Life Cycle Nutrition: Adulthood and the Later Years

Aging and Nutrition
Nutrition for Older Adults

• One-fifth of the American population is over 65.
• Older adult defined as anyone over 50
Adult Nutritional Requirements

18-51 years

Related to:

• Cessation of linear growth
• Increasing sedentary lifestyle
• Establishment of chronic disease risk factors
• Adjustment to chronic stress
Nutrition Risks of Adults

• Macronutrient excesses and micronutrient deficiencies
• Diminished activity and high fat intake
• Stress-related effects on immune function
Nutrient Requirements of the Older Adult

- Nutrient-dense diet
- Decreased energy needs
- High-quality protein
- Hydration
- Vitamins and minerals
- Adequate fiber from foods, not supplements
# Age-Related Changes in Nutrient Requirements

<table>
<thead>
<tr>
<th>Changed Requirement</th>
<th>Rationale</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>↑ Energy</td>
<td>↓ muscle mass</td>
<td>Weight Gain unless activity increased</td>
</tr>
<tr>
<td>↑ Protein</td>
<td>↓ amino acid pool</td>
<td>Loss of muscle mass and functional capacity</td>
</tr>
<tr>
<td>↑ Folate, B₁₂, B₆</td>
<td>↓ absorptive efficiency</td>
<td>↑ plasma homocysteine, neurological damage</td>
</tr>
<tr>
<td>↑ Vitamin E</td>
<td>Cumulative oxidative damage</td>
<td>Immune incompetence</td>
</tr>
<tr>
<td>↑ Ca, Mg. Vitamin D</td>
<td>↓ bioavailability</td>
<td>Accelerated bone loss; immunoincompetence</td>
</tr>
</tbody>
</table>
Comparison of Adult Nutrient Requirements
Nutrition and Longevity

• Observation of Older Adults
  – Healthy Habits
    • Sleeping regularly and adequately
    • Eating well-balanced meals, including breakfast, regularly
    • Engaging in physical activity regularly
    • Not smoking
    • Not using alcohol, or using it in moderation
    • Maintaining a healthy body weight
Nutrition and Longevity

• Observation of Older Adults
  – Physical Activity
    • Many benefits including lower weight, greater flexibility, increased endurance, better balance and health, and a longer life span
    • Regular physical activity can prevent or delay the decrease in muscle mass and strength that occur with age.
    • Active people benefit from higher energy and nutrient intakes.
    • Start easy and build slowly
    • Check with physician
<table>
<thead>
<tr>
<th>TABLE 17-1 Exercise Guidelines for Older Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Endurance</strong></td>
</tr>
<tr>
<td><strong>Examples</strong></td>
</tr>
<tr>
<td><strong>Start easy</strong></td>
</tr>
<tr>
<td><strong>Progress gradually to goal</strong></td>
</tr>
<tr>
<td><strong>Cautions and comments</strong></td>
</tr>
</tbody>
</table>

Nutrition and Longevity

• Manipulation of Diet
  – Energy Restriction in Animals
    • Shown to prolong life
    • Shown to delay onset of or prevent disease
  – Energy Restriction in Human Beings
    • Applying results in animal studies to human beings is problematic.
    • Moderation of energy intake may be valuable.
Adult Nutritional Requirements
51 yrs and older

• Related to:
  – Physical, emotional, and physiological changes affecting appetite and ability to eat
  – Medications that may interact with nutrients
  – Diseases with specific nutritional requirements
The Aging Process

• Physiological, psychological, social, and economic changes that accompany aging affect nutritional status.

• Everyday stress can influence physical and psychological aging.

• **Stressors** elicit the body’s stress response.

• Physical stressors include alcohol and drug abuse, smoking, pain and illness.

• Psychological stressors include exams, divorce, moving, and the death of loved ones.

• Malnutrition is common.
Nutrition Risks of Adults: Psychosocial Factors

- Living alone
- Depression
- Anxiety
- Long-standing food habits
- Economic considerations
Nutrition Risks of Adults: Physical Factors

- Loss of teeth
- Loss of neuromuscular coordination
- Impaired hearing and vision
- Macular degeneration
- Physical discomfort
- Loss of muscle mass
- Arthritis
- Diminished sense of taste and smell
- Anorexia
Percentage of Malnutrition in Long-term Health Facilities

- Contributing Factors
  - Sensory losses
  - Sarcopenia
  - Decline in digestive/absorptive efficiency
  - Stress
  - Disease
  - Medications
Factors Affecting Nutrient Use

- Organs less efficient
- Decreased kidney function
- Decreased gastric motility
- Malabsorption
- Decreased hormones
The Aging Process

- **Physiological Changes**
  - **Body Weight**
    - Two thirds of the adults in the U.S. are overweight or obese.
    - Older adults with low body weight may be unprepared to fight illness and disease.
  - **Body Composition**
    - Sarcopenia is the loss of muscle mass.
    - Nutrition and exercise play a role in maintaining muscle mass.
These cross sections of two women’s thighs may appear to be about the same size from the outside, but the 20-year-old woman’s thigh (left) is dense with muscle tissue. The 64-year-old woman’s thigh (right) has lost muscle and gained fat, changes that may be largely preventable with strength-building physical activities.

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The Aging Process

• Physiological Changes
  – Immune System
    • Compromised immune systems can occur with age.
    • Incidences of infectious disease increase
  – GI Tract
    • Slower motility resulting in constipation
    • Atrophic gastritis impairs digestion and absorption of nutrients due to stomach inflammation, bacterial overgrowth, and a lack of hydrochloric acid and intrinsic factor.
    • Dysphagia is defined as difficulties in swallowing and can result in nutritional deficiencies.
The Aging Process

- **Physiological Changes**
  - **Tooth Loss**
  - Tooth loss and gum disease can interfere with food intake.
  - Edentulous is lack of teeth.
  - Conditions that require dental care
    - Dry mouth
    - Eating difficulty
    - No dental care in 2 years
    - Tooth or mouth pain
    - Altered food selections
    - Lesions, sores, or lumps in mouth
  - Ill-fitting dentures
The Aging Process

• Physiological Changes
  – Sensory Losses and Other Physical Problems
    • Vision problems can make driving and shopping difficult.
    • Taste and smell sensitivities may diminish.
The Aging Process

• Other Changes
  – Psychological Changes
    • Depression and loss of appetite commonly occur together.
    • Support and companionship of family and friends are helpful.
  – Economic Changes
    • Older adults have lower incomes and are at risk for poverty.
    • Only 1/3 receive aid from federal assistance programs.
  – Social Changes
    • Loneliness is directly related to low energy intakes.
    • Malnutrition is common.
Energy and Nutrient Needs of Older Adults

• There are many nutrient concerns for aging adults.

• Supplements are not routinely recommended.

• Nutrient needs and health needs are highly individualized.
Energy and Nutrient Needs of Older Adults

• Water
  – Dehydration increases risks for urinary tract infections, pneumonia, pressure ulcers, confusion and disorientation.
  – Fluid needs are not recognized.
  – Mobility and bladder problems
  – Water recommendations: at least 6 glasses per day
Energy and Nutrient Needs of Older Adults

- Energy and Energy Nutrients
  - Energy needs decrease by around 5% per decade.
  - Protein to protect muscle mass, boost the immune system, and optimize bone mass
  - Carbohydrate for energy
  - Fiber and water to reduce constipation
  - Fat to enhance flavors of foods and provide valuable nutrients
Energy and Nutrient Needs of Older Adults

• Vitamins and Minerals
  – Vitamin $B_{12}$ from fortified foods and supplements is especially needed for those with atrophic gastritis.
  – Vitamin D from fortified milk and sunshine is needed to prevent bone loss.
  – For those who avoid milk and milk products, calcium can be obtained from fortified juices, powdered milk, or supplements.
  – Iron from red meats consumed with vitamin C-rich foods
Energy and Nutrient Needs of Older Adults

• Nutrient Supplements
  – Vitamin D and calcium for osteoporosis
  – Vitamin $B_{12}$ for pernicious anemia
  – Iron
Nutrition-Related Concerns of Older Adults

- Adults over 65 have many problems that might be preventable through good nutrition.
- There is a strong need to solve vision, arthritis, and brain related problems.
Major Nutrition-Related Issues of Older Adults

- Obesity
- Anemia
- Undernutrition
- Osteoporosis
- Drug-nutrient interactions
- Food-induced malnutrition
- Alzheimer’s disease
Nutrition-Related Concerns of Older Adults

• Vision
  – Macular degeneration is a deterioration of the macula (center of the retina) area of the eye that leads to vision problems and blindness.
    • Antioxidants, zinc, leutein, zeaxanthins, and omega-3 fatty acids are preventative factors.
    • Total fat intake may be a risk factor.
Nutrition-Related Concerns of Older Adults

• Arthritis
  – Osteoarthritis (also called degenerative arthritis)
    • Risk factors include age, smoking, BMI at 40, and lack of hormone therapy in women.
    • Painful deterioration of the cartilage in the joints
    • Associated with overweight
Nutrition-Related Concerns of Older Adults

• Arthritis
  – Rheumatoid Arthritis
    • Immune system attacks bone coverage
    • Omega-3 fatty acids may reduce joint tenderness and motility.
    • Vitamin C, vitamin A, and carotenoids as antioxidants often help.
Nutrition-Related Concerns of Older Adults

• Arthritis
  – Gout
    • Uric acid deposits in the joints
    • Purines are converted to uric acid.
    • There are increased uric acid levels when meat and seafood are consumed.
    • Milk products lower uric acid levels.
Nutrition-Related Concerns of Older Adults

• Arthritis
  – Treatment
    • Relief from discomfort and improve mobility
    • No cure
    • Alternative therapies such as glucosamine and chondroitin may help but this is not confirmed.
    • Drugs and supplements may affect nutritional status.
Nutrition-Related Concerns of Older Adults

• The Aging Brain
  – Nutrient Deficiencies and Brain Function
    • Neurotransmitters need precursor nutrients.
    • Senile dementia
    • Neurons diminish as people age.
<table>
<thead>
<tr>
<th>Brain Function</th>
<th>Depends on an Adequate Intake of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-term memory</td>
<td>Vitamin B$_{12}$, vitamin C, vitamin E</td>
</tr>
<tr>
<td>Performance in problem-solving tests</td>
<td>Riboflavin, folate, vitamin B$_{12}$, vitamin C</td>
</tr>
<tr>
<td>Mental health</td>
<td>Thiamin, niacin, zinc, folate</td>
</tr>
<tr>
<td>Cognition</td>
<td>Folate, vitamin B$<em>{6}$, vitamin B$</em>{12}$, iron, vitamin E</td>
</tr>
<tr>
<td>Vision</td>
<td>Essential fatty acids, vitamin A</td>
</tr>
<tr>
<td>Neurotransmitter synthesis</td>
<td>Tyrosine, tryptophan, choline</td>
</tr>
</tbody>
</table>
Nutrition-Related Concerns of Older Adults

• The Aging Brain
  – Alzheimer’s Disease
    • Abnormal deterioration of the brain
    • Free radicals and beta-amyloid
    • Senile plaques and neurofibrillary tangles develop in the brain.
    • Acetycholine breakdown may affect memory.
    • Drugs are useful.
    • Maintaining body weight is important; Alzheimer’s patients may forget to consume foods.
• This is cerebral atrophy in a patient with Alzheimer disease. The gyri are narrowed and the intervening sulci widened, particularly pronounced toward the frontal lobe region.
Brain of an 82 y.o. male (Left) vs 36 y.o. male (Right)
Physiologic atrophy due to age-related diminished blood supply
**Neurofibrillary Tangles:** Paired Helical Filaments

*MAPS* - microtubule-associated protein

Hyperphosphorylated tau protein, ubiquitin, MAPS*, Amyloid beta protein

Displace, Encircle, Nucleus
<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Disease</th>
<th>Excess</th>
<th>Deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulin Resistance</td>
<td>Type II Diabetes, IDDM</td>
<td>fat, refined sugars, energy</td>
<td>chromium, zinc, vitamin E, B&lt;sub&gt;6&lt;/sub&gt;</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>Atherosclerosis, CHD</td>
<td>sat fat, total fat, cholesterol, energy</td>
<td>folate, B&lt;sub&gt;12&lt;/sub&gt;, B&lt;sub&gt;6&lt;/sub&gt;, vitamin C</td>
</tr>
<tr>
<td>Elevated Blood Pressure</td>
<td>Hypertension, Stroke</td>
<td>sodium, potassium</td>
<td>Ca, Mg, ω&lt;sub&gt;3&lt;/sub&gt; to ω&lt;sub&gt;6&lt;/sub&gt; fatty acids</td>
</tr>
<tr>
<td>Excess Body Fat</td>
<td>CHD, IDDM, Cancer, HT, osteoarthritis</td>
<td>energy, fat</td>
<td>energy expenditure</td>
</tr>
<tr>
<td>Immune System Incompetence</td>
<td>Cancer, Infectious Disease</td>
<td>antioxidants, fat, ω&lt;sub&gt;6&lt;/sub&gt; to ω&lt;sub&gt;3&lt;/sub&gt; FA</td>
<td>folate, vitamin A, Zn, Fe, B&lt;sub&gt;6&lt;/sub&gt;, vitamin C</td>
</tr>
</tbody>
</table>
Food Choices and Eating Habits of Older Adults

• Older people benefit from the social interaction and the nutrients provided through food assistance programs.
• Older adults should purchase foods carefully and prepare foods creatively.
Food Choices and Eating Habits of Older Adults

• Food Assistance Programs
  – Congregate meals are group settings at community centers.
  – Meals on Wheels is a home-delivered meal program.
  – The Senior Farmers Market Nutrition Program allows low-income older adults to exchange coupons for fruits, vegetables, and herbs.
Food Choices and Eating Habits of Older Adults

- Meals for Singles
  - Foodborne Illness
    - Greater risk in older adults
    - If severe, can cause paralysis, meningitis, or death
  - Spend Wisely
    - Buying proper quantities
    - Buy foods with longer shelf life – ultrahigh temperature (UHT) for milk products
- Be Creative
  - Use fresh foods for different recipes.
  - Dine with others.
  - Freezing meals
Community Programs for the Older Adult Can Make a Big Difference

- Companionship and healthy meals are a good combination.
Nutrient-Drug Interactions

- Both prescription and nonprescription (over-the-counter) drugs may have nutrition related consequences.
- Individuals need to consult with all of their physicians and pharmacists to avoid harmful drug interactions.
The Actions of Drugs

• Modifies one or more of the body’s functions
• Desirable and undesirable effects
The Interactions between Drugs and Nutrients

• Altered Food Intake
  – Altering appetite
  – Interfering with taste and smell
  – Inducing nausea or vomiting
  – Changing oral environment
  – Causing sores or inflammation of the mouth
The Interactions between Drugs and Nutrients

• Altered Nutrient Absorption
  – Changing acidity of the digestive tract
  – Altering digestive juices
  – Altering motility of the digestive tract
  – Inactivating enzyme systems
  – Damaging mucosal cells
  – Binding nutrients
The Interactions between Drugs and Nutrients

• Altered Drug Absorption
  – Changing acidity of the digestive tract
  – Stimulating secretions of the digestive juices
  – Altering rate of absorption
  – Binding to drugs
  – Competing for absorption sites
The Interactions between Drugs and Nutrients

• Altered Metabolism
  – Acting as structural analogs
  – Competing with each other for metabolic enzyme systems
  – Altering enzyme activity and contributing pharmacologically active substances
The Interactions between Drugs and Nutrients

• Altered Nutrient Excretion
  – Altering reabsorption in the kidneys
  – Displacing nutrients from their plasma protein carriers

• Altered Drug Excretion
  – By changing acidity level of the urine
The Inactive Ingredients in Drugs

• Other ingredients in drugs may include sugar, sorbitol, lactose, and sodium.

• Sugar, Sorbitol, and Lactose
  – Sugar may be a problem for diabetics
  – Sorbitol may cause diarrhea
  – Lactose can be a problem for those with lactose intolerance

• Sodium can be found in antibiotics and antacids
Vitamin and Mineral Supplements
Vitamin and Mineral Supplements

• Many people take dietary supplements for dietary and health insurance.
• Some take multinutrient pills daily.
• Others take large doses of single nutrients.
• A valid nutrition assessment by professionals determines the need for supplements.
• Self-prescribed supplementation is not advised.
• There are many arguments for and against supplements.
Arguments for Supplements

- Correct Overt Deficiencies
- Support Increased Nutrient Needs
- Improve Nutrition Status
- Improve the Body’s Defenses
- Reduce Disease Risks
Arguments for Supplements

• Who Needs Supplements?
  – People with nutritional deficiencies
  – People with low energy intake – less than 1600 kcalories per day
  – Vegans and those with atrophic gastritis need vitamin B$_{12}$
  – People with lactose intolerance, milk allergies, or inadequate intake of dairy foods
Arguments for Supplements

• **Who Needs Supplements?**
  – People in certain stages of the life cycle
    • Infants need iron and fluoride
    • Women of childbearing age need folate
    • Pregnant women need folate and iron
    • Elderly need vitamins $B_{12}$ and $D$
  – People with diseases, infections, or injuries, and those who have had surgery that affects nutrient digestion, absorption or metabolism
  – People taking medications that interfere with the body’s use of specific nutrients
Arguments against Supplements

• Toxicity
• Life-Threatening Misinformation
• Unknown Needs
• False Sense of Security
Arguments against Supplements

• Other Invalid Reasons:
  – Belief that food supply and soil contain inadequate nutrients
  – Belief that supplements provide energy
  – Belief that supplements enhance athletic performance or lean body mass without physical work or faster than work alone
  – Belief that supplements will help a person cope with stress
  – Belief that supplements can prevent, treat or cure conditions

• Bioavailability and Antagonistic Actions
Selection of Supplements

• What form do you want?
• What vitamins and minerals do you need?
  – Do not exceed Tolerable Upper Intake Levels.
  – Be careful about greater that 10 mg of iron.
Selection of Supplements

• Are there misleading claims?
  – Ignore organic or natural claims.
  – Avoid products that make high potency claims.
  – Watch fake preparations.
  – Be aware of marketing ploys.
  – Be aware of preparations that contain alcohol.
  – Be aware of the latest nutrition buzzwords.
  – Internet information is not closely regulated.

• What about the cost?
  – Local or store brands may be just as good as nationally advertised brands.
Regulation of Supplements

• Nutritional labeling for supplements is required.
• Labels may make nutrient claims according to specified criteria.
• Labels may claim that lack of a nutrient can cause a deficiency disease and include the prevalence of that disease.
• Labels may make health claims that are supported by significant scientific agreement.
Multiple Vitamins

Dietary Supplement
Rich in 11 Essential Vitamins
100 TABLETS

For your protection, do not use if printed foil seal under cap is broken or missing.

Directions for use: One tablet daily for adults.

Warning: Close tightly and keep out of reach of children. Contains iron, which can be harmful or fatal to children in large doses. In case of accidental overdose, seek professional assistance or contact a poison control center immediately.

Store in a dry place at room temperature (59-86°F).

Supplement Facts

Serving Size 1 Tablet

<table>
<thead>
<tr>
<th>Amount Per Tablet</th>
<th>% Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A 5000 IU (40% RDA)</td>
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<tr>
<td>Vitamin C 60 mg</td>
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<tr>
<td>Vitamin D 400 IU</td>
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<tr>
<td>Vitamin E 30 IU</td>
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<tr>
<td>Thiamin 1.2 mg</td>
<td>100%</td>
</tr>
<tr>
<td>Riboflavin 1.7 mg</td>
<td>100%</td>
</tr>
<tr>
<td>Niacin 20 mg</td>
<td>100%</td>
</tr>
<tr>
<td>Vitamin B6 2 mg</td>
<td>100%</td>
</tr>
<tr>
<td>Folate 400 mcg</td>
<td>100%</td>
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<td>Vitamin B12 6 mcg</td>
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<tr>
<td>Biotin 30 mcg</td>
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<td>Iron 18 mg</td>
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<td>Iodine 150 mcg</td>
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<td>Magnesium 100 mg</td>
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<td>Zinc 15 mg</td>
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<td>Selenium 10 mcg</td>
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<tr>
<td>Copper 2 mg</td>
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<tr>
<td>Manganese 2.5 mg</td>
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<tr>
<td>Chromium 10 mcg</td>
<td>8%</td>
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<tr>
<td>Molybdenum 10 mcg</td>
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<tr>
<td>Chloride 34 mg</td>
<td>1%</td>
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<tr>
<td>Potassium 37.5 mg</td>
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Ingredients: Dicalcium Phosphate, Magnesium Hydroxide, Microcrystalline Cellulose, Potassium Chloride, Ascorbic Acid, Ferric Fulvate, Modified Cellulose Gum, Zinc Sulfate, Gelatin, Stearic Acid, Vitamin E Acetate, Hydroxypropyl Methylcellulose, Niacinamide, Calcium Silicate, Citric Acid, Magnesium Stearate, Calcium Panthothenate, Artificial Color (FD&C Red No. 40, FD&C Yellow No. 6 and FD&C Blue No. 2), Sodium Dihydrogen Phosphate, Polyethylene Glycol, Cupric Sulfate, Methylparaben, Biotin, Ascorbic Acid, Potassium Hydroxide, Riboflavin, Sodium Lauryl Sulfate, Thiamin Mononitrile, Beta Carotene, Folic Acid, Polyethylene Oil, Vitamin D, Potassium Iodide, Glucon, Biotin, Cyanocobalamin.

Supplements, Inc.
1234 Fifth Avenue
Anywhere, USA

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<td>Chromium 10 mcg</td>
<td>8%</td>
</tr>
<tr>
<td>Molybdenum 10 mcg</td>
<td>6%</td>
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<tr>
<td>Choline 34 mg</td>
<td>1%</td>
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<tr>
<td>Potassium 375 mg</td>
<td>1%</td>
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</tbody>
</table>

**Note:** All nutrients listed may be included in the nutrition panel; ingredients without a Daily Value may be listed below. Ingredients must be listed on the label, but not necessarily in the ingredient list nor in descending order of predominance; ingredients named in the nutrition panel need not be repeated here.

**Contents or weight**

100 TABLETS

**The suggested dose**

The name, quantity per tablet, and “% Daily Value” for all nutrients listed; nutrients without a Daily Value may be listed below.

**Name and address of manufacturer**

Stepped Art

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Regulation of Supplements

• Labels may claim to diagnose, treat, cure, or relieve common complaints but not make claims about specific diseases.

• Labels may make structure-function claims if accompanied by Food And Drug Administration (FDA) disclaimer.
  – Role a nutrient plays in the body
  – How the nutrient performs its function
  – How consuming the nutrient is associated with general well-being