Eat Right, Live Well Beyond Cancer

The Power of Choice

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Seattle Cancer Care Alliance

Fred Hutch · Seattle Children's · UW Medicine

Objectives for talk

- Looking at new science

- Vitamin D

- Omega-3 fatty acids

- Fish oil versus fish

- Intermittent fasting

- Ketogenic diet – Is it a good idea for cancer

- Does sugar feed cancer?

Thousands of cancer diagnoses tied to a poor diet, study finds

By Jacqueline Howard, CNN

Updated 10:59 AM ET, Thu May 23, 2019

Diet and cancer relationship

- Poor dietary habits have long been recognized to be associated with cancer risk

- 5.2% of all cancer diagnosis in 2015 were attributable to suboptimal diet

- Comparatively

  - Excess body weight – 7-8%

  - Alcohol intake - 4-6%

  - Physical inactivity – 2-3%

- 7 dietary factors were identified as having "convincing" or "probable" evidence on cancer risk among US adults for 15 cancers

  - Whole grains

  - Processed meats

  - Total dairy products

  - Vegetables

  - Fruits

  - Red meat

  - Sugar Sweetened Beverages – included for causal impact on adiposity (fat mass)

*Zhang et al. JNCI Cancer Spectrum, ,
pkz034,* https://doi.org/10.1093/jncics/pkz034

Major findings from Tufts study

Colorectal cancer had the highest number and proportion of diet-related cases - 38%

- Low consumption of whole grains and dairy products
- High intake of processed meats

- Other cancers cases associated with poor diet
  - Mouth, pharynx, larynx – 25.9%
  - Stomach – 6.8%
  - Corpus uteri (uterine) – 6.1%
  - Esophagus (adenocarcinoma) – 4.6%
  - Kidney – 3.9%
  - Liver – 3.1%
  - Gallbladder – 2.8%
  - Breast (postmenopausal) – 1.5%
  - Pancreas – 1.2%
  - Multiple myeloma – 1.1%
  - Prostate (advanced) – 0.9%
  - Thyroid – 0.9%
  - Ovary – 0.8%

- Among the 7 dietary factors evaluated the following were associated with the largest number of new cancer cases:
  - Low consumption of whole grains
  - High intake of processed meats

Let's take a closer look at the recommendations for the 7 dietary factors

Whole grains

Grain Anatomy
WholeGrainsCouncil.Org

- What is a whole grain?
  - A whole grain is defined as having all three components of the grain intact, i.e., bran, endosperm and germ.

- Key nutrient components:
  - Fiber, iron, zinc, manganese, folate, magnesium, copper, thiamin, niacin, vitamin B6, phosphorus, vitamin E, selenium, lignans, phenolic compounds.

- Refined versus Enriched grains
  - Refined grains are missing one or more of their three key parts (bran, germ, or endosperm).
  - Enriched grains adds back fewer than a half dozen of the many missing nutrients, and does so in proportions different than they originally existed.

- Whole grain versus whole wheat
  - whole wheat flour is always whole grain in the United States.
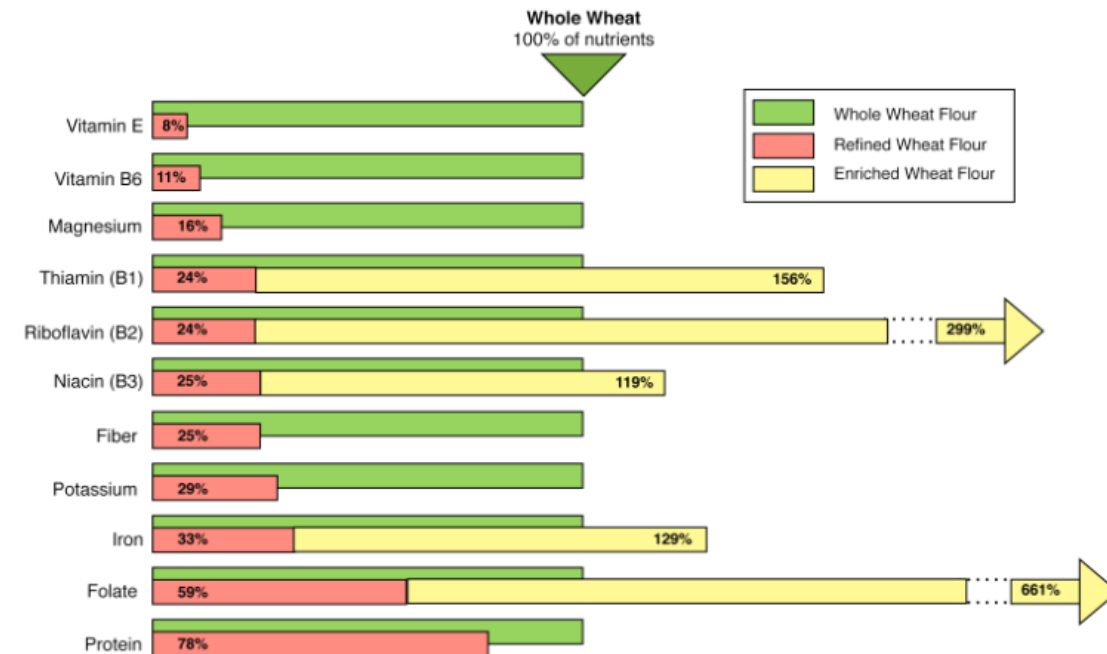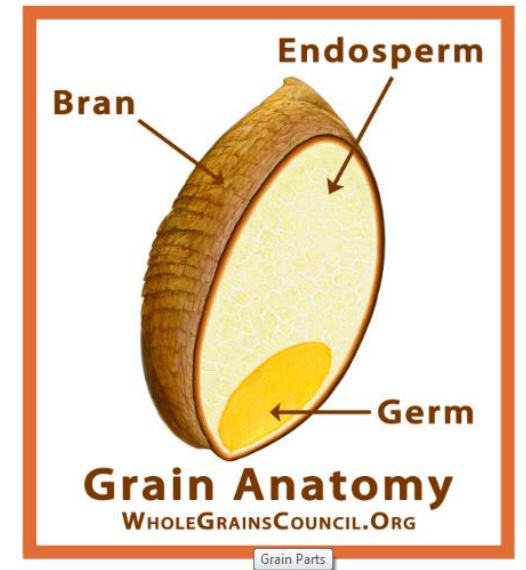
Grains – Dietary Guidelines for Americans 2015-2020

- Make ½ your grains whole grains
- Examples of a serving
  - ½ cup cooked rice, bulger, pasta or cooked cereal
  - 1 ounce dry pasta, or other dry grain
  - 1 slice bread
  - 1 small muffin – weighing one ounce
  - 1 cup ready-to-eat cereal

Grain Recommendations based on age and gender per day

age	girls / women	boys / men
2-3	1.5 to 3	1.5 to 3
4-8	2 to 4	2.5 to 5
9-13	3 to 5	3 to 6
14-18	3 to 6	3.5 to 7
19-30	3 to 6	4 to 8
31-50	3 to 6	3.5 to 7
51+	3 to 5	3 to 6

- Ways to increase whole grain consumption
  - Choose 100 percent whole-grain foods – look for the stamp.
  - Whole grain should be the FIRST ingredient on the ingredient list – or the second, after water.
  - For foods with multiple-grain ingredients – they should appear near the top of the ingredients list.
  - For more information on how to identify and purchase whole grains visit the website.
  www.wholegrainscouncil.org

Grains

1 slice of bread is equal to 1 ounce-equivalent grains

1/2 cup portion of cooked brown rice is equal to 1 ounce-equivalent grains

Processed meat

- Third leading dietary factor associated with cancer burden among US adults.

- <u>**Definition**</u>: meats transformed by smoking, curing, salting, or adding other chemical preservatives in order to enhance flavor or preserve them.
  - Ham, bacon, pastrami, sausages, hot dogs and cold cuts

- Usually high content in nitrates, when converted in the body to form carcinogenic nitrosamies which has been proposed as a major link with cancer progression.

- World Health Organization's International Agency for Research on Cancer (IARC) in 2015 named processed meat as a carcinogen.
  - Group 1: Carcinogenic to Humans, the same category as cigarettes.

- **Recommendations:**
  - American Heart Association - **< 0.5 oz/day of processed meat**
  - American Institute for Cancer Research – **avoid processed meat, except for special occasion**

Processed Meat Swaps

If you normally eat this → Try this instead!

Cold Cuts → Fresh Turkey, Chicken, or Fish

Bacon or Chorizo → Spicy Veggie Sausage

Sausage in Chili → Kidney Beans or Black Beans

Domingo, et al. *Food Chem Toxicol. 2017;107:256-261*
Zhang et al. JNCI Cancer Spectrum, ,
pkz034, https://doi.org/10.1093/jncics/pkz034

Red meat

- Definition: meat from mammals: cattle, sheep, pigs, lamb, beef and goats

- Key nutrient components:
  - B vitamins, iron and zinc

- Potential mechanisms in cancer process
  - Heme iron could initiate carcinogenesis through lipid peroxidation processes
  - Heterocyclic amines that are found on the surface of well-done (charred) meat have been proposed as initiators of the carcinogenic process
    - limit cooked meat at high temperatures for a long period of time or meat directly exposed over an open flame

- Recommendations:
  - AICR: **12 to 18 ounces (cooked) per week** -- 3 oz portion is roughly the size of a deck of cards, this allows for 4-6, 3 oz portions per week.

Red Meat Swaps

If you normally eat this → Try this instead!

Beef Burger → Portobello Mushroom or Grilled Chicken

Ground Beef → 1/2 Beef + 1/2 Lentils or Mushrooms

Large Steak → Smaller Steak, Chicken, or Fish

Domingo, et al. *Food Chem Toxicol. 2017;107:256-261*
Zhang et al. JNCI Cancer Spectrum, ,
pkz034, https://doi.org/10.1093/jncics/pkz034

Dairy

- There in an inverse relationship with consumption of dairy and all cancers with the possible exception of prostate cancer.

- No significant effect on premenopausal or post menopausal breast cancer incidence.

- Low-fat, but not high-fat dairy consumption reduced the risk of breast cancer.

- Hormones-Recombinant bovine somatotropin, rbST, is not absorbed in human digestive tract according to the FDA. Other investigators note that rbST and IGF-1 resisted pasteurization and digestive enzymes.

- Insulin growth factor- rbST treated cows have slightly higher levels of the hormone IGF-1. However, oral consumption of IGF-1 by humans has little or no biological activity. Concentrations of IGF-1 in digestive tract fluids of humans far exceed any IGF-1 consumed when drinking milk.

- Antibiotics- milk collected from cows must be antibiotic free. True for both organic and non-organic milk.

Dairy – Dietary Guidelines for Americans 2015-2020

- Recommendations:
  - 3 cup-equivalent per day

- Key nutrient components:
  - Calcium, phosphorus, vitamin A, Vitamin D (fortified), riboflavin, vitamin B12, protein, potassium, zinc, choline, magnesium, selenium

- Examples:
  - Most individuals would benefit from increasing consumption of low fat and fat free dairy products.
    - Milk, cheese, yogurt or from fortified soy beverages (soymilk)
  - Avoid or limit sweetened milk and yogurt products to avoid hidden sugars

Dairy products are considered part of a cancer-protective diet
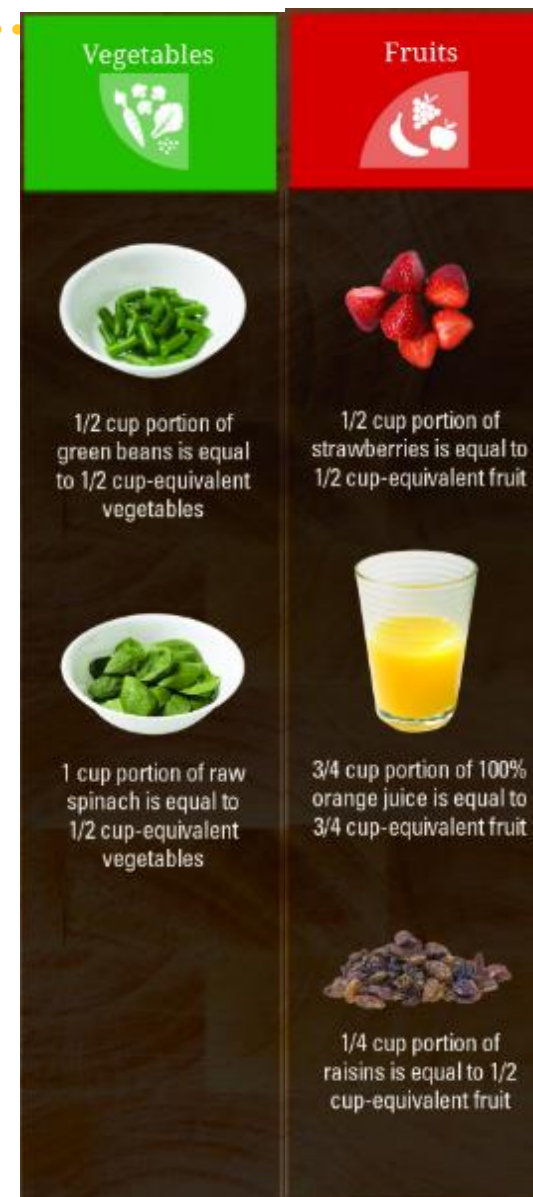
Dairy

6 ounce portion of fat-free yogurt is equal to 3/4 cup-equivalent dairy

1 1/2 ounces portion of cheddar cheese is equal to 1 cup-equivalent dairy

2015-2020 Dietary Guidelines for Americans. 8th ed. December 2015.

Vegetable and fruit intake Dietary Guidelines for Americans 2015-2020

- Centers for Disease Control and Prevention (CDC) show that only 9 percent of adults eat the recommended amounts of vegetables in the Dietary Guidelines for Americans.

- Recommendations:
  - Vegetable:
    - 2 to 3 cups per day
      - "Cups" of vegetables mostly refers to a portion equal to one measuring cup for raw or cooked vegetables. For lettuce, spinach or other raw leafy vegetables however, 2 cups = 1 cup.
      - A medium carrot, celery stalk and small pepper each count as ½ cup.
      - If you don't want to measure, an average adult fist is a rough guide to a 1-cup portion. Aim for one to two fist-size portions of vegetables at lunch and dinner each day.
  - Fruit:
    - 1 ½ cups per day

2015-2020 Dietary Guidelines for Americans. 8th ed. December 2015.
AICR.org. Accessed on May 31, 2019.
cdc.org. Accessed on May 31, 2019.

Vegetables
- 1/2 cup portion of green beans is equal to 1/2 cup-equivalent vegetables
- 1 cup portion of raw spinach is equal to 1/2 cup-equivalent vegetables

Fruits
- 1/2 cup portion of strawberries is equal to 1/2 cup-equivalent fruit
- 3/4 cup portion of 100% orange juice is equal to 3/4 cup-equivalent fruit
- 1/4 cup portion of raisins is equal to 1/2 cup-equivalent fruit

Ways to add more fruit and veggies into your diet

- For snacks, consider raw carrots, cucumbers or other fav's dipped in hummus, celery with peanut butter, peppers with salsa, or sweet juicy grape tomatoes all on their own.

- Reduce excess portions of meat, bread or pasta (especially refined grain versions), or sweets for more veggies.

- Add fruit to salads and main dishes

- Choose fruit for dessert

- Focus on color variation and aim to consume the rainbow of colors daily

Table 2-1.
**Examples of Vegetables in Each Vegetable Subgroup**

Vegetable Subgroup	Examples
Dark-Green Vegetables	Broccoli, Spinach, Leafy Salad Greens (Including Romaine Lettuce), Collards, Bok Choy, Kale, Turnip Greens, Mustard Greens, Green Herbs (Parsley, Cilantro)
Red & Orange Vegetables	Tomatoes, Carrots, Tomato Juice, Sweet Potatoes, Red Peppers (Hot and Sweet), Winter Squash, Pumpkin
Legumes (Beans & Peas)	Pinto, White, Kidney, and Black Beans; Lentils; Chickpeas; Limas (Mature, Dried); Split Peas; Edamame (Green Soybeans)
Starchy Vegetables	Potatoes, Corn, Green Peas, Limas (Green, Immature), Plaintains, Cassava
Other Vegetables	Lettuce (Iceberg), Onions, Green Beans, Cucumbers, Celery, Green Peppers, Cabbage, Mushrooms, Avocado, Summer Squash (Includes Zucchini), Cauliflower, Eggplant, Garlic, Bean Sprouts, Olives, Asparagus, Peapods (Snowpeas), Beets

Goals for fruit and veggie intake

"If everyone were to eat 10 fruits and vegetables a day, that could prevent an estimated 7.8 million premature deaths worldwide."

"You could get to the 10 servings in one day by including 1 orange at breakfast, a carrot and apple at lunch, a large banana at snack and cooked broccoli and a large salad with tomatoes at dinner."
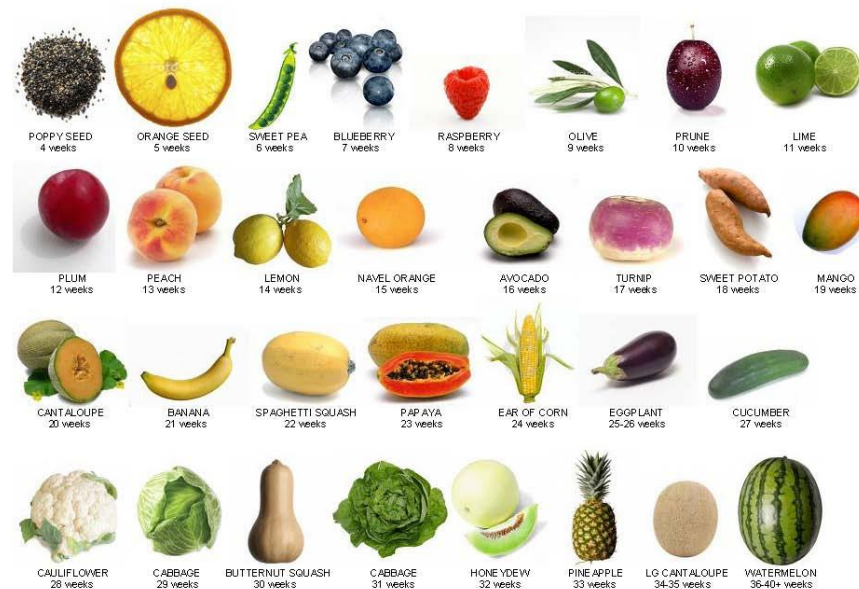
Sugar sweetened beverages (SSB)

- Definition
  - Any beverage that contained at least **50 calories** per serving.
  - This includes
    - Sugar-sweetened sodas
    - Fruit drinks
    - Sports/energy drinks
    - Homemade drinks
    - *100 percent fruit juice was excluded*

- The American Heart Association Recommendations
  - **Women**: No more than 6 teaspoons added sugars per day ~ 100 calories
  - **Men**: No more than 9 teaspoons added sugars per day ~ 150 calories
  - **Upper Limit (UL)**: 50 g per day or 10% of total calories for a 2000 calorie diet

1 20 oz. Coke contains ~ 17 teaspoons of sugars, roughly 68 g of sugar or 13% of total calorie intake per day

Added Sugars. American Heart Association Website. http://www.heart.org/HEARTORG/GettingHealthy/NutritionCenter/HealthyEating/Added-Sugars_UCM_305858_Article.jsp. Accessed on August 2, 2015.
Let's Ask Marion: What's the Recommended daily allowance of sugar? Food Politics Website. http://www.foodpolitics.com/2013/02/lets-ask-marion-whats-the-recommended-daily-allowance-of-sugar/. Accessed on August 3, 2015.
Sugary Drinks May Lead to 184,000 Deaths from Cancer, Other Diseases. American Institute for Cancer Research Website. http://www.aicr.org/cancer-research-update/2015/07_08/cru_Sugary-Drinks-Lead-to-Deaths-from-Cancer-Diseases.html. Accessed on August 2, 2015.
NCHS Data Brief. Consumption of sugar drinks in the United States, 2005-2008. Center for Disease Control. http://www.cdc.gov/nchs/data/databriefs/db71.htm. Accessed on July 14, 2015.

SSBs continued

- Added sugars on average account for ~ 270 calories or more than 13% of calories per day in the American diet.

- Increase in hedonic pathway activation (reward center of the brain) where the palatability of food overrides the normal hunger/satiety cues.
  - Motivates energy intake independent of energy need
  - Activates dopamine pleasure reward pathway

- Liquid versus solid
  - Energy intake from beverages has more than doubled from 1965-2001 according to notational survey data.
  - Provide little satiety, making it easy for calories to add up quickly.

Johnson et al. *Circulation.* 2009;120L1011-1020.
2015-2020 Dietary Guidelines for Americans. 8th ed. December 2015.

Tips for reducing SSB intake

- The American Institute for Cancer Research has some great ideas on ways to decrease you SSB consumption.

  - Switch sodas for flavored sparkling water without added sugar

  - Opt for unsweetened tea

  - Add colorful fruit like berries, melon and citrus to your water

  - Sprinkle cinnamon or cocoa on your coffee beverages and skip the sugar

  - Carry healthy snacks like nuts, fresh or dried fruit or whole grain crackers and cheese instead of sugary snacks.

Vitamin D – research and recommendations

- Evidence
    - Although randomized clinical trial data is still lacking, several epidemiological, clinical, preclinical, and *in vitro* experimental data strongly suggest that adequate vitamin D status could be a promising strategy for prevention as well as treatment of many types of cancer.

- Recommendations
    - Recommended vitamin D lab range
        - 30-50 ng/mL
    - Assess for adequate vitamin D status
        - If not regularly consuming fish or supplementing – **recommend supplementing with 2,000 IU/day AND have PCP check baseline level.**
        - If taking > than 5,000 IU/day – recommend a baseline vitamin D lab value to assess for vitamin D toxicity.

Omega-3 fatty acids

- Diets low in omega-3 fatty acids are associated with chronic inflammatory conditions and autoimmune diseases.

- In order to achieve a more beneficial ratio of omega-3 fatty acids in your body, it is important to decrease the amount of omega-6 fatty acids in your diet, while increasing the amount of omega-3 fatty acids.

- Reduce your consumption of conventionally raised meats and dairy products, and refined foods.

- Increase consumption of wild-caught cold-water fish like salmon, tuna, mackerel and sardines, ground flaxseeds, walnuts, pumpkin seeds leafy green vegetables, and grass fed meats and dairy.

Fish oil versus fish

- There is no daily requirement for fish oil. However, a healthy diet should provide at least 5 g of essential fatty acids daily.

- Over the counter brands (OTC) have been shown to contain ≥ 30 other saturated fatty acids. In all, 10-14 different saturated species accounted for up to 36% of the total fatty acid content.
  - In some cases, the levels of saturated fat and peroxides were deemed sufficient to inflict harm themselves.
  - Due to lack of regulation on supplements, it is advised to obtain fish oil as a prescription or sourced from a 3rd party tested company
  - Eat cold water fish 3x/wk for optimal n-3 PUFAs – wild fish is best if possible

Kones et al. *Med Princ Pract*. 2017;26:497-508.

Intermittent fasting

- Hypothesis – Intermittent fasting can help regulate obesity, type 2 diabetes and cardiovascular diseases by:
  - Limiting food intake to daytime ONLY
  - End the day with a little fat in your diet to help you feel satiated for the nights fast if you are prone to late night eating
  - "obese" microbiota vs. "lean" microbiota

- Preliminary studies show that intermittent fasting can lower inflammatory markers, but are not advised for patients at risk for nausea, vomiting, cachexia, or who are diabetic.
  - Possible mechanisms include:
    - Reduced Akt/mTOR and Ras signaling
    - Reduce leptin, IGF-1, and glucose
    - Reduce desmoplasia surrounding tumor tissue
    - Facilitate better therapeutic drug delivery to tumor cells

O'Flanagon et.al. *BMC Medicine*. 2017;15:106
Di Biase et. al. *Cancer Cell*. 2016;30:136-146
Patterson, et. al. http://dx.doi.org/10.1016/j.jand.2015.02.018

Ketogenic diet

Very low carbohydrate diet

Hypothesis – tumors rely on glucose to meet their energy demands and thus you can starve the tumor and reduce it's growth.
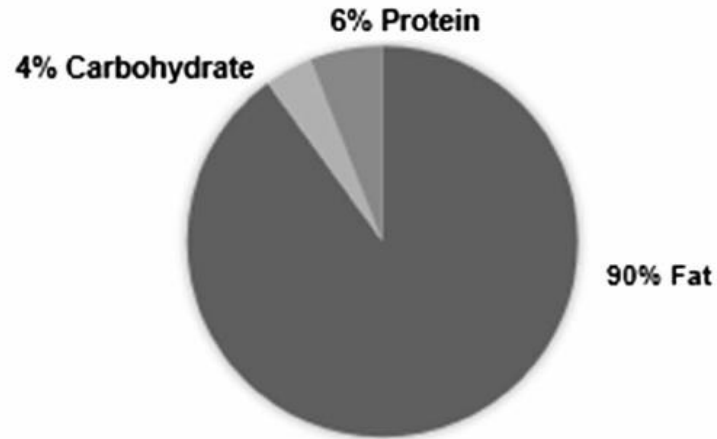
Based on this hypothesis - ***Sugar feeds cancer***
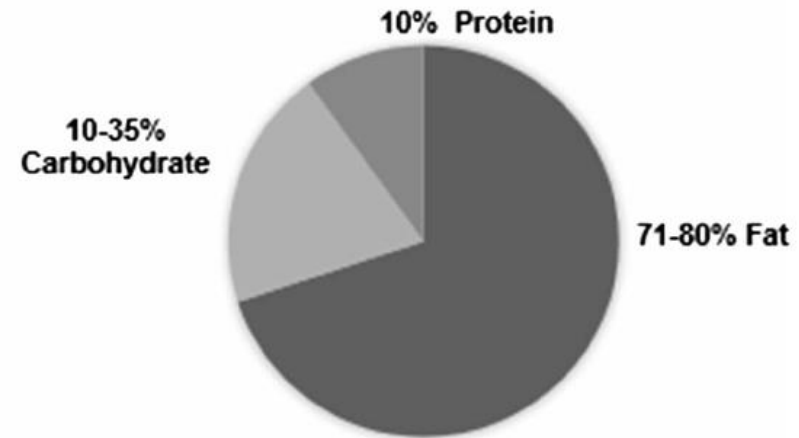
NOT THE WHOLE PICTURE

The relationship between sugar and cancer is about obesity and insulin resistance verses sugar as fuel for cancer cells.
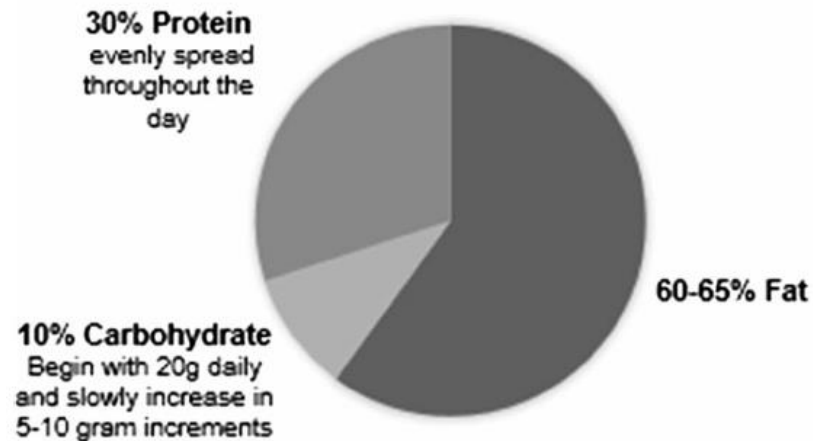
Erickson et.al. *Med Oncol.* 2017;34:72.
Klement *Med Oncol.* 2017;34:132.

Ketogenic diet breakdown

CLASSICAL KETOGENIC DIET 4:1
6% Protein
4% Carbohydrate
90% Fat

MIDDLE CHAIN TRIGLYCERIDE (MCT) DIET
10% Protein
10-35% Carbohydrate
71-80% Fat

MODIFIED AKTINS DIET
30% Protein evenly spread throughout the day
10% Carbohydrate Begin with 20g daily and slowly increase in 5-10 gram increments
60-65% Fat

LOW GLYCEMIC INDEX DIET (LGIT)
20-30 % Protein evenly spread throughout the day
40-60g/day Carbohydrate with a glycemic Index < 50
60-70% Fat

Erickson et.al. *Med Oncol.* 2017;34:72.
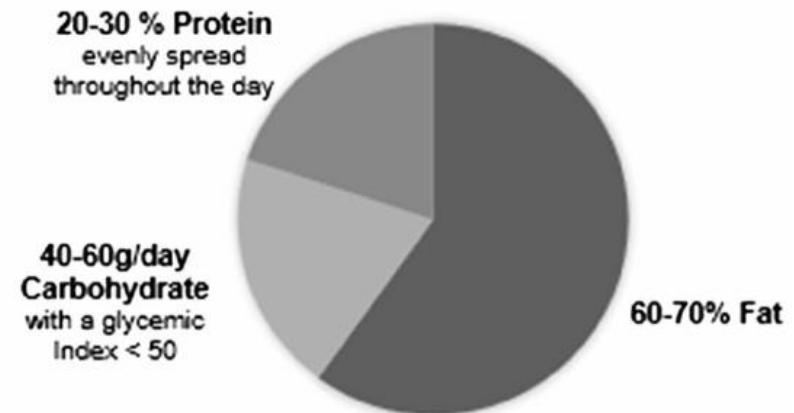
Ketogenic diet continued

- All forms of ketogenic diet are considered nutritionally inadequate.
    - Require a carbohydrate-free MVM with trace minerals (including selenium)
    - Calcium and vitamin D

- Patient adherence to diet is low

- Studies lack consistency, limited by small sample sizes and lack homogeneity of type, location and cancer stage.

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

Erickson et.al. *Med Oncol.* 2017;34:72.
Klement *Med Oncol.* 2017;34:132.

Does sugar feed cancer???

- **The facts**
    - Every cell in the body requires glucose to perform, cancer cells are no different.
    - If we don't get enough glucose from the foods we eat our bodies will manufacture glucose from fats and proteins.
    - Reducing or eliminating glucose from a healthy well balanced diet will not result in a slower growth of tumors.

- **Sugar and insulin connection**
    - Insulin is produced in response to the digestion and absorption of carbohydrates that produce glucose.
    - Excess sugar consumption can lead to obesity, obesity can lead to increased insulin resistance.
    - Insulin resistance can lead to metabolic syndrome and type 2 diabetes.
    - Insulin resistance can alter production of insulin growth factor binding protein (IGFBP) which is responsible for binding to insulin growth factor (IGF).
    - IGFBP and IGF subsequently increases the levels of free estrogens and androgens circulating in the body.

Giovannucci et. al. *CA Cancer J Clin.* 2010;60(4):207-221.
Arcidiancono et. al. *Exp Diabetes Res*. 2012;2012:789174.

At the end of the day….

"More studies will not suddenly prove that something that is untrue is now true. It is not a lack of will by the scientific establishment but an adherence to common sense. Deciding on fiction over fact is irrational (and irresponsible). It is like deciding that the moon is made of cheese because you think it is, despite no evidence to suggest or confirm that it is (and a lot to suggest it is not)."

Quote from Kelly Owens, a PhD geneticist

Thank you for your time! ☺
Questions?