



Provincial Health Services Authority

Nutrition and Cancer: What's the Evidence?

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Acknowledgements

BC Cancer Abbotsford Centre Dietitian team

- 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

World Cancer Research Fund International



Produced by World Cancer Research Fund International








World Cancer Research Fund International's Global Cancer Update Programme provides an analysis of international scientific research into how diet, nutrition and physical activity affect cancer risk and survival. More information is available at:

<https://www.wcrf.org/diet-activity-and-cancer/global-cancer-update-programme/>

[Interactive Cancer Risk Matrix](#)

Assessing Evidence

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

	Convincing decreases risk		Convincing increases risk
	Probable decreases risk		Probable increases risk
	Limited - suggestive decreases risk		Limited - suggestive increases risk
			Substantial effect on risk unlikely

Literature Review Process

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

General Cancer Risk	18
Bladder Cancer	4
Breast Cancer	19
Colorectal Cancer	17
Cutaneous Melanoma/Skin Cancer	2
Digestive Tract Cancer	1
Esophageal Cancer	10
Gastric Cancer	8
Liver Cancer	5
Lung Cancer	8
Oral Cavity Cancer	3
Ovarian Cancer	1
Pancreatic Cancer	5
Prostrate Cancer	6
Renal Cell Cancer	1
Stomach Cancer	2
Urinary Cancer	1

Articles by Food Types

Anti-Inflammatory Foods	1	Mushrooms	1
Aspirin	2	Nigella Satvia	1
Carbohydrates	2	Nuts	2
Carotenoid Intake	1	Olive Oil	2
Coffee	1	Pickled Vegetables	1
Curcumin	1	Polyunsaturated Fats	1
Dairy, Yoghurt	5	Probiotics	2
Diet, Exercise, Lifestyle	4	Statins	1
General Diet, Type of Diet	14	Soy & Isoflavones	4
Diet & PPARG2	1	Supplements & Vitamins	16
Fish & w-3 Fatty Acids	1	Tofu	1
Fruits & Vegetables	5	Tomato & Lycopene	1
Green Tea	2	Whole Grains, Refined Grains & Fiber	7

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:

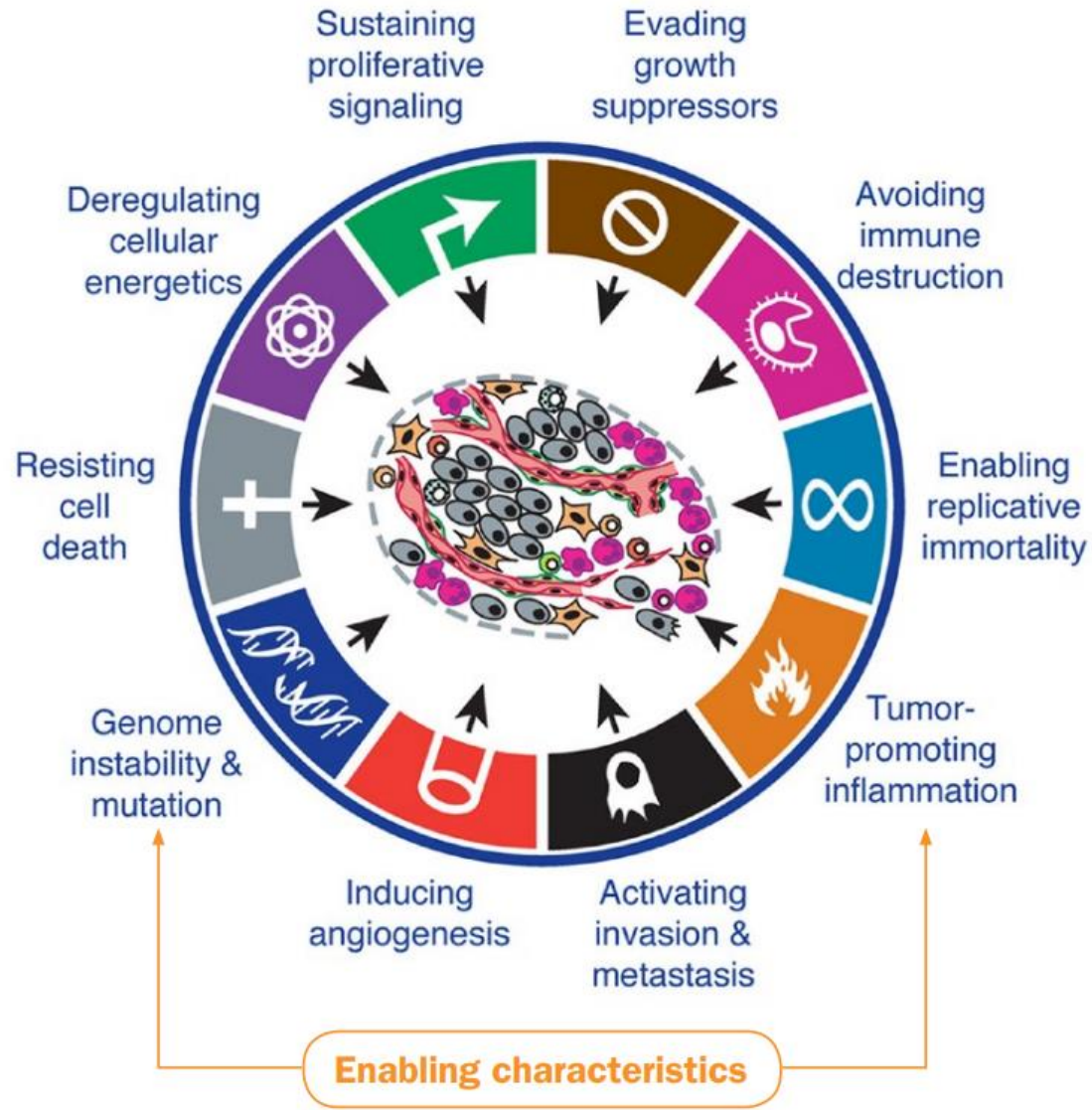
- a. Fruits and vegetables
- b. Walking and physical activity**
- c. Whole grains
- d. Red meat

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

BC
CAN

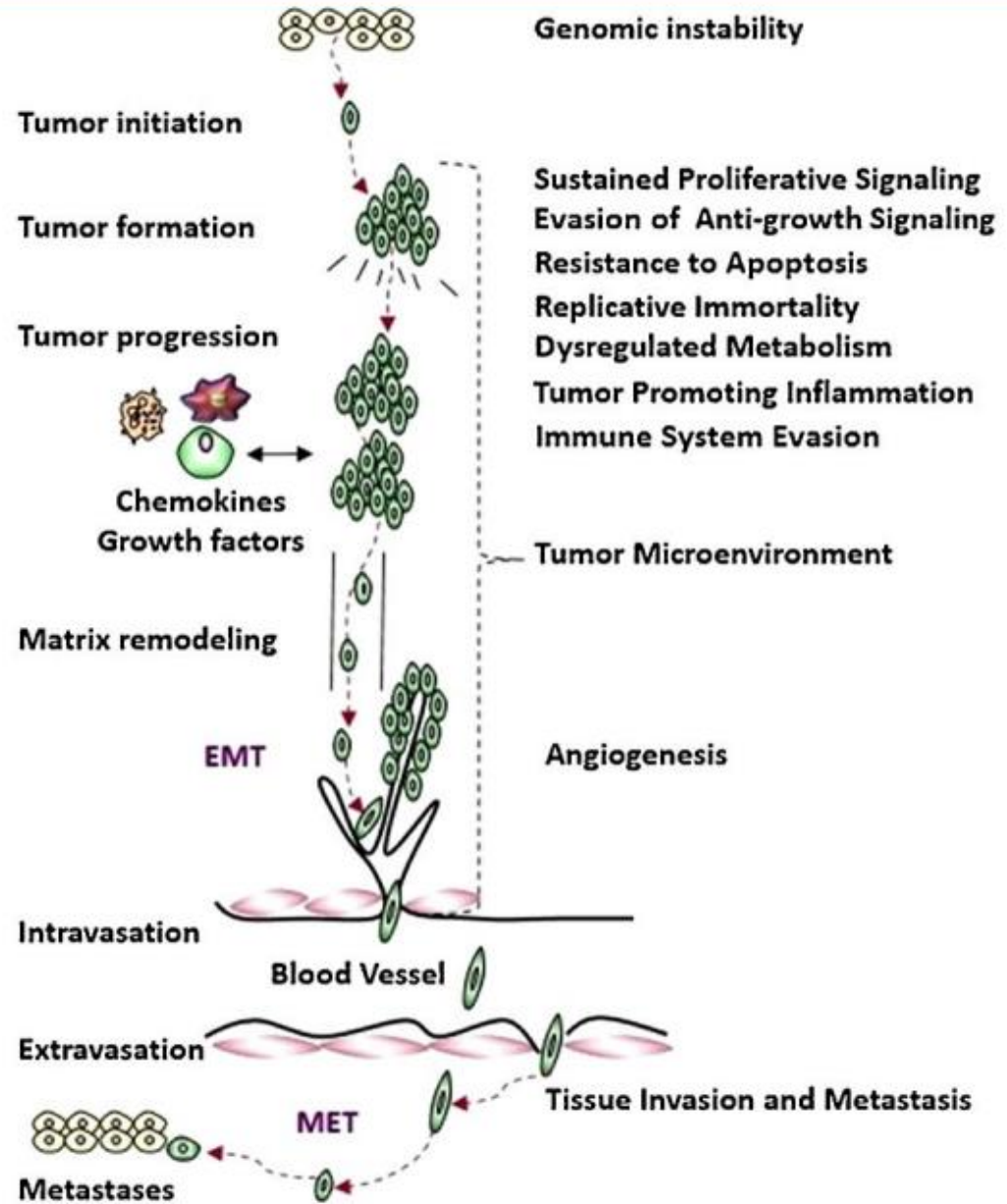
Figure 1: Hallmarks of cancer and two enabling characteristics



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

World Cancer Research Fund/American Institute for Cancer Research. Continuous Update Project Expert Report 2018. The cancer process. Available at dietandcancerreport.org

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

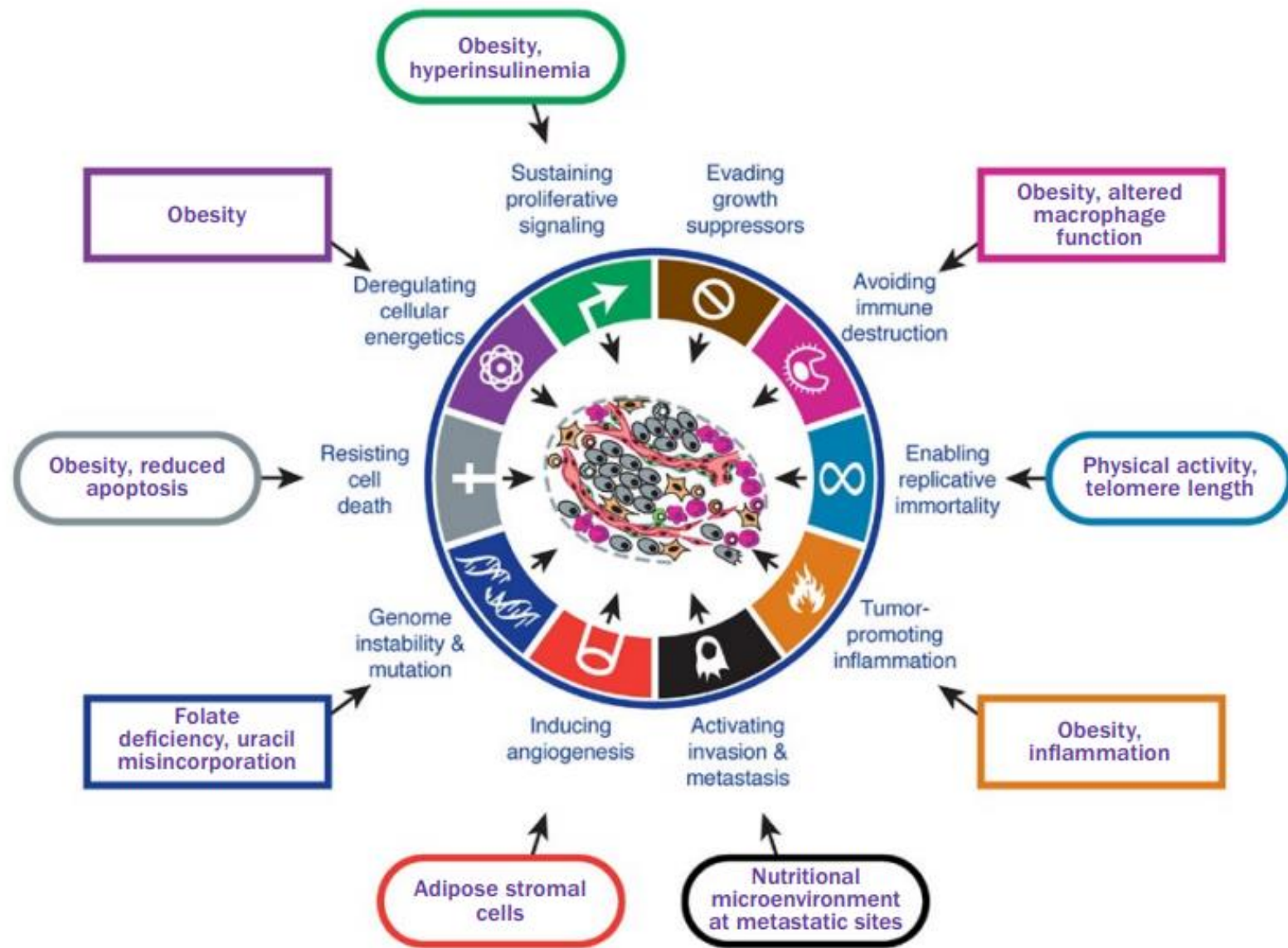


From: Block KI, Gyllenhaal C, Lowe L, et al. [Designing a broad-spectrum integrative approach for cancer prevention and treatment](#). *Semin Cancer Biol* 2015; 35 Suppl: S276-s304. Licenced under [CC BY 4.0](#).

World Cancer Research Fund/American Institute for Cancer Research. Continuous Update Project Expert Report 2018. The cancer process. Available at dietandcancerreport.org



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



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

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

BC
CAN

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

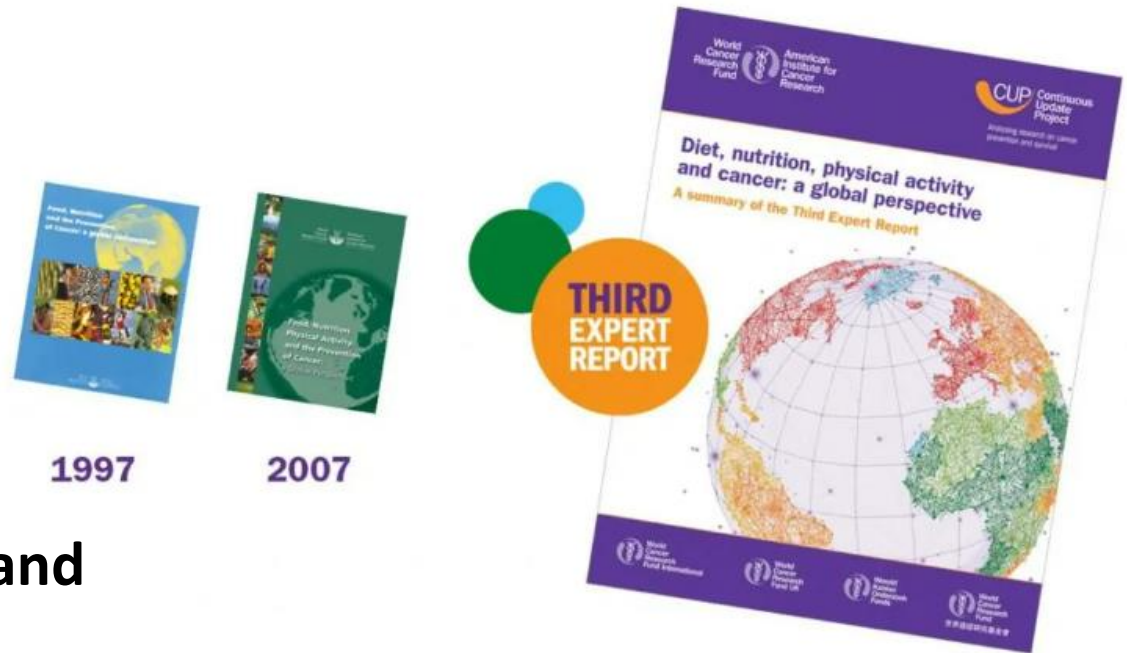
- Caffeine
- Arsenic
- Fibre
- Phytochemicals (lycopene, isoflavones)

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

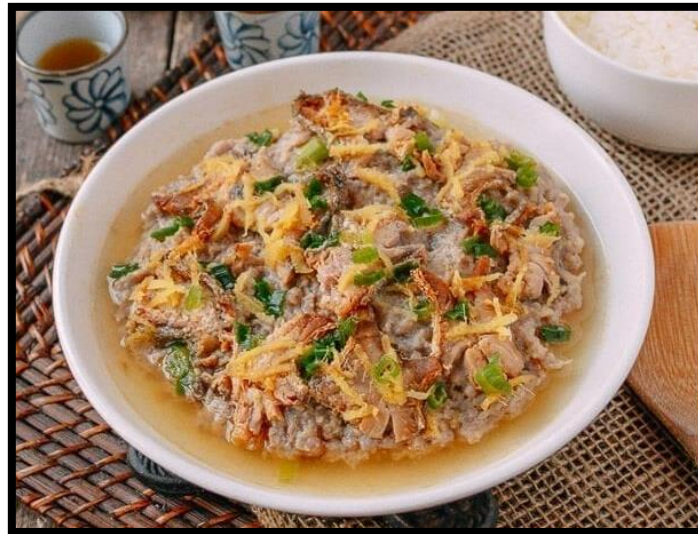


Increases Risk of Cancers

Food Preparation and Processing



Salted fish and chicken fried rice



Steamed pork cake with salted fish



Eggplant and salted fish casserole

Cantonese-style salted fish increases the risk of nasopharyngeal cancers

Diet and Cancer Report (2018): Meat, fish, and dairy products and the risk of cancer, page 17-18, 37-40: <https://www.wcrf.org/wp-content/uploads/2021/02/Meat-fish-and-dairy-products.pdf>

Photos from <https://thewoksoflife.com/>

Increases Risk of Cancers

Food Preparation and Processing

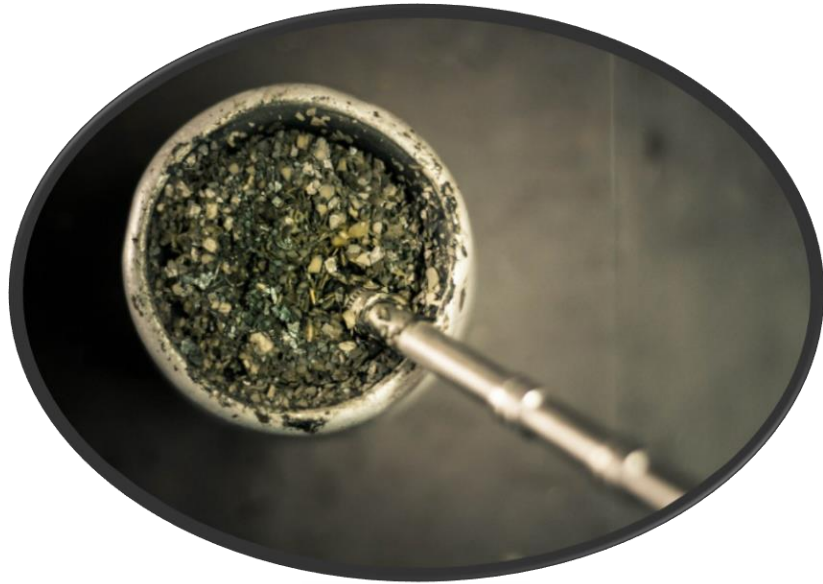


Processed meats and red meats increases the risk of colorectal cancer.

Foods preserved by salting increases the risk of gastric cancers.

Increases Risk of Cancers

Fluids

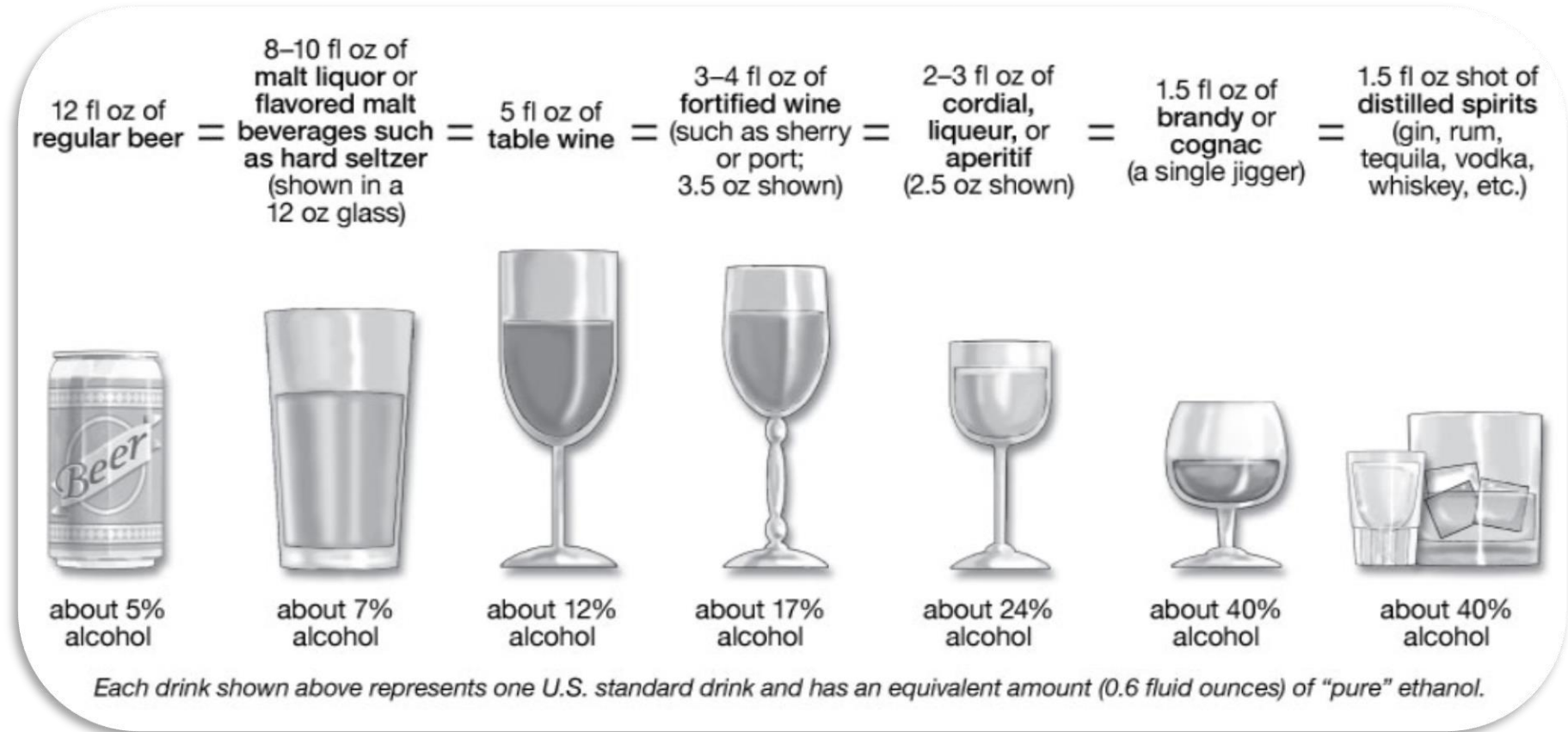


Mate (when drunk in the traditional style in South America) increases the risk of esophageal squamous cell carcinoma.

Increases Risk of Cancers Fluids - Alcohol

~14 g of ethanol
in a standard
drink

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



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

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

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**

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)

National Cancer Institute. (2015) "Selenium and Vitamin E Cancer Prevention Trial (SELECT): Questions and Answers was originally published by the National Cancer Institute." Accessed 16 October 2022. <https://www.cancer.gov/types/prostate/research/select-trial-results-qa>

Kristal AR, Darke AK, Morris JS, Tangen CM, Goodman PJ, Thompson IM, Meyskens FL Jr, Goodman GE, Minasian LM, Parnes HL, Lippman SM, Klein EA. Baseline selenium status and effects of selenium and vitamin e supplementation on prostate cancer risk. *J Natl Cancer Inst.* 2014 Mar;106(3):djt456. doi: 10.1093/jnci/djt456. Epub 2014 Feb 22. PMID: 24563519; PMCID: PMC3975165.

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

Alkaline Diet

What is it?

Belief: cancer cells thrive in acidic environment

10 levels of dietary restrictions

80:20 ratio

ALKALINE FOODS All CAPS = highest levels
*Some sources attribute foods to the Acid or Alkaline side. These foods are near Neutral or are mildly acidic. Remember, variety is the best answer.

Acidophilus	Carob	GARLIC	LETTUCE, all green	Peas, fresh	SPROUTS, all
ALFALFA SPROUTS	Cayenne	Ginger root	Lima beans	Pears	Squash, all
Almonds, raw	CELERY	Ginseng tea	LIME	Peppers, all	Stevia
Apples	Chayotes	Grapes sour	Loganberry	Pickles, in brine	Strawberry
Apple cider	Cherimoya	Grapefruit	Maitake	Pineapple	Sweet potato
Apricot	Chili pepper	GREENS, (beet, poke, turnip, mustard, collard, etc.)	Mango	Plums	SWISS CHARD
Asparagus	CHLORELA	Guava	Melons	Pomegranate	Syrup, maple, rice
Artichoke bulb	Cherries	Herbs & Spices, all	Milk, goat*	Potatoes	Tamari
Avacado	Chicory	Honeydew	Milk, organic*	Pumpkin	Tangerine
Baking soda	Chives	Horseradish, raw	Millet*	Quince	Taro
Bamboo shoots	Cilantro	Jams, unsugared	MISO	Radicchio	TEA, GREEN, or Herbal
Banana speckled	Cinnamon	Jerusalem artichoke	Mizuma	RADISH, all	Tempeh
Bancha tea	Coconut, fresh	Jicama	Molasses	Raisins	Tofu
BARLEY GRASS	Corn, sweet, fresh	JUICE, GREEN, fresh fruit	Mu Tea	Rutabaga	Tomato
Beans green, all	CUCUMBER	Juice, veggie	Mushrooms, Reishi, Shitaki	Sake	Turnip
Bee pollen	CULTURES, probiotic	Kain	Nectarine	Salsify	UMEBOSHI PLUM
Beets	Currants	Kale	Nori	Sapote	VINEGAR: apple cider, ume, balsamic, brown rice
Berries, most	Curry	KELP	Oils: Cold Pressed (almond, avocado, canola, flax, olive, safflower, sesame, sunflower, walnut)	Sauerkraut	Walnuts
Blackberry	Dandelion greens	Kiwi	Olives, dried	Scallions	WATER, mineral, distilled
Bok choy	Dates	Kohlrabi	Onion, all	SEA SALT	Water cress
Brazil nuts	DIAKON radish	Kombu	Orange	SEA VEGGIES	Watermelon
BROCCOLI	Dill	KUDZU	Okra	SEEDS, raw (sesame, sunflower, pumpkin)	WHEAT GRASS
Brussel sprouts	Dulce	Kumquat	Papaya	Sorrel	Whey, protein
Buckwheat*	Eggplant	Lecithin	PARSLEY, all	Soy sauce	Wine, fruit
Buttermilk	Endive	Leek	Parsnip	Soybeans	Yams
Cabbage, all	Escarole	Legumes*	Peach, fresh, dried	Spinach	Yogurt, live
Cantaloupe	Figs, fresh, dried	LEMON		SPINACH, raw	Zucchini
CARROTS	Flax seeds			SPIRULINA	

Moellering RE, Black KC, Krishnamurty C, Baggett BK, Stafford P, Rain M, Gatenby RA, Gillies RJ. Acid treatment of melanoma cells selects for invasive phenotypes. Clin Exp Metastasis. 2008;25(4):411-25. doi: 10.1007/s10585-008-

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



Mattson MP, Longo VD, Harvie M. Impact of intermittent fasting on health and disease processes. *Ageing Res Rev.* 2017; 39:46-58. doi:10.1016/j.arr.2017.10.005

White E. The role for autophagy in cancer. *J Clin Invest.* 2015; 125:42-6

Buono R, Longo VD. Starvation, stress resistance, and cancer. *Trends Endocrinol Metab.* 2018;29(4):271-280. doi:10.1016/j.tem.2018.01.008

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 protein minimum to try and prevent)
- Binge – disordered eating
- Altered eating schedule and social impacts
- Randomized human trials currently underway.

Lee C, Raffaghello L, Brandhorst S, et al. Fasting cycles retard growth of tumors and sensitize a range of cancer cell types of chemotherapy. *Sci Transl Med.* 2012;4(124):124a27. doi:10.1126/scitranslmed.30032933

Buschemeyer WC, Klink JC, Macropoulos JC, et al. Effect of intermittent fasting with or without caloric restriction on prostate cancer growth and survival in SCID mice. *Prostate.* 2010;70(10):1037-1043

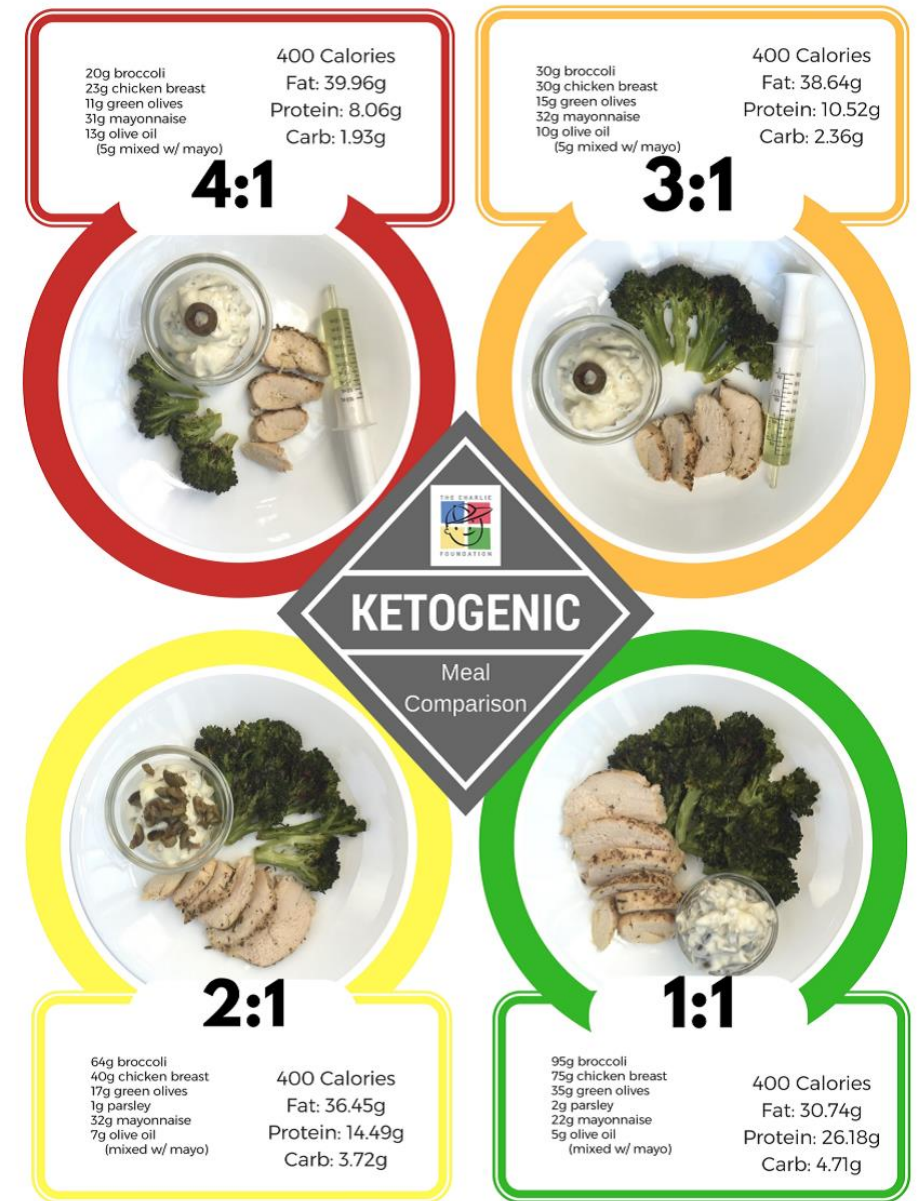
Marinac CR, Nelson, SH, Breen Cl, et al. Prolonged nightly fasting and breast cancer prognosis. *JAMA Oncol.* 2016; 2(8): 1049-1055

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.

Allen BG, Bhatia SK, Anderson CM, et al. Ketogenic diets as an adjuvant cancer therapy: history and potential mechanism. *Redox Biol.* 2012;2:963-970

doi:10.1016/j.redox.2014.08.002

Martin-McGill KJ, Marson AG, Smith CT, Jenkinson MD. Ketogenic diets as an adjuvant therapy in glioblastoma (the KEATING trial): study protocol for a randomized pilot study. *Pilot Feasibility Stud.* 2017;3:67. doi:10.1186/s40815-017-0209-9.

Vegan Diet

What's the evidence?

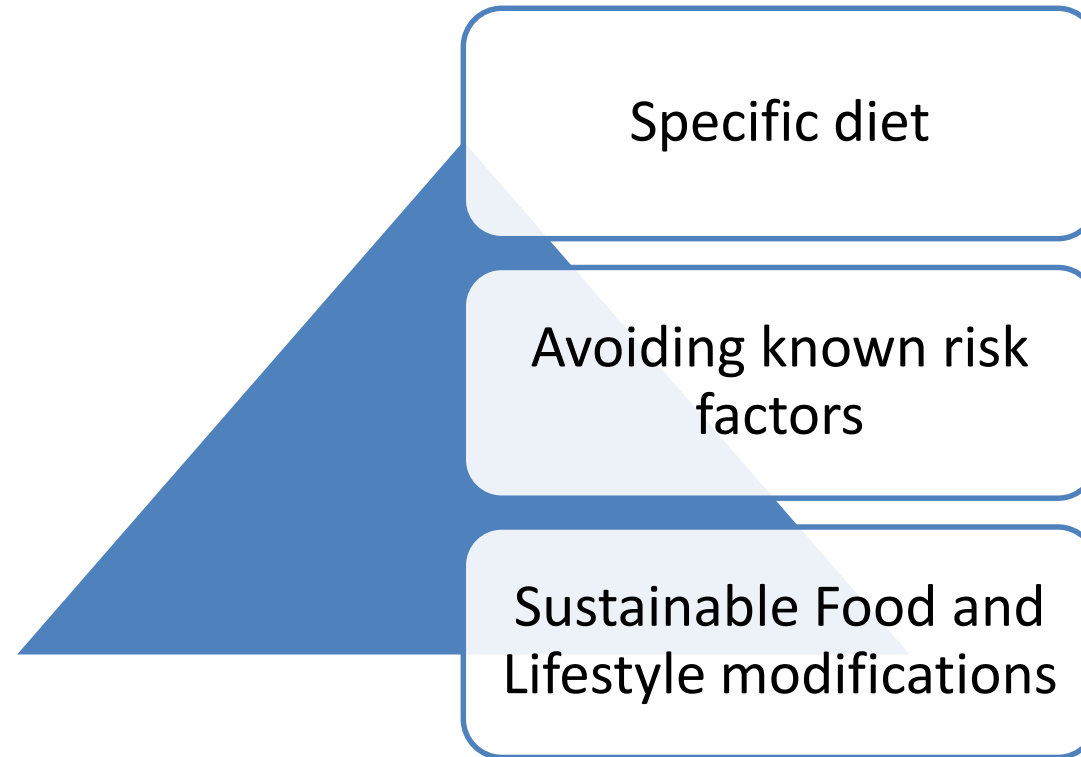
- Excludes flesh foods, dairy foods, eggs.
- Emphasis on fruits, whole grains, legumes, soy, nuts, and seeds.
- Reduces all-cancer risk by 14% but increased urinary tract cancer by 73% (Le and Sabate 2014)
- Diverse gut microbiota (Glick-Bauer and Yeh 2013)
- Risk deficiency for vit B12, D, iron, zinc, calcium, iodine, and protein.
- Likely require supplementation



Glick-Bauer M, Yeh MC. The health advantage of a vegan diet: exploring the gut microbiota connection. *Nutrients*. 2013;6(11):4822-4838

Le LT, Sabate J. Beyond meatless, the health effects of vegan diets: findings from the Adventist Cohorts. *Nutrients*. 2014;6(6):213-2147. doi:10.3390/nu6062131

Putting it into Practice



Finding 1-2 points to coach sustainable behaviour changes

Acknowledgements

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Resources & References

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Cancer Risk Matrix: <https://www.wcrf.org/diet-activity-and-cancer/interactive-cancer-risk-matrix/>

World Cancer Research Fund/American Institute for Cancer Research. Continuous Update Project Report 2018. Judging the evidence. Available at [dietandcancerreport.org](https://www.dietandcancerreport.org)

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Diet and Cancer Report (2018): Meat, fish, and dairy products and the risk of cancer, page 13, 17-18, 27 -32, 36-51: <https://www.wcrf.org/wp-content/uploads/2021/02/Meat-fish-and-dairy-products.pdf>

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Diet and Cancer Report (2018): Alcoholic drinks and the risk of cancer, : <https://www.wcrf.org/wp-content/uploads/2021/02/Alcoholic-Drinks.pdf>

Vitamin E: <https://www.acpjournals.org/doi/full/10.7326/0003-4819-142-1-200501040-00110>

Diet and Cancer Report (2018): Wholegrains, vegetables and fruit and the risk of cancer, page 9-44: <https://www.wcrf.org/wp-content/uploads/2020/12/Wholegrains-veg-and-fruit.pdf>

Diet and Cancer Report (2018): Non-alcoholic drinks and the risk of cancer, page 13-16, 34-39: <https://www.wcrf.org/wp-content/uploads/2021/02/Non-alcoholic-drinks.pdf>

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