Nutrition and Cancer: What’s the Evidence?

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Acknowledgements

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• Melanie Newman
• Ivy Wong
• Isabella Gastaldo

Literature analysis and slide development support from

Joanne Hochu
Coordinator for BC Cancer Provincial Programs Community Education
Poll Question

Test: Audience

a. Physician
b. Nurse Practitioner
c. Allied Health
d. Non-health care professional
Poll Question

Test: client population

a. Clients with a cancer diagnosis
b. Clients interested in healthy eating with no cancer diagnosis
c. Educator: Training other health care professionals
d. No direct patient care - Academia
Poll Question

Test: Where are you tuning in from?

a. Lower Mainland and Fraser Valley
b. Northern BC
c. Vancouver Island
d. Interior
Land Acknowledgement

This work is being presented within the shared, traditional, ancestral and unceded territory of Stó:lō Nation.

Stó:lō Nation

Stó:lō Tribal Council
Disclosure

I am employed by BC Cancer Abbotsford through the Provincial Health Services Authority.

Otherwise, there are no conflicts of interest.
Objectives

By the end of this session, participants will be able to:

1. Describe nutritional factors associated with increased cancer risk

2. Review the evidence behind the association between dietary factors and cancer risk

3. Cite dietary recommendations for cancer risk reduction
Poll Question

Test: Expectations

a. Validation of current knowledge
b. Disease- or food-specific new knowledge
c. Putting it to practice
d. Trending nutrition topics

Interactive Cancer Risk Matrix
# Summary of conclusions

Assessing Evidence

Evidence for cancer risk factors are separated into various strengths of confidence.

Conclusions Key

- Convincing decreases risk
- Probable decreases risk
- Limited – suggestive decreases risk
- Convincing increases risk
- Probable increases risk
- Limited – suggestive increases risk

Substantial effect on risk unlikely

Comprehensive literature review from 2020 – 2022

Terms searched: "diet" OR "plant-based diet" OR "vegetarian diet" OR "vegan diet" OR "Mediterranean diet" OR "ketogenic diet" OR "intermittent fasting" OR "paleo diet" OR "DASH diet" OR food OR "plant-based foods" OR "whole grain" OR "refined grain" OR cereal OR pasta OR rice OR potato OR vegetable OR fruit OR nut OR legume OR bean OR egg OR dairy OR milk OR yogurt OR cheese OR fish OR seafood OR meat OR "red meat" OR "processed meat" OR sugar OR "sugar sweetened beverage" OR miso OR Tofu OR soybean OR soy AND ("Neoplasms/prevention and control"[Mesh])

Additional filters: Meta Analysis, Systematic Review
## Literature Review Process

### Articles by Cancer Type

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Articles</th>
</tr>
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<tbody>
<tr>
<td>General Cancer Risk</td>
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<tr>
<td>Bladder Cancer</td>
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<tr>
<td>Breast Cancer</td>
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<tr>
<td>Colorectal Cancer</td>
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<td>Cutaneous Melanoma/Skin Cancer</td>
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<tr>
<td>Digestive Tract Cancer</td>
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<td>Esophageal Cancer</td>
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<tr>
<td>Liver Cancer</td>
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<tr>
<td>Lung Cancer</td>
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<tr>
<td>Oral Cavity Cancer</td>
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<td>Ovarian Cancer</td>
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<td>Pancreatic Cancer</td>
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<td>Prostate Cancer</td>
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<td>Renal Cell Cancer</td>
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<tr>
<td>Stomach Cancer</td>
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<tr>
<td>Urinary Cancer</td>
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### Articles by Food Types

<table>
<thead>
<tr>
<th>Food Type</th>
<th>Articles</th>
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<tr>
<td>Mushrooms</td>
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<tr>
<td>Aspirin</td>
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<tr>
<td>Nigella Satvia</td>
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<tr>
<td>Carbohydrates</td>
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<tr>
<td>Nuts</td>
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<tr>
<td>Carotenoid Intake</td>
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<td>Olive Oil</td>
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<td>Coffee</td>
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<tr>
<td>Pickled Vegetables</td>
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<td>Curcumin</td>
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<tr>
<td>Polyunsaturated Fats</td>
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<td>Diet, Exercise, Lifestyle</td>
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<tr>
<td>Statins</td>
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<td>Soy &amp; Isoflavones</td>
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<td>Tofu</td>
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<td>Green Tea</td>
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<td>Whole Grains, Refined Grains &amp; Fiber</td>
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</tbody>
</table>
Poll Question

Based on your experience, what do you think has the most evidence when it comes to cancer prevention in terms of lifestyle and nutrition factors?

Choose one:
  a. Fruits and vegetables
  b. Walking and physical activity
  c. Whole grains
  d. Red meat
Poll Question

Based on your experience, what do you think has the most evidence when it comes to cancer prevention?

Choose one:
- a. Fruits and vegetables
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- c. Whole grains
- d. Red meat
Cancer

• >100 different types of cancer
• “Hallmarks of Cancer”
  – Sustained proliferative signaling, enabling characteristic: tumour-promoting inflammation, inducing angiogenesis, etc.
• All cells can receive genetic damage
Figure 1: Hallmarks of cancer and two enabling characteristics

Adapted from: Cell 144, Hanahan D and Weinberg RA, Hallmarks of cancer: the next generation, 646–74, Copyright (2011), with permission from Elsevier.

Figure 3: Stages of cancer development and the hallmarks of cancer

Tumor initiation
- Sustained Proliferative Signaling
- Evasion of Anti-growth Signaling
- Resistance to Apoptosis
- Replicative Immortality
- Dysregulated Metabolism
- Tumor Promoting Inflammation
- Immune System Evasion

Tumor formation
- Genomic instability

Tumor progression
- Chemokines
- Growth factors
- Tumor Microenvironment
- Matrix remodeling
- EMT
- Angiogenesis
- Intravasation
- Blood Vessel
- Extravasation
- Tissue Invasion and Metastasis
- Metastases


Figure 5: Nutrition, physical activity and the hallmarks of cancer

Nutrition and Cancer

• Nutrition important for homeostasis and maintaining reserve capacity
• Reduction in resilience due to poor nutrition and lifestyle habits
  – Increased infections
  – Micronutrient inadequacy
  – Obesity
Nutrition and Cancer

**Nutrients**
- Carbohydrates
- Protein
  - Amino acids
- Fats
  - Omega 3’s
- Vitamins
  - Folate, Vit B12, C, D, E etc.
- Minerals
  - Iron (heme, non-heme), Selenium etc.
- Water

**Other substances**
- Caffeine
- Arsenic
- Fibre
- Phytochemicals (lycopene, isoflavones)

Foods that Impact the Risks of Cancers

The recommendations on nutritional factors that can increase or decrease the risk of cancers is from the Third Expert Report of the World Research Fund International.

Methodology of Expert Report:

- Conduct systematic literature reviews
- Expert Reviews
- Expert Panel
  - Strength of Evidence
  - Impact of exposure on risk
  - Assesses the strength of evidence and impact of the exposure to support recommendations
Increases Risk of Cancers
Food Preparation and Processing

Cantonese-style salted fish increases the risk of nasopharyngeal cancers

Salted fish and chicken fried rice
Steamed pork cake with salted fish
Eggplant and salted fish casserole


Photos from https://thewoksoflife.com/
Processed meats and red meats increases the risk of colorectal cancer.

Foods preserved by salting increases the risk of gastric cancers.

Mate (when drunk in the traditional style in South America) increases the risk of esophageal squamous cell carcinoma.
Increases Risk of Cancers

Fluids - Alcohol

~14 g of ethanol in a standard drink

Increases the risk of mouth, larynx, pharynx, esophageal, breast, colorectal, stomach, and liver cancers.


Decreases risk of kidney cancers? With 0-2 drinks per day.
Poll Question

Which of the following has not been found to decrease the risk of cancer?

a. Whole grains
b. Dairy
c. Coffee
d. Fish
e. Vitamin D Supplementation
Poll Question

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a. Whole grains
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c. Coffee
d. Fish
e. Vitamin D Supplementation
Increases Risk of Cancer

Supplements

34,887 men randomly assigned to 1 of 4 treatment groups to measure prostate cancer incidence

1. Vit E + Selenium placebo
2. Vit E placebo + Selenium
3. Vit E + Selenium
4. Placebo + Placebo

Increases Risk of Cancer
Supplements

There was a statistically significant *17% increase* in prostate cancer risk for men who took vit E supplements compared to placebo (NCI 2015)

Selenium supplementation did *not* benefit men with low selenium status but INCREASED the risk of high grade prostate cancer in men with high baseline selenium status (Kristal et al. 2014)


Reducing the Risk of Cancer

- 2020-2025 Dietary Guidelines for Americans, 9th edition
- American Cancer Society Guideline on Diet and Physical Activity for Cancer Prevention
- World Cancer Research Fund/American Institute for Cancer Research Cancer Prevention Recommendations
Poll Question

Which of the following diets is most consistent with cancer protective recommendations?

a. Vegan/vegetarian diet  
b. Mediterranean diet  
c. Intermittent fasting  
d. Ketogenic diet
Poll Question

Which of the following diets is most consistent with cancer protective recommendations?

a. Vegan/vegetarian diet
b. Mediterranean diet
c. Intermittent fasting
d. Ketogenic diet
Trending Nutrition Topics

Evidence-Based Guidelines

• Intermittent Fasting
• Ketogenic Diet
• Vegan Diet
• Mediterranean Diet

Unfounded Diets

• Alkaline Diet
• Bill Henderson Protocol/Budwig Diet
• Gonzalez Regimen
• Macrobiotic Diet
• Gerson Therapy
• Raw vegan food diet
Belief: cancer cells thrive in acidic environment

10 levels of dietary restrictions

80:20 ratio

Alkaline Diet
What’s the evidence?

- Following the diet – there was an insignificant change of 0.014 in systemic pH (Fenton and Huang 2016)
- No evidence to support the effectiveness or safety of this diet in humans.
- Cannot change the pH of the body while urine pH will change.
- Restrictive
- Dramatic changes from many baseline diets
- Water alkalinizers are extremely expensive
- *Putting it into practice - Is it worth talking patients out of an Alkaline Diet?*

Intermittent Fasting

What is it?

• Variable fasting periods 16 hours – 6 days (IF vs IER)
• 5:2 or >13 hours per day fast

• Weight loss
• Improved Insulin Sensitivity
• Cardiovascular Improvements
• Anti-inflammatory benefits

Intermittent Fasting
What’s the evidence?

• Short-term fasting improved efficacy of some chemotherapy agents (cisplatin, cyclophosphamide, and doxorubicin) (Lee et al. 2012)
• Short-term weight loss benefits
• Animal models showed radiosensitivity and improved chemotherapy treatment in various cancers (Buschemeyer et al. 2010).
• Review noted in 2,400 women with breast cancer that those with fewer than 13 hours of fasting had 36% increased risk for breast cancer recurrence (Marinac 2016).

• Sarcopenia (50 g pro minimum to try and prevent)
• Binge – disordered eating
• Altered eating schedule and social impacts

• Randomized human trials currently underway.

Ketogenic Diet

What is it?

• High-fat, moderate-protein, very-low-carbohydrate diet.
• Standard: 90% fat; 8% pro; 2% CHO
• Modified: 80% fat; 15% pro; 5% CHO

Gliomas!
Ketogenic Diet

What’s the evidence?

- Enhance chemotherapy effectiveness (Allen et al. 2012)
- May reduce tumor growth and improve survival in glioma and neuroblastoma patients. (Martin-McGill et al. 2017)
- Research underway for cancer treatment
- LIMITED research in cancer prevention

- Side effects: nausea, vomiting, lethargy, GI discomfort (constipation), hypercholesterolemia, renal damage, kidney stones, bone mineral loss, lean weight loss, cachexia.
- Possible nutrient deficiencies.


Vegan Diet

What’s the evidence?

• Excludes flesh foods, dairy foods, eggs.

• Emphasis on fruits, whole grains, legumes, soy, nuts, and seeds.

• Reduces all-cancer risk by 14% but increased urinary tract cancer by 73% (Le and Sabate 2014)

• Diverse gut microbiota (Glick-Bauer and Yeh 2013)

• Risk deficiency for vit B12, D, iron, zinc, calcium, iodine, and protein.

• Likely require supplementation

Putting it into Practice

- Specific diet
- Avoiding known risk factors
- Sustainable Food and Lifestyle modifications

Finding 1-2 points to coach sustainable behaviour changes
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