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BLOOD & MARROW TRANSPLANT INFORMATION NETWORK

The Role of Nutrition in Long-Term Health after Transplant

Celebrating a Second Chance at Life Survivorship Symposium

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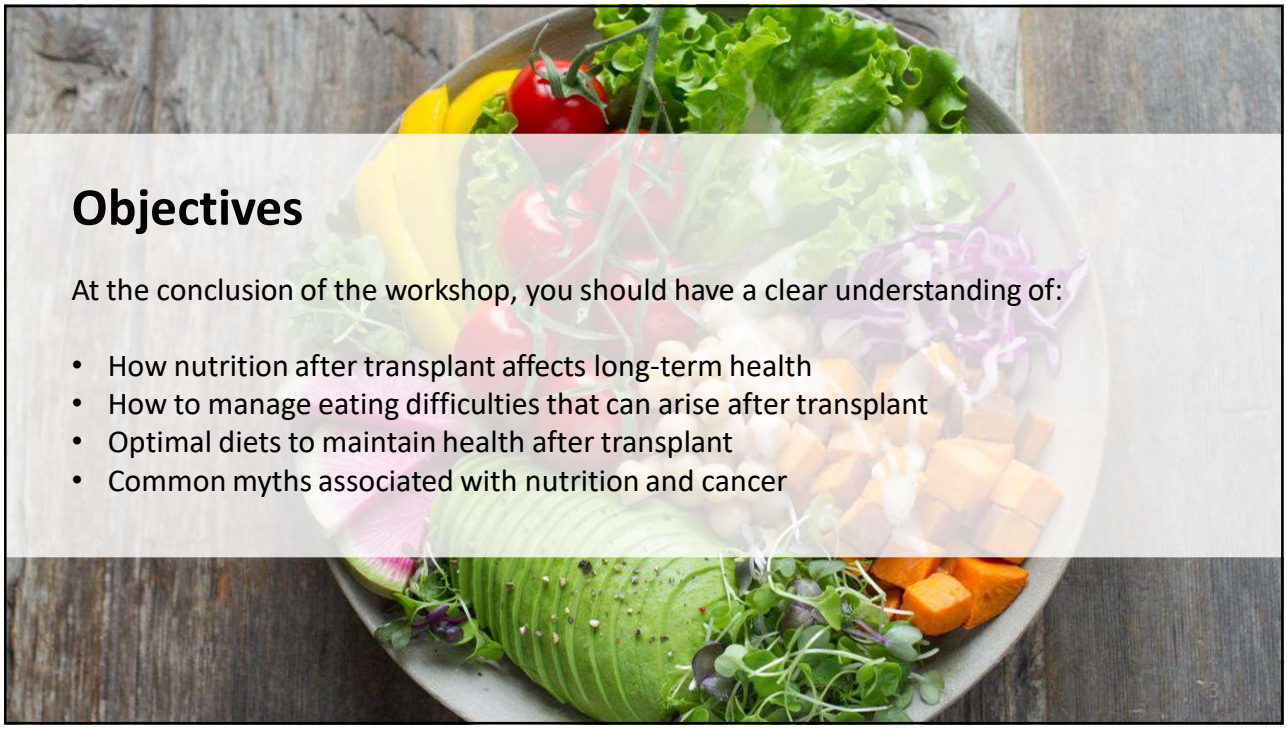

How does nutrition after stem cell transplantation effect long-term health?

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Stem cell transplantation

- Survival rates have increased.
- Therefore, long-term and late nutrition effects are of growing importance.
- Chronic graft-vs-host disease (GVHD), metabolic syndrome, cardiovascular issues, and osteoporosis are common post-transplant and impact life expectancy and quality of life.

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Chronic GVHD

- A problem that occurs when the donor's system attacks the patient's organs and tissues
- May affect many body organs including mouth, stomach, and gastrointestinal tract

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Common nutrition-related issues associated with chronic GVHD

- Oral/esophageal changes including increased sensitivity, dryness, and compromised swallowing ability
  - Texture modification (softer foods; liquid diet)
  - Choose less spicy foods
  - Avoid carbonated beverages
  - Consume adequate fluids with meals
- Appetite changes resulting in weight gain or loss

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Post-transplant nutrient and fluid needs

- Nutrient and fluid needs may change post-transplant:
  - Calorie needs may increase with GVHD or weight loss
  - Protein needs may increase with GVHD, some medications, or muscle loss
  - Fluid needs may increase with GVHD and some medications

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Chronic GVHD may change the amount of calories needed

- Increased need to repair damaged body tissues and help regain weight and strength.
- Body may digest food less efficiently, thus requiring increased nutrient intake to maintain weight.
  - Focus on small, frequent nutrient-dense meals and snacks
  - Consume adequate protein
  - Regularly include healthy fats, such as extra virgin olive oil or avocados, in your diet

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Protein

- Increased need with chronic GVHD
- Important for growth and rebuilding tissue
- Sources
  - **Animal:** lean meats, poultry, fish, eggs, dairy products
  - **Plant:** legumes (lentils, black beans, etc.), nuts or nut butters, soy-based foods

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Fluids

Increased needs due to:

- Immunosuppressive medications (cyclosporine; tacrolimus)
- Increased losses due to fever, sweat, diarrhea, vomiting, or rapid breathing

Good sources:

- Water/flavored water
- Broth
- Smoothies
- Milk *(including soy, almond, or coconut milk)*
- Yogurt
- Soups
- Vegetable juice
- Limit caffeine and alcohol

- Drink fluids throughout the day instead of waiting until thirsty
- Drink more on hot days and with exercise
- Keep a cup/bottle of water or other fluid in sight as a reminder

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Food safety guidelines

- Practice food safety if you are taking immunosuppressive medications
  - Clean, separate, cook, chill
  - Avoid high-risk foods including:
    - Unpasteurized milk and milk products
    - Undercooked meat, seafood, and eggs
    - Unwashed fresh fruits and vegetables
    - Uncooked bulk foods
  - SCCA food safety guidelines: **seattlecca.org/patient-education/food-safety-guidelines**

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Long-term nutritional consequences associated with stem cell transplantation: Metabolic Syndrome

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Metabolic Syndrome

Definition:
Presence of at least 3 of the 5 defining characteristics:

- Apple vs. pear fat distribution/centralized obesity
- High blood fats
- Low HDL ("good") cholesterol
- High blood pressure or on medications
- High fasting blood sugar or on medications

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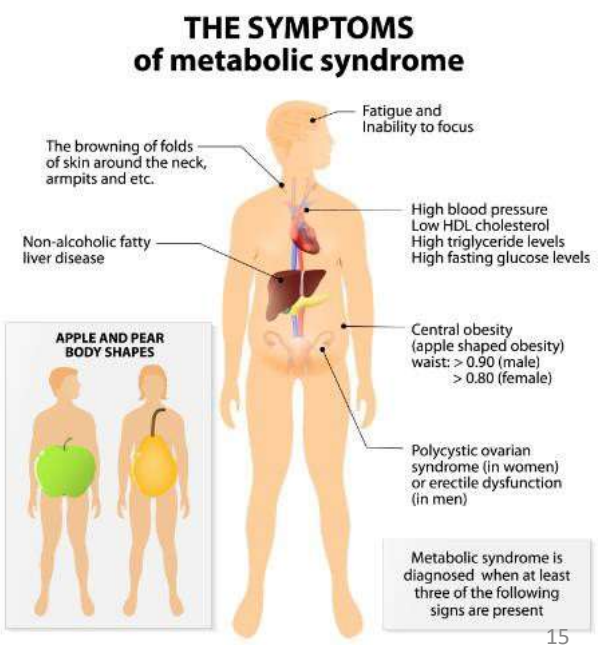
Symptoms of Metabolic Syndrome



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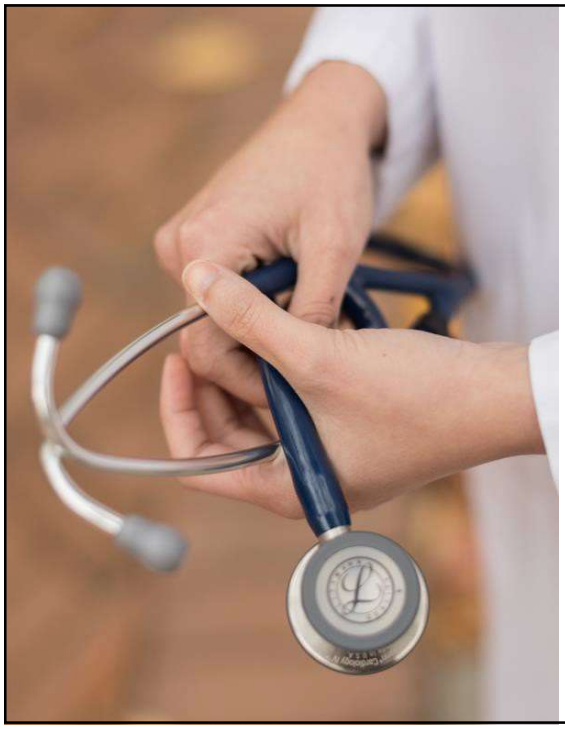

Studies have shown that both pediatric and adult transplant patients are **more likely** to develop diabetes and high blood pressure than the general population.

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Long-term nutritional consequences associated with stem cell transplantation
Metabolic Syndrome: Cardiovascular Disease

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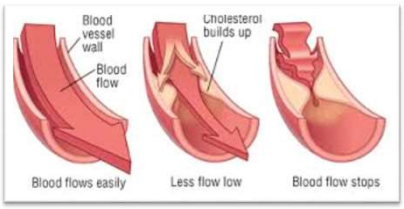
Metabolic Syndrome: Cardiovascular Disease

What is cholesterol?

- Type of lipid (fat) in our bodies that forms cells, makes hormones, and produces vitamin D.
- Our bodies make both "good" and "bad" cholesterol.



- Persistent high levels of cholesterol (particularly LDL-cholesterol) and triglyceride are associated with metabolic syndrome and increased risk for development of cardiovascular disease.

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What are normal blood lipid (fat) levels?

Total cholesterol	below 200 mg/dL
HDL-cholesterol ("good")	men: over 40 mg/dL women: over 50 mg/dL over 60 mg/dL is ideal
LDL-cholesterol ("bad")	below 130 mg/dL below 100 mg/dL is ideal
Triglyceride	below 150 mg/dL
Total cholesterol: HDL ratio	less than 5 mg/dL less than 3.5 is ideal

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Types of dietary fats found in common foods

- **Polyunsaturated and Monounsaturated (plant-based foods; help lower LDL-cholesterol):**
  - Avocado, canola, olives (fruits and oils)
  - Sesame, sunflower (seeds, butters, and oil)
  - Almonds, cashews, hazelnuts, peanuts, walnuts (nuts, butters, and oils)
  - Pecans
  - Whole grains
  - Vegetables

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Types of dietary fats found in common foods

- **Omega-3 (plant-based foods and fish; help lower triglyceride levels):**
  - Wild, cold-water fish (salmon, sardines, tuna)
  - Dark leafy greens
  - Legumes (lentils, dried beans)
  - Walnuts (oil), flaxseeds (oil)
  - Omega-3 eggs

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Types of dietary fats found in common foods

Saturated (primarily animal sources; can increase LDL-cholesterol levels):

- Processed meats, red meats
- Whole milk, cream, half and half, butter, cheese, full-fat yogurt, ice cream
- Palm oil
- Lard
- Chocolate

Trans (hydrogenated, artificial fats; can increase LDL-cholesterol and lower HDL-cholesterol levels):

- Margarine, shortening
- Fried foods (pastry, potatoes, fast foods, etc.)
- Some crackers, chips, and cookies

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Long-term nutritional consequences associated with stem cell transplantation: Osteoporosis

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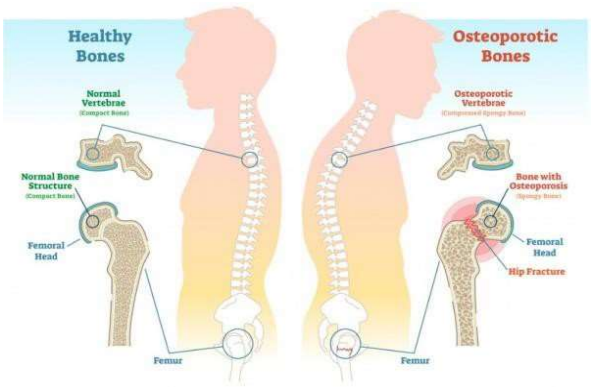
Osteoporosis

Definitions
Osteo: Bone
Porosis: Full of holes

Osteoporosis: Bones that are full of holes



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Why are transplant recipients at risk of developing osteoporosis?

- Common complication post-transplant
  - 50-60% incidence
- Primary causes and risk factors include:
  - Pre-existing bone disease
  - Hormonal changes
  - Long-term steroid (prednisone) therapy
  - Sedentary lifestyle
- Long-term issues
  - Fractures, disability, loss of independence

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How much calcium do I need to maintain good bone health after transplant?

Age	Calcium (mg)	Vitamin D (mcg)
Children 1-3 years	700	15
Children 4-8 years	1000	15
Children 9-18 years	1300	15
Female: 19-70 years	1200	15
Male: 19-70 years	1000	15
Male or female over 70 years	1200	20
Receiving steroid therapy		
Children 1-5 years	1000	15
Children 6-8 years	1200	15
Children 9-18 years	1500	20
Adults over 18	1500	25
Adults with osteopenia/osteoporosis	1500	25

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Nutrition facts food label: Calcium

	% Daily Value*
Total Fat 9g	**12%**
Saturated Fat 4.5g	**23%**
Trans Fat 0g	
Cholesterol 35mg	**12%**
Sodium 850mg	**37%**
Total Carbohydrate 34g	**12%**
Dietary Fiber 4g	**14%**
Total Sugars 6g	
Includes 0g Added Sugars	**0%**
Protein 15g	
Vitamin D 0mcg	0%
Calcium 320mg	25%
Iron 1.6mg	8%
Potassium 510mg	10%

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Maintaining good bone health post-transplant

Choose foods high in **calcium** and **vitamin D**:

Calcium:

- Low fat or fat-free milk, yogurt, cheese
- Calcium-enriched dairy alternatives (soy milk, almond milk)
- Calcium-fortified breakfast cereals
- Sardines with bones

Vitamin D:

- Seafood (herring, halibut, canned salmon)
- Low fat or fat-free milk
- Soy milk
- Calcium/vitamin D fortified juice

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Maintaining good bone health post-transplant

- Check with your health care provider about taking a calcium or vitamin D supplement
- Regular, weight bearing exercise including
  - walking
  - dancing
  - low-impact aerobics
  - elliptical training machines
  - stair climbing
  - gardening
- Medications to slow bone loss may be necessary

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What *dietary* and *lifestyle changes* can be made post-transplant to reduce the incidence of developing nutrition-related issues?

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Lifestyle changes

- Be a healthy weight
- Be physically active
- Eat a diet rich in plant foods
- Limit consumption of "fast foods" other processed foods high in fat, starches, or sugars
- Limit consumption of red and processed meat
- Limit consumption of sugar-sweetened drinks
- Limit alcohol consumption
- Do not use supplements for cancer prevention

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Be a healthy weight

- Keep your weight within the healthy range and avoid weight gain in adult life
- Aim to be at the healthy body mass index (BMI) range:

BMI = <u>weight in kilograms</u>
height in meters²

Underweight = <18.5
Normal weight = 18.5-24.9
Overweight = 25-29.9
Obesity = 30 or greater

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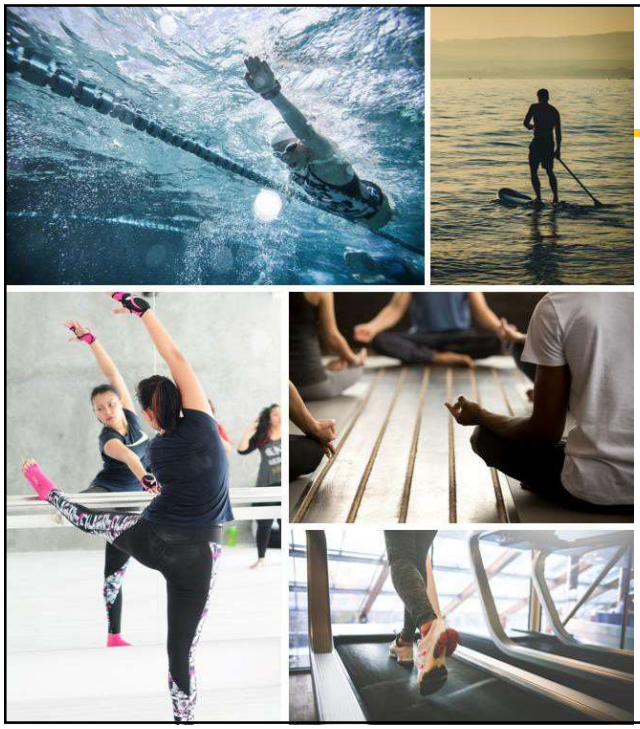

Be physically active

- Physical activity helps to lower cancer risk by helping to promote weight maintenance and helps to achieve physical and cardiovascular fitness and improve bone health
- Strive to build more activity into your daily routine
- Aim for at least 150 minutes of moderate, or 75 minutes of vigorous, physical activity per week
- Work toward achieving 45-60 minutes of moderate-intensity daily physical activity

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Eat a diet rich in plant foods such as whole grains, vegetables, fruits, and legumes

- Base diet around plant foods which contain fiber and other nutrients to reduce cancer risk
- Consumption of plant foods (lower in calories) also helps maintain a healthy weight

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2/3 of plate should include plant-based foods

Enjoy at least 4 cups (raw and cooked) daily

"Rainbow of colors"
- Green leafy, cabbage family
- Berries, citrus fruits

Legumes:
Garbanzo beans, kidney beans, black beans, dried peas rich in antioxidants, fiber, vitamins, and minerals

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Limit consumption of "fast foods" and other processed foods high in fat, starches, or sugars.

Choose whole foods

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What is a whole food?

- Contains all or most of the original edible parts
  - Whole grain bread vs. *white bread*
  - Brown rice vs. *white rice*
- It has had very little done to it
- It has not been fortified, enriched, bleached, refined, injected, hydrogenated, irradiated, or dehydrated

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Processed foods

- "Fast foods" and a "Western-type" of diet are causes for:
  - Weight gain
  - Overweight and obesity
  - These conditions linked to the development of at least 12 cancers
- Limiting processed foods helps control calorie intake and maintain a healthy weight
- Processed and refined foods contain many artificial ingredients

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Monitor intake of:

- Cookies
- "Health bars"
- Candy
- Commercial condiments
- Sweetened yogurt

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Limit consumption of red and processed meat

Eat no more than 12-18 ounces of cooked red meat per week

- Beef, Lamb, Pork

Eat little, if any processed meats

- Ham, Bacon, Hot dogs, Sausage

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Limit consumption of sugar-sweetened drinks

- **Strong evidence that consuming sugar-sweetened beverages causes:**
  - Weight gain
  - Overweight
  - Obesity
- **Limit consumption of:**
  - Sodas
  - Sweetened teas
  - Coffee drinks
  - Sweetened vitamin/energy/electrolyte beverages
- **Drink mostly water and unsweetened fluids**

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Limit alcohol consumption

For cancer prevention, it is best not to drink alcohol, which is a known carcinogen.

If you do choose to drink alcohol, limit your consumption to:

- **Women:** one drink/day
- **Men:** two drinks/day

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Suggestions to supplement AICR recommendations

- Add chopped ground flaxseeds to oatmeal or yogurt
- Add chopped kale or dark greens to soups, salads, or smoothies
- Vary hummus: use white beans, edamame, or lentils
- Snack on roasted pumpkin seeds
- Add chopped walnuts to salad or hot cereal
- Make salad dressing with olive or flaxseed oils
- For meat-eaters, choose grass-fed meats and wild fish
- Load up on herbs and spices that contain cancer fighting compounds
  - Ginger, turmeric, curry, cinnamon, rosemary, basil, garlic

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Common nutritional myths associated with nutrition and cancer

1. Does sugar feed cancer?
2. Do I need to follow an Alkaline Diet?
3. Is a Ketogenic Diet safe?

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The relationship between sugar and cancer is about obesity and insulin resistance **vs.** sugar as fuel for cancer cells.

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Does sugar feed cancer?

- Our bodies can make the glucose to "feed" both cancer cells and healthy cells regardless of diet, by breaking down fat and muscle protein
- Cancer risk is more about each individual's metabolism and response to food, over time
- Eating sugar has no health benefit other than providing a well-absorbed energy source

Summary:

Too much daily sugar intake can cause weight gain; unhealthy weight gain and a lack of exercise can increase cancer risk.

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Alkaline Diet

Acid/Alkaline Diet – eating to manage your pH

- **Hypothesis** – tumors cannot grow in an alkaline environment

What are acid/alkaline foods?

- **Acidic:** Meat, poultry, fish, dairy, eggs, grains, legumes, nuts
- **Neutral:** Natural fats, starches, sugars
- **Alkaline:** Fruits, vegetables

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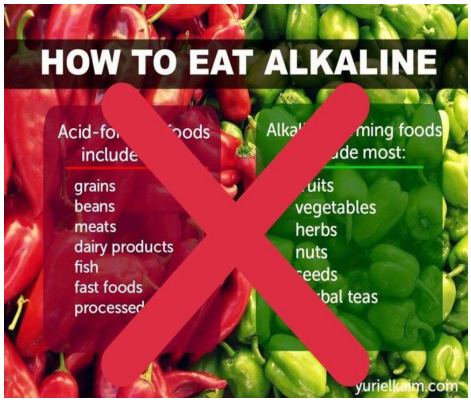
Alkaline Diet

- You can influence your urine pH, but food **can not** influence your blood pH
- Alkaline water filters cost over $1,000!
- Diet supports consuming lots of fruits and vegetables, and limits processed foods, however, may over-restrict protein, calcium, and vitamin D



Summary:
Promotion of Alkaline Diet/Alkaline Water for cancer prevention or treatment is not justified.

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Is a Ketogenic Diet safe?

Definition: Very low carbohydrate diet.

Hypothesis: Tumors rely on glucose to meet their energy demands and thus starve a tumor and reduce growth.

Based on this hypothesis: ***Sugar feeds cancer***

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Is a Ketogenic Diet safe?

- Premise: evidence-based therapy for epilepsy
- Current clinical trials for brain tumors
- Nutritionally unbalanced diet that promotes very low carbohydrate intake
- Reported side effects include:
  - Constipation, anemia
  - Cardiac abnormalities, dehydration

Summary:

Lack of consistency and efficacy in current literature along with a host of adverse effects make the ketogenic diet not recommended as a therapeutic approach in the cancer setting.

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Summary

- Eat real (whole) food; mostly plant-based
- Regular aerobic exercise
- Maintain a healthy weight
- Seek a registered dietitian nutritionist board certified in oncology nutrition

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Internet resources

- American Institute for Cancer Research: aicr.org
- The Cancer Fighting Kitchen: rebeccakatz.com
- Cook For Your Life: cookforyourlife.org
- Oncology Nutrition Dietetic Practice Group: oncologynutrition.org
- Seattle Cancer Care Alliance: seattlecca.org/services/nutrition
- The World's Healthiest Foods: whfoods.com

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Thank you.

If you have any questions, please contact me:

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