Nutrients of Concern for Vegetarians

Angeline B. David, DrPH, MHS, RDN
Health Ministries Director
North American Division of Seventh-day Adventists

Foods Contain...

- Fats
  - Provide energy as calories

- Carbohydrates
  - Support growth & health

- Proteins

- Vitamins
- Minerals
- Water
- Other compounds

Position of the Academy of Nutrition and Dietetics: Vegetarian Diets

Abstract

It is the position of the Academy of Nutrition and Dietetics that appropriately planned vegetarian, including vegan, diets are healthful, nutritionally adequate, and may provide health benefits for the prevention and treatment of certain diseases. These diets are appropriate for all stages of the life cycle, including pregnancy, lactation, infancy, childhood, adolescence, older adulthood, and for athletes. Plant-based diets are more environmentally sustainable than diets rich in animal products because they use fewer natural resources and are associated with much less environmental damage. Vegetarians and vegans are at reduced risk of certain health conditions, including ischemic heart disease, type 2 diabetes, hypertension, certain types of cancer, and obesity. Low intake of saturated fat and high intakes of vegetables, fruits, whole grains, legumes, soy products, nuts, and seeds (all rich in fiber and phytochemicals) are characteristics of vegetarian and vegan diets that produce lower total and low-density lipoprotein cholesterol levels and better serum glucose control. These factors contribute to reduction of chronic disease. Vegans need reliable sources of vitamin B-12, such as fortified foods or supplements. J Acad Nutr Diet. 2016;116:717-735.

Vegetarian and vegan dietary patterns can be quite diverse because of the variety of choices available for substitutions and combinations. It is important to recognize that a vegetarian or vegan diet can be nutritionally adequate if it includes a variety of nutrient-dense foods. A well-planned vegetarian or vegan diet provides all necessary nutrients for healthy development and maintenance of body tissues, including proteins, vitamin B-12, iron, and zinc. Adequate intake of these nutrients can be achieved by following dietary guidelines and reading food labels. It is important to note that vitamin D and omega-3 fatty acids are not usually included in a vegetarian or vegan diet; however, they can be obtained through fortified foods or supplements. The Academy of Nutrition and Dietetics recommends that all adults, including vegetarians and vegans, meet the RDA for vitamin D and omega-3 fatty acids. It is also important to note that vegans need reliable sources of vitamin B-12, such as fortified foods or supplements.
Protein Structure

- Amino acids are the building blocks of proteins
  - 100 amino acids found in nature
  - 20 can be used by humans

Amino Acid Classification

- 9 are **essential** - cannot be made by body
  - histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine
- 6 are **conditionally essential** - cannot be made sufficiently under some conditions, eg premature infants, illness
- 5 are **non-essential** - our body makes these

Protein Quality

- Foods ➔ amino acids ➔ proteins
- Different food groups tend to have different types of amino acids
  - “incomplete” proteins lack one or more amino acid
- Goal is to get a variety of amino acids over the course of the day
Protein

- **Beans & Nuts**
  - Beans, legumes 1/2 cup = 8 g
  - Soy, tofu 1/2 cup = 9 g
  - Hummus 1/3 cup = 4 g
  - Nuts 1 oz = 4-6 g
  - Nut butters 1 Tbsp = 4 g
  - Seeds 1 oz = 4-7 g

- **Vegetables**
  - Collards 1 cup = 5 g
  - Spinach 1 cup = 5 g
  - Asparagus 1 cup = 4 g
  - Broccoli 1 cup = 3 g
  - Kale 1 cup = 2.5 g

- **Whole Grains**
  - Kamut 1/2 cup = 6 g
  - Quinoa 1/2 cup = 4 g
  - Whole wheat bread 4 g
  - Brown rice 1/3 cup = 2 g

Calcium (Ca)

- 99% found in bone + 1% in muscle + 0.2% in blood
- If blood levels drop, body will compensate
  - Increase Ca absorption from food
  - Increase Ca reabsorption via kidney
  - Remove Ca from bone stores

Calcium

- **Recommendation**
  - Most adults should get 1000 mg daily
  - Women over 50 and men over 70 should get 1200 mg daily
- **Inhibit absorption of calcium**
  - Oxalates: Beet greens, Swiss chard, rhubarb, spinach, beans
  - Phosphorus: cola, processed foods
  - Insoluble fiber: wheat bran

Ca & Other Nutrients

- **Vitamin D**: necessary to absorb Ca from food
- **Protein**: not conclusive that it affects Ca absorption
- **Phosphorus**: not conclusive that it decreases Ca absorption
- **Caffeine**: short-term increase in Ca loss
- **Sodium**: increases Ca loss
- **Potassium**: increases Ca retention
Calcium

**300 mg**
- Fortified soy milk, almond milk, other alternatives, 8 oz
- Fortified orange juice, 8 oz
- Collard greens, cooked, 1 cup

**200 mg**
- Turnip greens, cooked, 1 cup
- Mustard greens, cooked, 1 cup
- Tofu, calcium-set, ½ cup
- Calcium-fortified breakfast cereal, 1 oz
- Blackstrap molasses, 1 Tbsp

**100 mg**
- Kale, cooked, 1 cup
- Bok choy, cooked, 1 cup
- Edamame, cooked, 1 cup
- Soy nuts, ½ cup
- Sesame seeds, 1 Tbsp
- Dried figs, 3

**50-75 mg**
- Broccoli, cooked, 1 cup
- Almond butter or tahini, 2 Tbsp
- Tempeh, ½ cup
- Navy, great northern, garbanzo, pinto, black beans, cooked, 1 cup
- Almonds, 2 Tbsp

Vitamin D

**Steroid hormones**

- Two types
  - D2 - ergocalciferol
  - Found in plants, fungi, molds, snails, worms
  - D3 - cholecalciferol
  - Formed when UVB radiation from sun activates 7-Dehydrocholesterol in skin

Vitamin D Functions

- Bone and muscle health: maintains normal levels of calcium and phosphorus by helping absorption of calcium
- Regulates immune function
- Regulates cell growth & development
- Regulates blood pressure & insulin

Vitamin D

- Sun exposure is most important
  - Affected by season, latitude, time of day, cloud cover, smog, sunscreens, skin color, etc.
- Recommendation: 600 mg daily for everyone
- Vegans - may be more difficult to meet vitamin D requirements
- Have your physician check your levels
**Vitamin D**

- **Sunlight**
  - Aim for at least 20 minutes of sunlight exposure daily

- **Fortified Foods**
  - Dairy
  - Grains
  - Soymilk, almond milk, other alternatives
  - Orange juice
  - Mushrooms

- **Supplements**
  - Depending on blood levels, you may need to take a vitamin D3 supplement to ensure adequate levels
  - D3 is better absorbed
  - Have your physician check your vitamin D levels

**Vitamin B₁₂: Cyanocobalamin**

- Function: assists enzyme reactions, health of nerve and red blood cells, supports making DNA
- Deficiency:
  - megaloblastic anemia (large red blood cells)
  - neurologic changes: numbness in fingers and toes, unsteadiness, poor muscle coordination, forgetfulness, moodiness, mental slowness, poor memory, confusion, agitation, depression, delusions, hallucinations, psychosis, paranoia
  - Causes: inadequate intake, poor absorption, metabolic disorders

**Vitamin B₁₂ Absorption**

- Amount absorbed is influenced by amount eaten
  - Eat more ➔ absorb less
  - Maximum absorbed: 5 micrograms
  - RDA = 2.4 micrograms per day (adults)
- Elderly have lower absorption due to less stomach acids to free B₁₂ from food proteins

- In food, B₁₂ is bound to protein (free in supplements)
- Stomach acids separate protein and B₁₂
- Intrinsic Factor (IF) released into stomach and binds B₁₂
- IF-B₁₂ complex absorbed by terminal cells of small intestine
- B₁₂ is released by IF then enters blood stream
Vitamin B₁₂ Storage

- 80% of absorbed B₁₂ put in storage
- Adult stores can be 2-3 milligrams
- About 0.5 micrograms lost per day
- High stores can take 15-20 years to deplete
  - Total vegetarians & elderly at higher risk
- Fortified foods or supplements if older than 50 years of age

Omega-3 Fats

- Important for cardiovascular health, brain and eye development
- Recommended intake per day
  - Adult males 1.6 g ALA
  - Adult females 1.1 g ALA
  - Vegetarians may need slightly more

Omega-3 Fats

- ALA (alpha-linolenic acid)
  - Essential fatty acid - must be eaten because body cannot make it
  - Converted to EPA and DHA in the body
  - Canola oil, flax and flaxseed oil, walnuts, chia seeds, leafy green vegetables, fatty fish, breast milk
Omega-3 Fats

- EPA
  - About 10% conversion rate from ALA
  - Can also be retro-converted from DHA
  - Fatty fish, fish oil, breast milk
- DHA
  - Very little converted from ALA
  - Supplements are well absorbed
  - Algae oil, fatty fish, fish oil

Iron (Fe)

- Iron found in blood cells, muscle cells, linked with other compounds
- Deficiency: anemia
- Two dietary forms
  - Heme - found in meat
    - Easily absorbed
  - Non-heme - found in cereals, vegetables, legumes, fruits, etc
    - Increase absorption with Vitamin C

Iron

- Inhibit iron absorption
  - phytates
  - calcium
  - polyphenols found in tea, coffee, herb teas, cocoa
- Enhance iron absorption
  - Vitamin C
  - Food preparation
    - soaking, sprouting, leavening decreases phytate
    - fermentation

Iron

- Recommendations:
  - Vegetarians need more than non-vegetarians
  - Adult males 8 mg per day
  - Adult females 18 mg per day
  - Older than 50 years - 8 mg per day (males & females)
- Body may adapt to lower intake over long term
Iron

Beans & Legumes
- Lentils boiled 1 cup = 7 mg
- Kidney beans boiled 1 cup = 5 mg
- Blackeye peas boiled 1 cup = 4 mg
- Pinto, navy, black beans boiled 1 cup = 4 mg
- Tofu raw 1/2 cup = 3 mg
- Pumpkin seeds 1 ounce = 3 mg

Fruits & Vegetables
- Dried apricots 1 cup = 2 mg
- Raisins 1/2 cup = 2 mg
- Spinach fresh boiled 1/2 cup = 3 mg
- Spinach frozen boiled 1/2 cup = 2 mg

Grains & Other
- Fortified instant oatmeal 1 packet = 11 mg
- Enriched quick grits 1 cup = 2 mg
- Molasses 1 tablespoon = 1 mg
- Bread 1 slice = 1 mg
- Enriched cereals

Iodine (I)

- Plants absorb iodine from soil
  - Soil may be deficient in high altitudes
- Iodine is component of thyroid hormones
- Deficiency: goiter, cretinism, stillbirth, abortion, congenital malformation
- Recommend: 150 micrograms per day (adult males & females)

Iodine

Plant Foods
- Seaweed (kelp, nori, kombu, wakame) are variable in content
- Fruit & vegetable content depends on soil, fertilizer, irrigation

Fortified Foods
- Iodized salt in USA 45 mcg per 1 gram salt
- Enriched macaroni, canned corn, cereals, apple juice, etc

Supplements
- Listed as potassium iodide or sodium iodide
- May also use kelp (seaweed)

Zinc (Zn)

- Important for growth & development
- Incorporated into muscle, bone, skin, liver, brain, kidneys, heart, hair, blood
- Phytic acid (whole grains, legumes), oxalic acid (vegetables), and fiber decrease Zn absorption from food
- Absorption can be increased by:
  - food preparation (soaking, sprouting, leavening) - decreases phytate
  - vitamin C
Zinc Deficiencies

- Growth retardation
- Delayed sexual maturation
- Hair loss
- Diarrhea
- Eye & skin lesions
- Poor wound healing
- Impaired taste sensation
- Excess intake (1-2 g/d) → sideroblastic anemia

Zinc

- Body does not store zinc
- Must be consumed daily
- Recommended:
  - Adult males 11 mg per day
  - Adult females 8 mg per day

Zinc Sources

<table>
<thead>
<tr>
<th>Category</th>
<th>Food</th>
<th>Serving Size</th>
<th>Zinc (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beans &amp; Legumes</td>
<td>Lentils raw</td>
<td>1 cup</td>
<td>9 mg</td>
</tr>
<tr>
<td></td>
<td>Soybeans raw</td>
<td>1 cup</td>
<td>9 mg</td>
</tr>
<tr>
<td></td>
<td>Navy beans raw</td>
<td>1 cup</td>
<td>8 mg</td>
</tr>
<tr>
<td></td>
<td>Black beans raw</td>
<td>1 cup</td>
<td>7 mg</td>
</tr>
<tr>
<td></td>
<td>Chickpeas raw</td>
<td>1 cup</td>
<td>7 mg</td>
</tr>
<tr>
<td></td>
<td>Tofu firm raw</td>
<td>1/2 cup</td>
<td>2 mg</td>
</tr>
<tr>
<td>Nuts &amp; Seeds</td>
<td>Pumpkin seeds</td>
<td>roasted 1 cup</td>
<td>9 mg</td>
</tr>
<tr>
<td></td>
<td>Roasted peanuts</td>
<td>1 cup</td>
<td>9 mg</td>
</tr>
<tr>
<td></td>
<td>Pine nuts dried</td>
<td>1 cup</td>
<td>9 mg</td>
</tr>
<tr>
<td></td>
<td>Chickpeas raw</td>
<td>roasted 1 cup</td>
<td>8 mg</td>
</tr>
<tr>
<td></td>
<td>Almonds</td>
<td>1 cup</td>
<td>8 mg</td>
</tr>
<tr>
<td>Grains</td>
<td>Wild rice raw</td>
<td>1 cup</td>
<td>10 mg</td>
</tr>
<tr>
<td></td>
<td>Durum wheat</td>
<td>1 cup</td>
<td>8 mg</td>
</tr>
<tr>
<td></td>
<td>Oats</td>
<td>1 cup</td>
<td>6 mg</td>
</tr>
<tr>
<td></td>
<td>Prepared cereals</td>
<td>vary</td>
<td></td>
</tr>
</tbody>
</table>

* Starchy & root vegetables contain less than 1 mg

www.NADHealthMinistries.org
health@nadadventist.org