification

<table>
<thead>
<tr>
<th>Stage of Change</th>
<th>Attitude Toward Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre contemplation</td>
<td>“never”</td>
</tr>
<tr>
<td>Contemplation</td>
<td>“Someday”</td>
</tr>
<tr>
<td>Preparation</td>
<td>“Soon”</td>
</tr>
<tr>
<td>Action</td>
<td>“Now”</td>
</tr>
<tr>
<td>Maintenance</td>
<td>“Forever”</td>
</tr>
</tbody>
</table>

Precontemplation: 40%
Contemplation: 40%
Preparation: 20%
Maintenance: 40%

<table>
<thead>
<tr>
<th></th>
<th>Skim Milk</th>
<th>Whole Milk</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Serving Size</strong></td>
<td>8 fl oz (240mL)</td>
<td>8 fl oz (240mL)</td>
</tr>
<tr>
<td><strong>Servings Per Container</strong></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Amount Per Serving</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Calories</strong></td>
<td>80</td>
<td>150</td>
</tr>
<tr>
<td><strong>% Daily Value</strong></td>
<td>0%</td>
<td>70%</td>
</tr>
<tr>
<td><strong>Total Fat</strong></td>
<td>0g</td>
<td>8g</td>
</tr>
<tr>
<td><strong>Saturated Fat</strong></td>
<td>0g</td>
<td>5g</td>
</tr>
<tr>
<td><strong>Cholesterol</strong></td>
<td>less than 5mg</td>
<td>35mg</td>
</tr>
<tr>
<td><strong>Sodium</strong></td>
<td>130mg</td>
<td>125mg</td>
</tr>
<tr>
<td><strong>Total Carbohydrate</strong></td>
<td>12g</td>
<td>12g</td>
</tr>
<tr>
<td><strong>Dietary Fiber</strong></td>
<td>0g</td>
<td>0g</td>
</tr>
<tr>
<td><strong>Sugars</strong></td>
<td>11g</td>
<td>11g</td>
</tr>
<tr>
<td><strong>Protein</strong></td>
<td>8g</td>
<td>8g</td>
</tr>
<tr>
<td><strong>Vitamin A</strong></td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td><strong>Vitamin C</strong></td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td><strong>Calcium</strong></td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td><strong>Iron</strong></td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td><strong>Vitamin D</strong></td>
<td>25%</td>
<td></td>
</tr>
</tbody>
</table>

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs. 

**Calories:**
- 2,000
- 2,500

**Fats:**
- Less than 55g
- Less than 80g
- Less than 20g
- Less than 25g
- Less than 300mg
- Less than 300mg
- Less than 2,400mg
- Less than 2,400mg

**Carbohydrates:**
- 300g
- 375g

**Dietary Fiber:**
- 25g
- 30g
Reduced fat chocolate milk

Nutrition Facts

Serving Size: 35 3/100 g (1.2 oz)
Servings Per Container: 8

Amount Per Serving

- Calories: 130
- Calories from Fat: 20

- % Daily Value:
  - Total Fat: 2g (3%)
  - Saturated Fat: 1g (6%)
  - Trans Fat: 0g
  - Cholesterol: 0mg (0%)
  - Sodium: 280mg (12%)
  - Potassium: 240mg (7%)
  - Total Carbohydrate: 29g (10%)
    - Dietary Fiber: 1g (4%)
    - Sugars: 24g
  - Protein: 2g

Vitamin A: 0%
Vitamin C: 0%
Calcium: 2%
Iron: 4%
Vitamin D: 2%
Vitamin E: 0%
Thiamin: 0%
Riboflavin: 0%
Niacin: 0%
Vitamin B6: 0%
Folate: 0%
Vitamin B12: 0%
Copper: 0%

* Percent Daily Values are based on a 2,000 calorie diet.

Calories per gram:
- Fat: 9
- Carbohydrate: 4
- Protein: 4
Label Reading
DLM: MNT and Referral to a RD

- Medical Nutrition Therapy (MNT) provided by a registered dietitian (RD) is recommended for patients with an abnormal lipid profile as defined by current National Heart, Lung and Blood Institute (NHLBI) Clinical Practice Guidelines and low-density lipoprotein cholesterol (LDL-C) goals.

- Patients who attend multiple RD visits for MNT lasting an average of 45 minutes (30-60 minutes per session) over six to twelve weeks can reduce daily dietary fat (5% to 8%), saturated fat (2% to 4%) and energy intake (232-710 kcal per day). This can result in a reduction in serum total cholesterol (TC) (↓7% to 21%), LDL-C (↓7% to 22%) and triglycerides (↓11% to 31%).

- Strong
### Effects of Diet Interventions on Triglyceride Lowering

<table>
<thead>
<tr>
<th>Nutrition Practice</th>
<th>TG-Lowering Response, %</th>
</tr>
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<tbody>
<tr>
<td>Weight loss (5% to 10% of body weight)</td>
<td>20</td>
</tr>
<tr>
<td>Implement a Mediterranean-style diet vs a low-fat diet</td>
<td>10-15</td>
</tr>
<tr>
<td>Add marine-derived PUFA (EPA/DHA) (per gram)</td>
<td>5–10</td>
</tr>
<tr>
<td>Decrease carbohydrates</td>
<td>1%</td>
</tr>
<tr>
<td>Energy replacement with MUFA/PUFA</td>
<td>1–2</td>
</tr>
<tr>
<td>Eliminate <em>trans</em> fats 1%</td>
<td></td>
</tr>
<tr>
<td>Energy replacement with MUFA/PUFA</td>
<td>1</td>
</tr>
</tbody>
</table>

TG indicates triglyceride; PUFA, polyunsaturated fatty acid; EPA, eicocicosapentaenoic acid; DHA, docosahexaenoic acid; and MUFA, monounsaturated fatty acid.

What to Say About Physical Activity

- Walking 1 mile = 100 kcal
- WHO, ADA, AHA, NIH:
  - 60 min./day for weight loss
  - 60-90 min./day for maintaining weight loss
Effective Lifestyle Counseling

• Participant motivation to change is essential
• Goals must be clear and outcomes must be measurable
• Strategies must be practical
• Interventions must be culturally compatible
Improving Adherence Strategies for Physicians and Health Professionals

• Be clear that the patient knows the rationale for food choices (why)
• Identify a goal and establish a specific plan (what)
• Identify facilitators and barriers to success (how)
• Follow-up at the next visit
Approaches to Improving Adherence

Multidisciplinary approaches are critical:

- Physician
- Registered Dietitian
- Nurse
- Physician Assistant
- Pharmacist
- Dentist

**Patient-focused process**

- Simplify
- Encourage family support
- Reward adherence
- Involve patients
Count Your Fats:
Self- Monitoring Food Diary

<table>
<thead>
<tr>
<th>Patient Initials</th>
<th>Date of Diary</th>
<th>Day (circle):</th>
<th>SUN</th>
<th>MON</th>
<th>TUE</th>
<th>WED</th>
<th>THUR</th>
<th>FRI</th>
<th>SAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time of Day</td>
<td>* Where Food Prepared</td>
<td>Description of food or beverage (Record one food item per line) Be specific… give details</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicate Amount Food</td>
<td>Indicate Cooking Method</td>
<td>Staff notes</td>
</tr>
</tbody>
</table>
Very Low Fat Menu

**Breakfast**
- Bagel with cream cheese and coffee: 394 kcal, 12g fat, 2g fiber
- Oatmeal with blueberries and skim milk: 355 kcal, 3g fat, 9g fiber

**Mid-Morning Snack**
- Sweetened ice tea and a donut: 1045 kcal, 7g fat, 0g fiber
- Non-fat Yogurt dip with veggies: 105 kcal, 0.54g fat, 3g fiber

**Lunch**
- Tuna sub with chips and ice cream: 1025 kcal, 54g fat, 1g fiber
- Shrimp wrap with veggies on a whole wheat tortilla, and fruit salad: 234 kcal, 1.7g fat, 9g fiber

**Dinner**
- Pasta with meat sauce, garlic bread and a Caesar salad with croutons: 772 kcal, 35g fat, 5g fiber
- Fish kebobs with vegetables over brown rice, spinach salad with vinaigrette Strawberry smoothie: 873 kcal, 8g fat, 23g fiber

Total:
- 3875 kcal / 108 g fat / 8g fiber
- 1567 kcal / 13g fat / 44g fiber
Management of Hypertriglyceridemia:

Mild to moderate HTG: Lifestyle therapy focusing on diet macronutrient composition, glycemic index, omega-3 fatty acids, weight reduction, physical activity

Severe hyperchylomicronemia: dietary fat restriction, MCT oil Weight management, physical activity, reduced simple carbohydrates
Thank you