Module 13
Nutrition Guidelines for People with Intellectual and Developmental Disabilities
I. Build on the Basics-Part 2

https://www.the-ntg.org/
Section Learning Objectives

Upon completion of this webinar, the participants will be able to:

• Relate the pillars of brain health to lifestyle factors, including healthy eating
• Summarize the major principles in planning a healthy diet
• State the classes of nutrients, their general functions, health benefits, and major food sources.
• Describe how some nutrients may protect the brain from damage and ADRD development.
• Discuss the overall results of studies on the effects of dietary factors on risk reduction for ADRD
• Explain how different diets can be individualized for each person.
Overview of topics

Part 2 of the module on the Basics continues the story in part 1 about healthy eating and the nutrients that foods provide

• Review of the pillars of brain health
• The context: Good nutrition is good for the brain
• Classes of nutrients and the general functions of each class
• Selected nutrients, functions, health benefits and major food sources
• Factors that damage the brain and nutrients that may protect the brain
• Characteristics of a healthy diet and how they can be individualized
• Resources
The Brain: Pillars of Brain Health

• Stay active
• Eat well
• Sleep well
• Exercise your brain
• Connect with friends and family
• Relax and reduce stress
• Control risk factors (diabetes, Hypertension, obesity, depression)

(Source: Acti-v8 Your Brain, Global Alzheimer’s Platform)
Nutrients Nourish the Brain

• The brain: Active metabolism
  • Needs sufficient calories and nutrients for health.
  • Foods deliver these.
  • Carbohydrates (glucose for the brain) & fiber, proteins, lipids/fats, vitamins, minerals and water/fluid. Note: The brain can use ketones.
  • Malnutrition affects brain structure and function throughout the life course

(Dauncey, 2012; Morris, 2012; Cusick & Georgieff, 2016; Camandola & Mattson, 2017)

Photos Courtesy of USDA ARS Snaped.fns.USDA
Carbohydrates, Proteins, and Lipids/Fats

<table>
<thead>
<tr>
<th>Carbohydrates, proteins, and fats: Provide calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate: 4 kcal per gram</td>
</tr>
<tr>
<td>Protein: 4 kcal per gram</td>
</tr>
<tr>
<td>Fats: 9 kcal per gram</td>
</tr>
</tbody>
</table>

(IOM, DRI, 2005)

Table 2. Proportion of calories from nutrients in day’s total calories (2,000 Cal - used as reference)

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Percent (%)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate</td>
<td>45-65</td>
<td>Supplies large proportion. The range offers flexibility.</td>
</tr>
<tr>
<td>Protein</td>
<td>10-35</td>
<td>The range offers flexibility.</td>
</tr>
<tr>
<td>Fat/Lipid</td>
<td>20-35</td>
<td>Most concentrated source of calories. Has a place in healthy diets. The range offers flexibility</td>
</tr>
</tbody>
</table>

Photo Courtesy of USDA ARS

Carbohydrates, proteins, and fats: Provide calories

Carbohydrate: 4 kcal per gram

Protein: 4 kcal per gram

Fats: 9 kcal per gram

(IOM, DRI, 2005)
Carbohydrate & Fiber

Carbohydrate (Complex and Simple forms)

- Main energy source
- Important to the central nervous system & brain
- Protects protein from being used for energy
- Promotes complete breakdown of fat
- Excess → Stored as fat (energy reserve)

Fiber: Not digested; does not yield energy
- Promotes bowel regularity
- Helps lower blood cholesterol
- Benefits the gut microbiome

Photo Courtesy of USDA ARS
Carbohydrates: Selected Major Food Sources

• Grains and grain products
• Fruits (Fresh, frozen, dried, canned, juices)
• Vegetables, especially the starchy ones (corn, peas, potatoes)
• Sugars
• Use the link for specific foods and portion

Whole grains and their products, fruits and vegetables are also high in fiber.
Proteins: Functions and Major Food Sources

Proteins: Functions
- Critical to growth, maintenance, and tissue repair
- Are used to make
  - Enzymes
  - Hormones
  - Antibodies for immunity
  - Bone and red blood cells
- Can be used as alternative fuel source

Excess ➔ Stored as fat (energy reserve)

Use the link for specific foods and portions.

Sources: Animals and Plants
- Animal-derived
- Meats, poultry, fish, milk, cheese, eggs
- Higher quality than plant proteins

Plant-derived
- Beans, lentils, nuts
- Soy: Good quality protein

Eating a variety of plant proteins can enhance their quality.

Photo: Courtesy ARS USDA, Unsplashcom.
Sarcopenia and Aging: Protein and Calorie Needs

• Sarcopenia
  • Age-associated loss of muscle and function
  • **Poor muscle quality**: Weakness, decreased activities of daily living. Risks for falls and fractures, increased morbidity (Morley et al, 2010)
  • Prevalence of sarcopenia in older adults with IDD
    • (54+ years old, n=884), 14.3%
    • Associated with mobility impairment and inflammation
      (Bastiaanse et al, 2012)

*Sarcopenic obesity*: Presence of both sarcopenia and obesity. This leads to frailty, disability, morbidity and mortality.

**Malnutrition-Sarcopenia syndrome**: Another condition
(Barazonni et al, 2018; Vandewoude et al., 2012).
Sarcopenia: Recommended Protein Intake

Persons with sarcopenia:
- Increased protein and calorie intake
- Recommended amount of protein for treating frailty:
  - 1.2-1.5 g/kg of body weight (Morley, 2011)
  - Note: RDA for healthy adult:
  - 0.8 g /kg of body weight (IOM, 2005)

Protein quality matters. Choose protein foods with high quality.
Animal-derived: Meats, poultry, fish, cheese, milk, eggs
Plant-derived: Soy. Eat a variety of plant proteins.
- Resistance training
- Adequate vitamin D intake
- Leucine in the essential amino acid mix (Morley, 2011)

Many individuals with IDD have risk factors for sarcopenia (Evenhus et al, 2012)
Fats: Functions and Major Food Sources

• Concentrated energy source
• Help in absorption of fat-soluble vitamins
• Cushion vital organs
• Spare protein from use for energy
• Provide essential fatty acids and vitamin E
• Omega-3 fatty acids: “Healthy fats”
  Polyunsaturated: (See the slides specific to them.)
• Add palatability to foods

(Callahan, 2020)
Water

- People live longer without food that they do without water.
- Water maintains cell volume.
- Acts as a solvent.
- Transports nutrients and other substances in the circulation.
- Excretes waste products of metabolism.
- Regulates body temperature, and maintains normal fluid and electrolyte balance (Armstrong, 2010).
- Aids in maintaining normal blood pressure and cardiac and renal function (Roumelioti et al., 2018).
- Dehydration disrupts cognitive and physical performance and causes fatigue and delirium (Popkin, D’Anci & Rosenberg, 2010).
• Monitor fluid balance.

• Establish a hydration schedule.

• Flavoring water with orange or lime slices can enhance the appeal of plain water. Watery fruits and vegetables, milk, and fruit juices add not only fluid but also nutrients.

• Sugar-sweetened beverages should be avoided as they supply calories without the nutrients. Excessive sugar intake contributes to obesity. (DHHS/USDA, 2020-25).

• Recommended fluid take intake includes water, beverages and water in foods. For men and women (19 + years), 3.7 L and 2.7 L, respectively. (IOM, 2005)
Links to the Food Groups: Specific Foods, Portion Sizes and Other Information

- https://www.myplate.gov/eat-healthy/food-group-gallery
- https://www.nia.nih.gov/health/know-your-food-groups
- https://www.myplate.gov/eat-healthy/grains
- https://www.myplate.gov/eat-healthy/fruits
- https://www.myplate.gov/eat-healthy/vegetables
- https://www.myplate.gov/eat-healthy/protein-foods
- https://www.myplate.gov/eat-healthy/dairy
- https://www.nia.nih.gov/health/know-your-food-groups#oils
Vitamins are divided by their solubility:

**Fat-soluble:** Vitamins A, D, E, and K

**Water-soluble:** (See the links for details)

Some examples: Vitamin C

- B1-Thiamine
- B2-Riboflavin
- B3-Niacin
- B12-Cyanocobalamin
- B9- Folate (Folic acid) (Medline Plus, 2021)


Vitamins

Do not yield energy, but help in many body functions and processes.

Examples:

- Growth, maintenance and repair of tissues
- Energy production
- Bone formation
- Red blood cell formation
- Maintenance of vision
- Blood clotting

(Callahan 2020)
Minerals

Do not yield energy but some help in energy production

Regulate body functions and processes

Examples

• Growth, maintenance & repair of tissues
• Bone formation
• Red blood cell formation
• Fluid & electrolyte balance
• Nerve transmission
• See the link for complete list.

Examples:

• Calcium
• Iron
• Iodine
• Phosphorus
• Magnesium
• Sodium
• Potassium
• Zinc

See the link for complete list.

Selected Vitamins: Vitamin D

- Vitamin D: Group of fat-soluble vitamins that includes both vitamin D2 and vitamin D3.
- Both a nutrient and a prohormone
- **Manufactured in the skin**: Direct exposure to sun.
- **Amount varies** with time of day, season, latitude, and skin pigmentation
- **10–15 minutes exposure of hands, arms and face** 2–3 times/week may be sufficient (depending on skin sensitivity).

- Clothing, aging, skin pigmentation, sunscreen, window glass and pollution → Reduced amount produced

(IOM, 2011; Bikle, 2017)
Vitamin D Deficiency

• Regulates calcium and phosphorus balance
  → Maintains healthy bones
• Rickets: Children
• Osteomalacia: Adult rickets
• Osteoporosis: Multifactorial disease
• The prevalence of osteopenia and osteoporosis, including their risk factors, in adults with IDD is well documented (Frighi et al, 2014; Jasien et al, 2012; Srikanth et al, 2011).

  (Public domain) Blausen Medical. Wikimedia.org/Wikipedia commons

• Timely screening and risk assessment for osteoporosis can identify the disorder early for further assessment and intervention (Srikanth et al, 2011). Osteoporosis is preventable and treatable.
• Low vitamin D level and depression? Observed an association but not supported by clinical trial. https://ods.od.nih.gov/factsheets/VitaminD-HealthProfessional/

Vitamin D and COVID-19?
Vitamin D: RDA and Sources

• Sources
  
  - Diet
    
    Vitamin D-fortified foods, cod liver oil, some fish
  
  - Production in the skin
    
    From cholesterol precursor and solar energy
  
  - Supplements: D₂ or D₃

RDA: 51-70 years old: 600 IU (15 micrograms)
> 70 years: 800 IU (20 micrograms)

Excessive vitamins A and D intake: Toxic

Recommended limit: Tolerable Upper Intake Level (UL): 4000 IU (100 micrograms) per day
(IOM.2011)
Selected Minerals - Calcium

**Functions**
- Bone mineralization/hardening (Works with vitamin D and other bone forming nutrients)
- Contraction and relaxation of blood vessels
- Nerve transmission
- Blood clotting

Note: Blood calcium level is tightly controlled by hormones. Excess PTH → thin fragile bones  
(IOM .2011)

**Food sources**
- Dairy – dependable source
- Calcium-fortified juice and non-dairy alternative (soy milk)
- Some vegetables: Kale, turnip greens, broccoli
- Fish: Sardines and salmon with bones
## RDA for CALCIUM

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Amount (mg per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19–50 Years</td>
<td>1,000</td>
</tr>
<tr>
<td>51–70</td>
<td>1,200</td>
</tr>
<tr>
<td>Over 70</td>
<td>1,200</td>
</tr>
</tbody>
</table>

(IOM, 2011)

Access the link for sources of calcium

[https://www.dietaryguidelines.gov/food-sources-calcium](https://www.dietaryguidelines.gov/food-sources-calcium)

*1 equivalent of dairy:
- 1 cup yogurt, 2 cups cottage cheese, 1 ½ oz hard cheese, 1/3 cup shredded cheese, 1 cup milk or calcium-fortified soy milk, or 1 cup pudding made with milk
Videos on Vitamin D and Calcium

• Video: Vitamin D- Benefits, Functions, Sources, Effects of Deficiency and Recommended Dietary Allowance
  • https://www.youtube.com/watch?v=tKd4XPaUQoU

• Video: The Truth About Calcium-Benefits and Food Sources (1.11 minutes)
Review: Practice Questions

1. Someone advises you, “Don’t eat bread and potatoes. These foods are fattening.”
   • How would you respond to this statement?

2. Someone says, “You should completely avoid fat because fat is bad for you.”
   • How would you respond to this statement?

For review, please view this video.

• A video on Healthy Eating: My Plate My Wins. What is Your Eating Style? 1.46 minutes.
  • [https://www.myplate.gov/resources/videos](https://www.myplate.gov/resources/videos)

• Rice and beans recipe video (1.21 minutes)
  • [https://www.youtube.com/watch?v=nNFnLKULbxY&list=PLBcton6gOdrIKFFh-M9mf8VkPEV2ZVr_&index=13](https://www.youtube.com/watch?v=nNFnLKULbxY&list=PLBcton6gOdrIKFFh-M9mf8VkPEV2ZVr_&index=13)
Nutritional Factors and Dementia Risk Reduction

B Vitamins: Water-soluble
Folate (vitamin B-9) and vitamin B-12 (Cobalamin)
• Have interrelated roles in human health
• Affect neurological health
• Folate –preventive for neural tube defect (such as spina bifida and anencephaly)
(Morris, 2012, ODS, 2021)

CDC used in
https://upload.wikimedia.org/wikipedia/commons/7/7e/Spina-bifida.jpg
B Vitamins, Continued

Folate and vitamin B-12: Functions

• DNA and red blood cell and protein/tissue formation

• Deficiency of vitamin B-12
  • Peripheral neuropathy
  • Megaloblastic anemia (large, immature red blood cells)
  • Fatigue
  • Cognitive impairment

• (Morris, 2012) (Folate, ODS, 2021)
Folate and vitamin B-12 deficiency
  → Associated with cognitive decline and dementia

**Folate deficiency**: Raises homocysteine blood level. A risk factor for cardiovascular disease (CVD)

*CVD* is a risk factor for Alzheimer’s disease and related dementia *(Alz Assoc 202)*.

- **Conclusion**: Insufficient evidence to support an association between either folate or vitamin B12 deficiency
Folate: Recommended Allowance (RDA)

Folate
19+years old: 400 mcg DFE
Pregnancy: 600 mcg DFE

Selected Food Sources
- Spinach, frozen, cooked, boiled
  ½ cup: 100 mcg DFE
- Beef liver, cooked, braised
  3 ounces: 185 mcg DFE
- Breakfast cereals fortified (100% of the DV)
  ¾ cup: 400 mcg DFE
- Cowpeas (black-eyed), immature, cooked, boiled,
  ½ cup: 100 mcg DFE

Note: Folate & phenytoin

Folate, ODS, 2021
Vitamin B-12

• Naturally found only in animal products

  Vitamin B-12 deficiency:
  More likely due to malabsorption (rather than dietary deficiency).

• Lack of factors in the stomach that promote B-12 absorption
  - Intrinsic factor
  - Hydrochloric acid

• Atrophic gastritis in older adults
  - Up to 30% of older adults

• Helicobacter H pylori infections in the stomach

RDA for VITAMIN B-12

• 14-18 years old: 2.4 micrograms per day

• 19 and older: 2.4 micrograms per day

Advice for older adults

• Meet the RDA by use of
  ◦ Synthetic vit B-12 supplement
  ◦ Vitamin B-12 -fortified foods

http://ods.od.nih.gov/factsheets/VitaminB12-HealthProfessional/
Niacin

**Niacin**: Water-soluble vitamin

- Functions in energy metabolism and production
- The body can form it from tryptophan, an essential amino acid
- The RDA: Expressed in niacin equivalent

**Deficiency disease - Pellagra**

**Dermatitis, diarrhea, and dementia**

- A study, with 3718 participants (65 yrs. and older), in 1993-2002 results: Higher dietary intake of niacin was associated with slower annual rate of cognitive decline. Dietary niacin may protect people from Alzheimer’s dementia and age-related decline

(Morris et al 2004)
Oxidative Stress and Inflammation

Theory
• Brain: Prone to oxidative stress and damage to neuronal tissue
• Oxidative damage and neuron inflammation
• Underlying cause of neurodegenerative diseases (AD and Parkinson’s disease)

Other theories: Mitochondrial dysfunction, production of neurotransmitters
• Anti-oxidants may help prevent damage. (Morris, 2012) (Mielech et al, 2020)
• (Next are the antioxidant nutrients)
  • Note: This needs brief explanation per literature
<table>
<thead>
<tr>
<th>Nutrients</th>
<th>RDA (Per Day Basis)</th>
<th>Select Food Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin C</td>
<td>Adults: Men 90 mg Women: 75 mg</td>
<td>Citrus fruits, red and green peppers, kiwi, Other fruits and vegetables: Broccoli, strawberries</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>Adults 15 mg</td>
<td>Vegetable oils: Wheat germ, sunflower, and safflower oils Nuts: Peanuts, hazelnuts, and, especially, almonds) and seeds</td>
</tr>
</tbody>
</table>

Source: [https://ods.od.nih.gov/factsheets/list-all/](https://ods.od.nih.gov/factsheets/list-all/)

Callahan et al. 2020
How do omega-3s work in cardiovascular health?

**Fish and omega-3 fatty acids**

- Lower blood pressure
- Reduce blood triglyceride level
- Omega 3 may reduce inflammation. Inflammation can injure the arteries causing atherosclerosis. Blocked arteries can cause high blood pressure which can cause the heart to work harder. (Reference)

- 1.6 g a day for men; 1.1 g a day for women

**Conclusion:** Evidence on beneficial effect is conflicting. Protective role does not exist.

(Morris, 2012)(ADI, 2014)
Heart and Brain Connection

http://tuftsjournal.tufts.edu/2008/07/briefs/03/

http://www.firstaidcafe.co.uk/clipart/clipartlib/pages/heartAnatomy_jpg.htm
Microbiome and Brain health

• What do we know?
• This is a complex topic and the science is still evolving. I suggest that we include brief information on how diet affects the microbiome
Alternative products

• Do they work?
• I suggest that we add this. Some people may be using them
Summary

• Back to the food and the plate
• Repeat a healthy diet pattern mentioned in other slides. Reminding readers about the role of the other pillars.
• People eat food and not nutrients.
Practice Question

• See workbook