Healthy Eating When You Have a Brain Tumor: Nutrition During Treatment

Saturday, July 28
3:05pm to 3:50pm

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Certified Personal Trainer
Outline

• **Review of:**
  • Tumor metabolism and nutrition
  • Nutrition implications of treatment
  • Nutrition therapy and goals during treatment
Brain Tumors and Nutrition

- Treatment is a battle.
  - Changes in nutrition status and metabolism begin with the disease and proceed through treatment and recovery.

- Equip for battle with healthful food.
  - Food is both the energy and building blocks for this battle.
Brain Tumors and Nutrition

- Brain tumors can cause several nutrition-related changes\(^1\)-\(^3\), including:
  - High blood sugars and insulin resistance
  - Increased breakdown of fat
  - Increased use of protein for energy
  - Changes in metabolism, appetite and weight

- If left untreated, this can lead to progressive wasting and weakness.
Brain Tumors and Nutrition

• Metabolic changes are caused by changes in $^{4-6}$:
  • Immune system triggers release of:
    • Cytokines (block NPY)
    • TNF-α (Increases breakdown & metabolism, Insulin resistance)
    • IL-1 & 6 (Increased breakdown)
  • Neuropeptides
    • Neuropeptide Y (NPY) – Hunger Cue
    • Leptin (Blocks NPY) – Satiety Cue
    • Ghrelin – Hunger Cue
  • Neurotransmitters
    • Serotonin (Satisfies appetite)
Figure 1. Metabolic interactions between tumor and host.\textsuperscript{6} Image Copyright © by The American Society for Parenteral and Enteral Nutrition
## Brain Tumors and Nutrition

<table>
<thead>
<tr>
<th>Starvation</th>
<th>Cancer/Tumor</th>
<th>Contributing Compound</th>
</tr>
</thead>
</table>
| Increased mobilization of Fat | Equal mobilization of Fat and Protein | • Lipoprotein lipase  
• Increased Leptin |
| Decreased protein breakdown | Increased protein breakdown | • Cytokines, TNF-α, IL-1 & 6 |
| Decreased Metabolic rate | Increased Metabolic rate | • TNF-α |
| Decreased liver size | Increased liver size | • Increase production of glucose  
• Insulin resistance |
| Decreased blood sugar use | Increased blood sugar use | • Tumor metabolism  
• Insulin resistance |
| | Increased lactic acid |  
| | Increased synthesis of acute-phase proteins | • Increase in cytokines, TNF-α, IL-1 & 6 |
Brain Tumors and Nutrition

- Various tumor locations can also affect the ability to chew and swallow safely\(^7\), including:
  - Cerebrum
  - Cerebellum
  - Brain Stem
  - Cranial nerves
Nutrition Implications of Treatment Modalities

- Surgery
- Chemotherapy
- Radiation
- Immunotherapy
- Steroids
- Drug-Nutrient Interactions
Treatment: Surgery

• Surgery is an attack on the body.
• Common post-op symptoms\textsuperscript{8-10} include:
  • Fatigue, pain, and loss of appetite.
  • Proper nutrition can prevent and or treat the fatigue.
Treatment: Chemotherapy

- Systemic treatment
- Targets rapidly dividing cells, which include:
  - Cancer cells
  - Blood cells
  - Cells that line the digestive tract
  - Hair follicles
- Limited use due to blood-brain barrier, reserved for high-grade tumors
  - Often administered into CSF or via surgery
Treatment: Chemotherapy

• One of the more common effects of chemo are low blood cell counts, leading to:
  • Anemia (Fatigue)
  • Low Platelets (Easy bruising or bleeding)
  • Low Antibodies (Increased risk of infection)

• Other common symptoms include:
  • Poor appetite, taste changes, nausea, diarrhea, constipation, hair loss and mouth sores
Treatment: Radiation$^{13-14}$

- Localized therapy that uses high-energy rays or particles to kill cells.

- Used to:
  - To decrease tumor size if surgery is not an option.
  - Try to kill remaining tumor cells after surgery.
  - To relieve or prevent symptoms of tumors, especially those in the spinal cord.
Treatment: Radiation

- Possible side effects of radiation therapy:
  - Irritability and fatigue
  - Headaches
  - Nausea/Vomiting
  - Damage of healthful tissues that may affects the ingestion, digestion or absorption of nutrients.

- Nutrition intervention is based on symptom management.
Treatment: Immunotherapy

- These drugs target antibodies that stop the formation of new blood vessels that can carry nutrients to the tumor.
  - Example: Bevacizumab (Avastin)
- Common side effects of these drugs include:
  - High blood pressure,
  - low white blood cell count
  - poor appetite,
  - diarrhea, and
  - mouth sores
Treatment: Medications

- *Everolimus (Afinitor)* that blocks cell growth and division.
  - Side-effects: Mouth sores, Nausea, Poor appetite, Diarrhea, High Blood sugar, and High Cholesterol.

- *Dexamethasone (Decadron)*, corticosteroid, given to reduce swelling around brain tumors.
  - Side-effects: Increased appetite, High blood sugar, Fluid retention (edema).
Treatment: Drug-Nutrient Interactions

• *Laxatives* cause food to move more rapidly through the body
  • **Side-Effects:** Poor nutrient absorption of many vitamins and minerals.

• Antacids used to manage indigestion and gastric reflux
  • **Side-Effects:** Those that contain aluminum hydroxide can bind to phosphorus in food and over time this could result in weak bones and pain when walking.

• Anticonvulsants used to treat seizures
  • **Side-Effects:** Decrease folate absorption, which can result in megaloblastic anemia.
Treatment: Drug-Nutrient Interactions

- **Diuretics** *(HCTZ, Lasix)* remove excess fluid from the body.
  - **Side-Effects**: May increase loss of potassium and/or calcium. Potassium is vital for muscle contractions, including the heart. Calcium is important for bone health.

- **Aspirin** Large amounts of aspirin can cause increased loss of folate and/or iron.
  - **Side-Effects**: Decreased folate can lead to megaloblastic anemia. Low iron may be a result of stomach bleeding resulting in iron-deficient anemia.
Treatment: Drug-Nutrient Interactions

- **Calcium** important for bone health.
  - Side Effects: May bind to the antibiotic tetracycline and the body does not absorb the amount of antibiotic intended.

- **Zinc** provided for wound healing and to correct deficiency.
  - Side-Effects: Large amounts can interfere with copper and iron absorption.
Nutrition Therapy

• **Goals:**
  1. Provide adequate energy for weight maintenance.
  2. Prevent or reverse nutrient deficiencies.
  3. Preserve muscle (lean body mass).
  4. Minimize nutrition-related side effects.
  5. Protect immune function.
1. Provide adequate energy for weight maintenance.

- Healthful eating choices are something you can control.
- Food is both the energy and building blocks for this battle.
1. Provide adequate energy for weight maintenance.

- Energy Sources
  - Carbohydrate
  - Protein
  - Fat
- Fluids
- Phytochemicals
1. Provide adequate energy for weight maintenance.

What is a Calorie?

- Unit of food energy that vary by nutrient
  - Carbohydrate: 4 Calories per gram
  - Protein: 4 Calories per gram
  - Fat: 9 Calories per gram
  - Alcohol: 7 Calories per gram
1. Provide adequate energy for weight maintenance.

- **What is a Carbohydrate?**
  - The main form of energy for the body that is broken down into glucose (blood sugar)

- **Types:**
  - Simple (Quick Carbs)
  - Complex or Starches (Slow Carbs)
  - Fiber
1. Provide adequate energy for weight maintenance.

- Carbohydrates can be HALF of what you eat.

- Choose quality carbohydrates to achieve 25-35g fiber daily:
  - Whole grains: 100% whole wheat bread, oatmeal, brown rice, whole wheat pasta
  - Whole Fruit and Vegetables
1. Provide adequate energy for weight maintenance.

- **What is Protein?**
  - Animal and Plant structures that assist the body maintain structure, growth and lean tissue, such as muscle.

- **What does it do?**
  - Protein supports the immune system
  - Essential hormones and enzymes
1. Provide adequate energy for weight maintenance.

- Strive for at least 10 grams of protein at every meal.

- Choose **LEAN** sources such as:
  - Lean beef, Skinless poultry and Fish
1. Provide adequate energy for weight maintenance.

- **What is Fat?**
  - Fat is the most dense form of energy with a bad reputation

- **What does it do?**
  - Fat helps the body grow and develop, absorb fat-soluble vitamins (A, D, E & K), provides cushioning for organs and cells.
1. Provide adequate energy for weight maintenance.

The Good Guys-

- **Polyunsaturated Fats (PUFA):** The MOST flexible fats found in plant oils
  - Corn oil, Safflower oil, Soybeans, and Sesame seeds, walnuts, almonds, flaxseed and fish oils.

- **Monounsaturated Fats (MUFA):** Flexible fats that are HIGH in the American diet
  - Dairy, beef and partially hydrogenated vegetable oils.
  - These fats are also high in peanuts, seeds, canola oil and olive oil.
1. Provide adequate energy for weight maintenance.

The Bad Guy-

• **Saturated Fats**: Fixed fats with a rigid structure that makes them SOLID at room temperature
  • Animal fats (Lard, Butter, Meat, Dairy) and plant sources (Palm & Coconut Oil)

The Ugly Guy-

• **Trans Fats**: Unsaturated fats that have been TRANSformed into saturated fats
  • Processed foods, Pies, Vegetable shortening, Stick margarine
1. Provide adequate energy for weight maintenance.

- Choose heart healthy fats
  - The “Good” guys

- Keep saturated fats low
  - Less than 20 grams per day

- Keep trans fats minimal
  - Less than 1 gram per day
2. Prevent or Treat nutrient deficiencies.

- Malnourished individuals are often at greater risk for complications

- Common deficiencies:
  - B-Vitamins
  - Vitamin D
  - Iron

- Supplement safely.
Supplements\textsuperscript{15}

- Always check with your doctor before use.

- Safe during treatment:
  - Multivitamin with $\leq 100\%$ Daily Recommended Intake (DRI) for all ingredients
  - Calcium and Vitamin D $\leq 100\%$ DRI
  - Vitamin B complex $\leq 100\%$ DRI
  - Iron, as advised
### Supplement Facts

**Serving Size:** Two Tablets

<table>
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<tr>
<th>Ingredient</th>
<th>Amount per Serving</th>
<th>% Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A (as Beta Carotene)</td>
<td>25,000 IU</td>
<td>500</td>
</tr>
<tr>
<td>Vitamin C (as Ascorbic Acid)</td>
<td>1,000 mg</td>
<td>1670</td>
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<tr>
<td>Vitamin E (as Tocopheryl Succinate)</td>
<td>400 IU</td>
<td>1330</td>
</tr>
<tr>
<td>Zinc (as Zinc Gluconate)</td>
<td>50 mg</td>
<td>333</td>
</tr>
<tr>
<td>Copper (as Copper Gluconate)</td>
<td>2 mg</td>
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<tr>
<td>Selenium (as Selenomethionine)</td>
<td>50 mcg</td>
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<tr>
<td>Chromium (as Chromium Picolinate)</td>
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<tr>
<td>Citrus Bioflavonoid Complex</td>
<td>250 mg</td>
<td>*</td>
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<tr>
<td>Eyebright (Euphraisia officinalis)</td>
<td>50 mg</td>
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<tr>
<td>Alpha-Lipoic Acid</td>
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<tr>
<td>Ginkgo Biloba</td>
<td>25 mg</td>
<td>*</td>
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<tr>
<td>L-Glutathione</td>
<td>10 mg</td>
<td>*</td>
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<tr>
<td>FloraGLO® Lutein (containing Zeaxanthin)</td>
<td>6 mg</td>
<td>*</td>
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*Daily Value not established

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**INGREDIENTS** | **AMT** | **%DV**
---|---|---
Vitamin A | 3500IU | 70%
Vitamin B6 | 2mg | 100%
Vitamin B12 | 10mcg | 166%
Vitamin C | 60mcg | 100%
Vitamin D | 400IU | 100%
Vitamin E | 40IU | 133%
Folic Acid | 400mcg | 100%
Thiamine | 1.5mg | 100%
Niacin | 40mcg | 200%
Calcium | 200mg | 20%
Biotin | 50mcg | 17%
Riboflavin | 1.5mg | 88%
Magnesium | 50mg | 13%

**Proprietary Blend** | **1165mg**
---|---
Curcumin
Green Tea Extract
L-Carnitine
Ginseng Extract

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*Daily Value Not Established
Percent Daily Value Are Based On A 2000 Calorie Diet
Supplements

Nutrition Facts

Serv. Size 1 bottle
(8 fl oz)

<table>
<thead>
<tr>
<th>Amount Per Serving</th>
<th>%DV$</th>
<th>Amount Per Serving</th>
<th>%DV$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fat 6g</td>
<td>9%</td>
<td>Potassium 420mg</td>
<td>12%</td>
</tr>
<tr>
<td>Saturated Fat 1g</td>
<td>5%</td>
<td>Total Carb. 41g</td>
<td>14%</td>
</tr>
<tr>
<td>Trans Fat 0g</td>
<td></td>
<td>Dietary Fiber 1g</td>
<td>4%</td>
</tr>
<tr>
<td>Polyunsaturated Fat 3g</td>
<td></td>
<td>Sugars 18g</td>
<td></td>
</tr>
<tr>
<td>Monounsaturated Fat 2g</td>
<td></td>
<td>Protein 9g</td>
<td>18%</td>
</tr>
<tr>
<td>Cholesterol &lt;5mg</td>
<td>&lt;2%</td>
<td>Sodium 200mg</td>
<td>8%</td>
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</table>

Calories 250

Calories from Fat 50

Ingredients

WATER, CORN MALTODEXTRIN, SUGAR (SUCROSE), CORN SYRUP, MILK PROTEIN CONCENTRATE, COCOA POWDER (PROCESSED WITH ALKALI), SOY OIL, SOY PROTEIN ISOLATE, CANOLA OIL; LESS THAN 0.5% OF: CORN OIL, CALCIUM PHOSPHATE, POTASSIUM CITRATE, SOY LECITHIN, MAGNESIUM PHOSPHATE, MAGNESIUM CHLORIDE, NATURAL AND ARTIFICIAL FLAVORS, SALT (SODIUM CHLORIDE), SODIUM CITRATE, CARRAGEENAN, CHOLINE CHLORIDE, ASCORBIC ACID, POTASSIUM CHLORIDE, DL-ALPHA-TOCOPHERYL ACETATE, ZINC SULFATE, Niacinamide, Ferrous Sulfate, Calcium Pantothenate, Copper Sulfate, MANGANESE SULFATE, CHROMIUM CHLORIDE, FD&C RED #3, VITAMIN A PALMITATE, THIAMINE HYDROCHLORIDE, PYRIDOXINE HYDROCHLORIDE, RIBOFLAVIN, FOLIC ACID, BIOTIN, SODIUM SELENATE, POTASSIUM IODIDE, SODIUM MOLYBDATE, PHYLLOQUINONE, CYANOCOBALAMIN, AND VITAMIN D3. CONTAINS MILK AND SOY INGREDIENTS; GLUTEN-FREE; SUITABLE FOR LACTOSE INTOLERANCE.

Vitamins and Minerals

Vitamin A 25% • Vitamin C 50% • Calcium 30% • Iron 25% • Vitamin D 25% • Vitamin E 30% • Vitamin K 25% • Thiamin 25% • Riboflavin 25% • Niacin 25% • Vitamin B6 25% • Folate 25% • Vitamin B12 25% • Biotin 25% • Pantothenic Acid 25% • Phosphorus 25% • Iodine 25% • Magnesium 25% • Zinc 30% • Selenium 30% • Copper 25% • Manganese 25% • Chromium 25% • Molybdenum 25% • Chloride 8% • Choline 15%
3. Preserve lean body mass.

Lean body mass helps to maintain the following during treatment:

- Healthy metabolism
- Strength
- Stability

Muscle breakdown is common when the body is under stress.
3. Preserve lean body mass.

- Muscle breakdown is common when the body is under stress.

- Poor nutrition increases the risk of poor bone health due to decreased calcium and vitamin D intake.
3. Preserve lean body mass

Preserve lean body mass by:

- Choosing lean protein at every meal.
- Eat well-balanced meals for a variety of fuel sources.
- Consuming adequate calcium and vitamin D.
- Partake in regular physical activity:
  - 60 minutes of Moderate-aerobic Physical Activity most days of the week.
  - Resistance exercise 2 days per week.
4. Minimize nutrition-related side effects

- Poor Appetite
- Good Appetite
- Nausea
- Diarrhea
- Constipation
- Hydration

- Dry Mouth
- Mucositis
- Fluid Retention
- Blood Sugar Management
- Taste Changes
Symptom: Poor Appetite

**Treatment:**
- Eat small, frequent meals and snacks.
- Select foods with neutral or pleasant scent.
- Perform frequent mouth care.
- Add extra calories and protein as needed:
  - Non-fat Dry Milk Powder
  - Dairy
  - Eggs
  - Heart healthy fats (Olive/canola oils; Nuts/Seeds)
Symptom: Poor Appetite

• **Treatment:**
  - Choose healthful foods that are easy to prepare and eat (finger foods):
    - Raw Vegetables with Dip
    - Fresh Fruit with Yogurt
    - Homemade Trail Mix
  - Store extra portions into homemade frozen dinners.
  - Ask for help.
Symptom: Good Appetite

• **Treatment:**
  • Create and follow a meal plan.
  • Design well-balanced meals with at least 3 food groups.
  • Choose healthful snacks with at least 2 food groups.
  • Satisfy your thirst.
Symptom: Nausea

• **Treatment:**
  - Eat before your treatment.
  - Identify foods that trigger nausea.
    - Common trigger foods: spicy, greasy, smelly.
  - Choose a room that is comfortable in temperature and neutral in scent.
  - Practice good oral hygiene.
Symptom: Nausea

- **Treatment:**
  - Eat while sitting up and do not lie down for ≥1 hour after eating.
  - Choose foods that are bland and/or dry:
    - Toast, Crackers, Dry Cereal, Potatoes
    - Skinless Chicken
    - Cooked fruits (applesauce, canned fruit)
Symptom: Diarrhea

• Various treatments and stress can cause diarrhea.
• Discontinue use of stool softeners.
• Hydration is very important.
  • Drink plenty of room-temperature fluids
    • 1 Cup Water after every bowel movement.
  • Eat your water
    • Broth or Soup, Sports drinks, and Banana or Canned Fruit can help to prevent dehydration.
Symptom: Diarrhea

• **Treatment:**
  • Limit dairy to 2 servings per day.
  • Limit caffeinated beverages.
  • Limit gas-forming foods and beverages:
    • Carbonated beverages,
    • Cruciferous vegetables, legumes, lentils
    • Chewing gum, and
    • Sugar alcohols (candy, gum, sugar-free foods)
Symptom: Constipation

• **Treatment:**
  - Stay hydrated with calorie-free beverages.
  - Slowly add fiber to your daily meals.
    - Aim for 3-5 servings of vegetables and 2-4 servings of fruit daily.
    - Choose whole grains.
    - Add chia seeds to hot cereal.
Symptom: Constipation

**Treatment:**

- Supplement fiber (drinks, cereal, snack bars).
- Inquire about a bowel regimen.
  - Stool softener
  - Laxative
- Increase physical activity.
Symptom: Dry Mouth

• Xerostomia is a common side-effect with radiation and medications.

• **Treatment:**
  • Stay hydrated
    • Drink and Eat Water
  • Practice good oral hygiene.
    • Avoid rinses with alcohol
  • Sugar-free candies (mint and lemon)
Symptom: Mucositis

• Damage to the digestive tract is common with radiation and chemotherapies.

• **Treatment:**
  
  • Avoid oral irritants: spicy, salty and acidic foods.
  
  • Choose foods that are soft and easy to chew and swallow:
    
    • Soft fruits and vegetables, cottage cheese or yogurt, cooked cereal or pasta, eggs, pudding

  Use a straw to drink fluids.

  • Numb mouth with ice chips.
Symptom: Taste Changes

- Changes in taste and smell can be a result of:
  - Treatment (Radiation and Chemotherapy)
  - Dental problems
  - Mucositis
  - Infection, such as “thrush”
Symptom: Taste Changes

**Treatment:**
- Use plastic utensils to avoid metallic taste.
- Try a sugar-free lemon drop prior to meals and snacks.
- Practice good oral hygiene.
- Try a variety of herbs, spices, and citrus
  - Be cautious if you have mucositis
- Enjoy favorite foods.
- Choose lean chicken, fish, eggs or low-fat dairy over red meat.
  - Try meat with a sweet sauce (cranberry or apple sauce)
Symptom: Edema

- Fluid retention can be the result of medications, including steroids.

**Treatment:**

- Limit intake of salt and added salt.
  - Choose foods with <300mg of sodium per serving.
  - Avoid condiments high in salt (ketchup, pickles, hot peppers)
- Choose sugar-free beverages.
Symptom: High Blood Sugar

• Blood sugars can become high during treatment.

• **Treatment:**
  • Consume well-balanced meals and snacks at similar times each day.
  • Avoid consuming carbohydrates alone.
    • Always pair the carbohydrate with a lean protein or healthy fat.
    • Limit intake of sugar-sweetened beverages.

Choose whole grains or high fiber starches
• More than 3g fiber per serving.
5. Protect immune function

- Low blood cell counts often fall during treatment, resulting in:
  - Anemia (Fatigue)
  - Low Platelets (Easy bruising or bleeding)
  - Low White Blood Cells (Increased risk of infection)

- This makes the body more susceptible to infection.
5. Protect immune function

**Tips for Anemia:**

- Choose iron-rich proteins:
  - Red Meat, Chicken, Shellfish, Legumes and Lentils
- Combine plant sources of iron with Vitamin C:
  - Citrus Fruits
  - Bell Peppers
  - Dark Green Vegetables
- Limit fiber intake with iron supplement.
5. Protect immune function

**Tips Low Platelets:**

- Choose foods high in B-Vitamins:
  - Whole Grains and Leafy Green vegetables
- Consume adequate Vitamin K:
  - Dark Green Vegetables: Kale, spinach, greens, asparagus, broccoli.
  - Contraindicated if you are taking a blood thinner.
- Choose a source of protein at every meal.
5. Protect immune function

Tips for Low White Blood Cells to Avoid infection:

• Check expiration dates on food and throwing away leftovers after 1-2 days.
• Refrigerate leftovers within 2 hours of cooking.
• Avoid moldy or damaged fruits and vegetables.
• Consume only cooked proteins, avoiding raw eggs and fish.
• Thaw foods in the refrigerator and cook foods immediately.
• Be cautious when dining out and avoid salad bars and buffets.

Wash hands frequently with soap and water.
Conclusion: Key Points

• Protect yourself from the nutrition implications of treatment, by:
  • Providing adequate energy for weight maintenance.
  • Preventing or treating nutrient deficiencies.
  • Preserving muscle and bones.
  • Minimize nutrition-related side effects.
  • Protect immune function.
Resources

• Katz, R & Edelson, M. Cancer-Fighting Kitchen: *Nourishing, Big-Flavor Recipes for Cancer Treatment and Recovery.*

• **National Cancer Institute**
  • Call 1-800-4-CANCER
  • NCI Public Inquiries Office, Suite 3036A
    6116 Executive Boulevard, MSC8322
    Bethesda, MD 20892-8322
References


References


