

**Oncology Nutrition: Bridging the Gap  
Between Treatment, Survivorship &  
Prevention**

Allison McKinley, RD, CSO  
Clinical Dietitian, Oncology  
University of Colorado Cancer Center

uhealth

---

---

---

---

---

---

---

---

**Disclosures**

- No commercial affiliations to disclose

uhealth

---

---

---

---

---

---

---

---

**Learning Objectives**

1. Define malnutrition and understand its impact on cancer-related outcomes
2. Identify interventions for managing long term side effects of chemotherapy, radiation and surgical treatment
3. Understand cancer risk factors and current survivorship recommendations
4. Recognize frequently asked questions from oncology patient population related to popular foods and diets

uhealth

---

---

---

---

---

---

---

---



## Long-term Nutrition Complications

uhealth

---

---

---

---

---

---

---

---

## Enteritis & Chronic Diarrhea

- Bowel changes resulting from radiation therapy, surgical resections or total body irradiation
  - Pelvic (uterus, cervical, ovarian), prostate, colon, rectum, anal, bladder, small bowel
- Symptoms may include frequent stools, loose and/or watery stools, abdominal pain, cramping, gas & bloating after eating

### Nutrition Interventions:

- Monitor trigger foods and keep food diary – common GI irritants
- Increase fluid intake and replete electrolytes as needed
- Alter fiber intake – insoluble vs. soluble?
- Decrease total fat intake
- May need to limit dairy intake as needed
- Consider adding probiotics
- Consider adding bulking agent – psyllium fiber, soluble fiber, pectin

uhealth

---

---

---

---

---

---

---

---

## Malabsorption

- Impaired nutrient absorption resulting from surgical resections and/or changes in bowel function
  - Pancreas, colon, rectum, gastric, esophageal, small bowel
- Symptoms include fatty, oily or floating stools, yellow/tan stools, indigestion, excessive and/or smelly gas, stomach bloating & distention, abdominal pain or cramping, diarrhea or loose stools, weight loss despite eating well, vitamin & mineral deficiencies

### Nutrition Interventions:

- Monitor need for vitamin/mineral supplementation
- Increase intake or modify sources of specific nutrients
- Consider use of pancreatic enzyme replacement therapy (PERT)
- Monitor weight and fluid status
- If rapid transit present, monitor intake of concentrated sugars, fat & fiber

uhealth

---

---

---

---

---

---

---

---



## Cardiovascular Complications

- Increased risk for cardiovascular disease, elevated blood cholesterol and triglycerides
- Certain chemotherapies and radiation therapy (chest & breast)
  - Alkylating agents, anthracyclines, monoclonal antibodies

### Nutrition Interventions:

- Increase intake of omega-3s
- Choose healthy fats
- Increase intake of dietary fiber
- Promote healthy weight
- Encourage physical activity
- Aim for target serum levels

Lab	Goal
Cholesterol	<200 mg/dL
High Density Lipoprotein (HDL)	>40-50 mg/dL
Low Density Lipoprotein (LDL)	<130 mg/dL
Triglycerides	<150 mg/dL

uhealth

13

---

---

---

---

---

---

---

---

## Metabolic Disorders

- Increased risk for pre-diabetes, type 2 diabetes and metabolic syndrome due to corticosteroid use during treatment and hormonal agents
- Diagnosis based on fasting blood sugar or random blood sugar
  - Pre-diabetes: fasting 100 to 125 mg/dL
  - Diabetes: fasting 126 mg/dL or higher on two separate tests or random blood sugar >200 mg/dL
- Metabolic Syndrome - abdominal obesity, triglycerides, HDL cholesterol, blood pressure, fasting glucose

### Nutrition Interventions:

- Promote healthy weight
- Choose complex carbohydrates and whole grains
- Limit refined carbohydrates and added sugars
- Encourage physical activity

uhealth

14

---

---

---

---

---

---

---

---

## Weight Changes

- Patients may experience weight gain or weight loss following treatment
- Alterations in energy needs, hormones, bowel function, physical activity, muscle mass, appetite and dysphagia
- Sarcopenia increasing concern in cancer survivors
  - Estimates 16 to 23% among cancer survivors
- As patients start to regain weight after treatment, often increase fat mass without increasing lean mass
  - Increased risk for sarcopenic obesity, metabolic syndrome, and mortality

### How does obesity and extra fat mass affect cancer risk & recurrence?

- Increases inflammation and decreases immune system function
- Alters circulating hormone levels like insulin and estrogen
- Impacts factors involved with cell growth such as insulin like growth factor
- Breast, colorectal, endometrial ovarian, pancreatic, prostate, esophageal, liver, gallbladder, kidney are all linked

Andersson B, Wilton S, Neuner A, et al. Rapid resolution and cancer risk: an analysis of the pathogenesis mechanisms. *Exp Diabetes Res.* 2012;2012:789176. doi: 10.1155/2012/789176  
 ©2012 by the author. Published by Creative Commons Attribution License, http://creativecommons.org/licenses/by/2.0/  
 Copyrights ©2012 by the author. Published by Creative Commons Attribution License, http://creativecommons.org/licenses/by/2.0/  
 Copyright ©2012 by the author. Published by Creative Commons Attribution License, http://creativecommons.org/licenses/by/2.0/

uhealth

15

---

---

---

---

---

---

---

---

## Risk Reduction and Survivorship

uhealth

---

---

---

---

---

---

---

---

## Healthy Weight After Treatment

- What is a healthy weight?
  - BMI between 18.5-24.9
  - BMI >25 overweight and BMI >30 is obese
- How we do get there?
  - Develop a healthy diet
  - Increase physical activity

uhealth

17

---

---

---

---

---

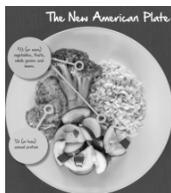
---

---

---

## Building a Healthy Diet

- Eat a diet rich in whole grains, vegetables, fruit and beans
- Limit intake of red meat and avoid processed meats
  - Consume <18 oz per week (or 11 oz for breast cancer survivors)
- Choose healthy unsaturated fats and limit saturated & trans fats
- Limit consumption of sugar-sweetened drinks and added sugars found in processed foods
- Limit alcohol consumption
  - Less than 2 drinks for men, less than 1 drink for women per day
  - 1 drink = 12 oz beer, 5 oz wine, 1.5 oz liquor
- Limit salt consumption
  - Less than <2300 mg per day (AHA)
  - 1 tsp salt = 2300 mg sodium



uhealth

18

---

---

---

---

---

---

---

---

## Physical Activity

- At least 150 min of moderate intensity or 75 min vigorous intensity activity each week or a combination of these
  - Aim for 30-60 minutes most days of the week
- Include strengthening, cardiovascular, core stability, balance and flexibility
- Especially important for re-building lean body mass during recovery
- For every two hours sitting, there is a modest increase in the risk of colon and endometrium cancer
- Community programs: BfitBwell, Silver Sneakers, CancerFit




---

---

---

---

---

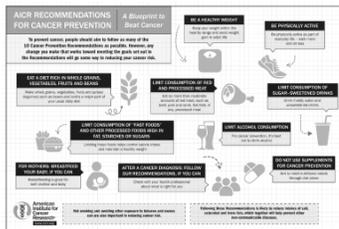
---

---

---

## AICR Recommendations for Cancer Prevention (2018)

Guidelines made for population with or without cancer diagnosis, at any point in cancer continuum




---

---

---

---

---

---

---

---

## Trending Cancer Diets & Frequently Asked Questions

---

---

---

---

---

---

---

---

## Does Sugar Feed Cancer Cells?

**NO - There is no clear evidence that the sugar in your diet preferentially feeds tumors over other cells**

- All carbohydrates are broken down to simple sugars (glucose) during digestion
  - Simple sugars are absorbed into the blood → blood sugar levels increase
  - Pancreas releases insulin in response to increased blood sugar levels
  - Glucose enters the cell → feeds every cell in the body
- Cancer cells consume more sugar due to being more active than healthy cells
- Glucose is key to cell function, especially brain function
  - Body has back up systems to make sugar from other sources if you eliminate carbohydrate intake
- Body weight and insulin levels may have greater influence on tumor growth than dietary sugar intake alone
- Sugar can provide a high amount of "quick" calories which can be more than the body needs at one time leading it to be stored as fat → leads to insulin resistance resulting in higher insulin growth factor which may result in tumor cell growth

uhealth

22

---

---

---

---

---

---

---

---

## What do I tell my patients?

- Maintain healthy weight to limit excess abdominal weight
- Consume minimally processed carbohydrates with fiber + protein + healthy fat
- Limit sources of processed carbohydrates and added sugars
- Spread out carbohydrate intake through small, frequent meals
- Omission of added/refined sugars will likely provide more benefit than removal of whole grains, fruits and vegetables

uhealth

23

---

---

---

---

---

---

---

---

## Ketogenic Diet

- High fat, moderate protein, extremely low carbohydrate (<50 grams)
- Without substantial carbohydrate intake, the body will switch from using glucose as a primary energy source to using fat (ketosis)
  - Increases fatty acid oxidation and creates ketone bodies
- Normal healthy cells can use both glucose and ketones for fuel
- Some cancer cells have a strong preference for glucose and limited ability to use ketones

### Potential clinical applications

- Epilepsy, malignant glioma, pediatric patients w/ astrocytoma, high grade gliomas and neuroblastoma (paired with traditional therapies)

### Risks & Complications

- Due to the restrictive nature of this diet, a true ketogenic diet is difficult to follow for long periods of time
- Intolerable gastric side effects, low glucose, lethargy, dehydration, vitamin/mineral deficiencies, metabolic acidosis (rare)

uhealth

24

---

---

---

---

---

---

---

---

## Alkaline Diet

- **Myth:** Cancer thrives in an acidic environment so you should drink alkaline water and avoid all foods that are acidic
  - Alkaline: fruits, vegetables
  - Acidic: animal proteins, processed foods
- **Reality:** Cancer cells create an environment that is acidic and short of oxygen because there aren't enough blood vessels to bring oxygen to the tumor cells or to flush away wastes like lactic acid.
  - This does not mean that the whole body becomes acidic
  - Your body has a tight set of checks and balances to keep your blood's pH near neutral – liver, lungs, kidney
  - It is impossible to significantly alter your blood pH with the food you eat

uhealth

25

---

---

---

---

---

---

---

---

## Detoxing & Juicing

- Specific diets vary but typically a period of fasting is followed by a strict diet of raw vegetables, fruit, fruit juices, and water
- Some detox diets advocate using herbs and other supplements along with colon cleaning to empty intestines
- No current medical literature to support the theory that the body needs an outside source to cleanse itself – our kidneys and liver work 24 hours/day to constantly cleanse
- Support our bodies natural detoxing process thru following healthy diet

Do I need to start juicing?

- Juicing extracts the juice from fresh fruits or vegetables – vitamins, minerals, phytonutrients
- Healthy fiber is often lost during the process – add this back if able
- Can be great alternative if patients have trouble digesting fiber post treatment
- Bottom line: first five servings of vegetables and fruits should come from whole foods

uhealth

26

---

---

---

---

---

---

---

---

## Gluten-free? Soy? Dairy-free? Organic? Non-GMO?

- No research to support gluten increases cancer risk
- Research has shown soy does not increase the risk for hormone-related cancers & may be protective
  - Consume 1-2 whole soy foods daily
  - Limit processed soy supplements and soy isolates – inconclusive research
- Research shows no reduction in cancer risk by avoiding foods with dairy
  - Protective against colorectal cancer, limited-suggestive evidence with breast cancer
  - Further evidence needed to investigate dairy and prostate cancer
- No data in humans that organic foods decrease risk of cancer or other diseases compared to non-organic
  - No consistent evidence organic foods are more nutritious
  - Organic foods have less pesticide residue, less additives, better utilization of natural resources
- Non-GMO research is inconclusive - cannot confirm whether or not GMOs increase cancer risks

uhealth

27

---

---

---

---

---

---

---

---

## Summary

1. Malnutrition is rising concern impacting cancer outcomes and overall survival
2. Malnutrition is multi-factorial and may be masked by excess fat mass in overweight/obese patients
3. Common long-term side effects from treatments can impact survivors' overall nutrition status, quality of life and risk for developing other chronic diseases
4. Excess abdominal fat and obesity can increase risk for overall cancer and insulin resistance
5. Aim for healthy weight by consuming whole, nutrient-dense foods and engaging in daily physical activity
6. Increase intake of plant-based food sources and decrease intake of animal proteins
7. Avoid processed & refined foods
8. Avoid restrictive diets and only use supplements when deficiency is present
9. **Encourage patients to find nutrition information from evidence-based sources**
10. **When in doubt, refer to the Registered Dietitian**

28

uhealth

---

---

---

---

---

---

---

---

## Take Home Resources

- American Institute for Cancer Research - AICR.org
- American Cancer Society - Cancer.org
- National Cancer Institute - Cancer.gov
- National Comprehensive Cancer Network - Nccn.org
- Memorial Sloan-Kettering – mskcc.org; herbal database
- Oncology Nutrition Dietetics Practice Group - Oncologynutrition.org
- Cook for Your Life – cookforyourlife.org
- Cancer site specific
  - Susan G. Komen
  - Colorectal Cancer Alliance
  - PanCAN

29

uhealth

---

---

---

---

---

---

---

---

## Active Learning Questions

1. How does body fatness influence cancer risk?
  - A: Impacts inflammation, circulating hormones, and insulin resistance
  - B: Impacts wound healing, respiratory function, and lining of mucous membranes
  - C: Impacts protein metabolism, bone density, and insulin resistance
2. Which diet is recommended for reducing overall cancer risk?
  - A: Plant-based - Mediterranean style
  - B: Paleo - minimal carbohydrate, high intake of red meat
  - C: Vegan - no animal products allowed

30

uhealth

---

---

---

---

---

---

---

---

### Active Learning Answers

1. C : Excess body fat is associated with insulin resistance, resulting in elevated levels of insulin and increase bioavailable insulin-like growth factor. This increase in IGF-1 can stimulate a mitogen-activated protein kinase pathway, promoting growth and reproduction of cancer cells and inhibiting apoptosis. Adipose tissue is primary site of estrogen-production in post-menopausal women increasing risk for hormone-positive cancers. Fats cells produce hormone leptin that may promote cell proliferation while inhibiting apoptosis. Overweight and obesity are associated with low-grade chronic inflammation that can promote cancer thru elevations in DNA-damaging free radicals and cell-to-cell signaling proteins.

Resources:

Arcidiacono B, Iritano S, Nocera A, et al. Insulin resistance and cancer risk: an overview of the pathogenic mechanisms. *Exp Diabetes Res.* 2012;2012:789174. doi: 10.1155/2012/789174  
WCRF/AICR Diet, Nutrition, Physical Activity and Cancer: a Global Perspective, Third Expert Report (2018)

2. A : Whole-foods based diet with intake of fruits, veggies, whole grains, lean proteins is recommended for cancer risk reduction. Choose plant-based protein sources or lean animal sources like chicken, fish or beef. Intake of red meat has been associated with increased cancer risk especially related to colorectal. Removing all animal products has not been found to reduce cancer risk.

Resources:

WCRF/AICR Diet, Nutrition, Physical Activity and Cancer: a Global Perspective, Third Expert Report (2018)

uhealth

---

---

---

---

---

---

---

---

### Questions?

Thank you!

uhealth

---

---

---

---

---

---

---

---