Food As Medicine for Cancer Prevention

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Objectives:

1) Today, we are focusing on prevention.
2) Carcinogenesis
3) Lifestyle Factors
4) Eating Patterns
5) Key Diet Interventions
Let’s start with the stats...

- In 2015 – National Institutes of Health estimated that 1.6 million new diagnosis will be made.
- 40% of the total population of the U.S. will be diagnosed at some point in their lives.
- According to the World Cancer Research Fund (WCRF) the number of global cancers has increased by a fifth in less than a decade to around 12 million new cases per year.
- Cancer diagnoses worldwide are expected to increased by 45% in the next 20 years.
- More than 67% of cancer patients will survive more than 5 years after diagnosis.

*Kelland K, Healthier living could cut 2.8 million cancer cases. Sun, Dep 25, 2011. London (Reuters)*
The Cancer Process

- Normal cell division
- Cell damage - no repair
- Apoptosis
- First mutation
- Second mutation
- Third mutation
- Fourth and later mutations
- Uncontrolled cell growth

Normal cell division and the development of cancer
Hallmarks of Cancer

- Accelerator pedal is stuck
- Brakes don’t work
- Cancer cells don’t die
- Telling the body to give it a blood supply
- Infinite generation of descendants.
- Migrating and spreading to other organs
- Sustained Angiogenesis
- Evading Apoptosis
- Self-sufficiency in growth signals
- Brakes don’t work
- Insensitivity anti growth signals
- Inflammatory Microenvironment
What is inflammation?
Acute Inflammation
Chronic Inflammation: The Body on Fire

- Physical Inactivity
- Obesity
- Infections
- Diet
- Stress
- Toxins
The milieu is more important than tumor cell genomics

- 5-10% of cancers are attributable to true inherited genetic mutations
- We want to create an environment that is inhospitable for cancer in our bodies
- Lifestyle-based influence of the milieu is at the heart of cancer prevention.
True inherited genetic mutations account for only 5%-10% of all cancers.
“For better or for worse, everything in our human environment, from the foods we eat, to the air we breathe, to the songs we sing (think stress, or the lack thereof) affects our genes, playing a role in how long we live.”

Rebecca Katz
Epigenetics and Nutrition

The foods we eat communicate with our genes, and we’re able through our food choices to alter our gene expression.
Objective #2: Lifestyle Factors
AICR (American Institute on Cancer Research) Report

Recommendations:

- November 2007
- Analysis of over 7000 research studies.
- The most comprehensive report on diet and cancer ever completed.
- Developed 10 Recommendations for Cancer Prevention
10 CANCER PREVENTION RECOMMENDATIONS

- Maintain a healthy weight
- Move more
- Eat well
- Enjoy a plant-based diet
- Reduce red meat, avoid processed meat
- Cut down on alcohol
- Eat less salt
- After treatment, cancer survivors should follow the cancer prevention recommendations
- If you can, breastfeed your baby
- For cancer prevention, don’t use supplements

And always remember - do not smoke or chew tobacco.

aicr.org
Modifiable Risk Factors

- **Weight**: Aim to be a healthy weight throughout life.
- **Cancer Prevention**: Choose mostly plant foods, limit red and avoid processed meat.
- **Diet**: Be physically active every day in any way, for 30 minutes or more.
- **Physical Activity**:
How Much We Weigh
Obesity in America

7 in 10 Americans are currently overweight or obese.

69%

AND ...

Only about half of all Americans are even aware of the obesity-cancer link.

52%
Weight-Cancer Link

WHAT YOU NEED TO KNOW ABOUT OBESITY AND CANCER

After not smoking, BEING AT A HEALTHY WEIGHT is THE MOST IMPORTANT THING you can do to prevent cancer.

Overweight and obesity INCREASE RISK FOR

- Esophageal Cancer
- Liver Cancer
- Kidney Cancer
- Stomach Cancer
- Colorectal Cancer
- Advanced Prostate Cancer
- Post-Menopausal Breast Cancer
- Gallbladder Cancer
- Pancreatic Cancer
- Ovarian Cancer
- Endometrial Cancer
Relationship between excess body fat and cancer... *possible mechanisms*

- Fat is not an inert mass.
- Fat cells produce homones, called adipokines, that causes low-grade inflammation.
- Fat tissue produces estrogen which promotes cell growth.
- Increased level of insulin and insulin-like growth factor-1 (IGF-1)
Relationship between excess body fat and cancer... possible mechanisms

- Obese people often have chronic low-level inflammation, which has been associated with increased cancer risk
- Chronic inflammation is a slow, silent disturbance that never shuts off.
Apple vs. Pear

Apple shape

More weight above waist

Apple shape

More weight below waist

Pear shape
Sugar and Cancer

- Sugar and Refined Carbohydrates (white bread, white rice, pasta, chips, candy, high fructose corn syrup, etc.) promote inflammation.
- The relationship to high insulin levels that related growth factors that may influence cancer cell growth the most.
- Diabetes-cancer link
Body Weight Recommendations

- Be as lean as possible without becoming underweight
- Maintain weight within normal range from age 21
- Avoid weight gain and increases in waist circumference throughout adulthood
Objective #4: Eating Patterns
Food as Medicine: Nutrition and Cancer Prevention
Current State of the Plate
Standard American Diet (SAD)
If it wasn’t food 100 years ago, it ain’t food today...
The key to cancer prevention: move toward a whole-food, plant based diet
www.choosemyplate.gov
Integrative Nutrition Plate
AICR Plate

The New American Plate

2/3 (or more) vegetables, fruits, whole grains and beans.

1/3 (or less) animal protein.
Mediterranean diet: the best plant-based diet

- Whole grains
- Raw and Cooked Vegetables
- Fresh and dried fruits
- Legumes
- Nuts and Seeds
- Fish
- Moderate meat/dairy
- Olive oil
- Moderate wine
Mediterranean diet

The “Med” diet has been found to reduce all-cause mortality and the risk for chronic disease (especially cardiovascular disease) in the Seven Countries Study when compared to US and northern European diets.
Mediterranean-style diet and breast cancer risk

- **Meta-analysis:**
  Case-control and cohort studies that identified:
  1) Prudent/healthy diet (n=18)
  2) Western/unhealthy diet (n=17)
  3) Drinker (n=4) dietary patterns.

- In total, 18 studies met the inclusion criteria and were included in the analysis.

Mediterranean-style diet and breast cancer risk

- Evidence of an 11% decrease in the risk of breast cancer in the highest compared to the lowest categories of prudent/healthy dietary patterns in all studies and in pooled cohort studies alone.
- Prudent/healthy diets tended to have high quantities of fruit, vegetables, poultry, fish and low-fat dairy and whole grains
Plant-based diet & Prostate Cancer Risk

- Men who ate more than one serving of vegetables each week had roughly half the risk of developing advanced-stage prostate cancer compared with their peers who ate these vegetables once a month.

- Men who ate the most veggies had a 49% lower risk of being diagnosed with prostate cancer that had advanced to stage III or IV.
Plant-based diet & Prostate Cancer Risk

- Broccoli and cauliflower appeared to have the biggest impact. Men who ate broccoli more than once a week had a 45% lower risk of advanced prostate cancer than those who ate the vegetable less than once a month, while eating cauliflower this often cut risk by 52%.
Key Takeaways

1) Men are not eating very many vegetables
2) Eating specific types of vegetables have a bigger impact
3) What would happen if you ate it more???
ONE SIMPLE RULE

If it came from a plant, eat it;

If it is made in a plant, don't.
“DON’T EAT ANYTHING your GREAT-GREAT GRANDMOTHER WOULDN’T RECOGNIZE as FOOD.”

MICHAEL POLLAN

simpletruth.com
It's not food if it arrived through the window of your car.

Michael Pollan
Key Diet Recommendations
(Objective #5)
Increase Fruits and Vegetables
Risk Reduction Associated with Fruit and Vegetable Intake

- 75% of Americans eat 1.5 servings or less per day.
- Diets high in vegetables and fruits (400 g/d) may prevent at least 20% of all cancers.
- Some of the most convincing evidence for the health benefits of fruit and vegetable consumption relates to the reduced risk of gastrointestinal cancers, such as those associated with the mouth, pharynx, esophagus, stomach, colon, and rectum.
Fiber

- Eat 30-45 grams/day – or more!
- Reduces cancer risk
- Binds to toxic compounds and carcinogens
- Fiber and colon cancer
- Fiber and breast cancer
- Reduces inflammation
Increase fruits and vegetables

- Eat a minimum of 5-10 colorful servings of fruits and vegetables per day

  1 serving:
  - 1/2 cup cut, cooked or sliced
  - 1 cup leafy greens
  - 1 piece medium fruit
  - 1/4 cup dried fruit
Phytonutrients: Prevention in a Plant
Phytonutrients

How do they work?

- Stimulate enzymes that help the body detoxify
- Decrease inflammation
- They can increase the tendency of cancer cells to self-destruct.
- Others increase the production of enzymes that detoxify carcinogens before they have a chance to damage DNA and begin the cancer process.
- They may also block the development of new blood vessels that enable cancer to grow and spread.
Phytonutrients – Additional Benefits

- Anti-inflammatory
- Anti-bacterial
- Skin health
- Reproductive Health
- Improved Cognition
- Eye health
- Vascular Health
- Etc.
Phytonutrients

Phytonutrients (Flavanoids) are natural compounds found in plant-based foods that give plants their rich pigment as well as their distinctive taste and smell.
Phytonutrients

The “immune system” of a plant
The antioxidant level of Alaska’s wild berries: high, higher and highest.

Abstract

BACKGROUND: In the last few years, antioxidants have become the stars of the nutritional world. Antioxidants are important in terms of their ability to protect against oxidative cell damage that can lead to conditions, such as Alzheimer's disease, cancer and heart disease—conditions also linked with chronic inflammation. The antioxidant and anti-inflammatory effects of Alaska’s wild berries may have the potential to help prevent these diseases.

OBJECTIVE: To discover the antioxidant levels of Alaska wild berries and the ways these antioxidant levels translate when preservation methods are applied to the berry.

DESIGN: This research centred on both the raw berries and products made from the berries. In the first year, a variety of wild berries were tested to discover their oxygen radical absorption capacity (ORAC) in the raw berries. The second level of the research project processed 4 different berries—blueberries, lingonberries, salmonberries, highbush cranberries—into 8 or 9 products made from these berries. The products were tested for both ORAC as well as specific antioxidants.

RESULTS: The Alaska wild berries collected and tested in the first experiment ranged from 3 to 5 times higher in ORAC value than cultivated

Alaskan wild berries collected and tested ….ranged from 3 to 5 times higher in ORAC value than cultivated berries from the lower 48 states.

Conclusion: Alaskan wild berries have extraordinarily high antioxidant levels. Though cooking lowered the antioxidant level, and adding ingredients such as sugar diluted the antioxidant concentration.
Berries and Cherries

- Anthocyanins –
  - powerful antioxidants that protect cells from damage by free radicals.
  - Damaged cells that are not neutralized by antioxidants can replicate and begin the cancer process.
  - In berries, anthocyanins affect how genes and molecular pathways are triggered in our bodies.
  - Elegiac acid – anti cancer compound
Help prevent damage to cells from the attack of free radicals
Free Radicals

- The byproduct of normal cellular metabolic oxidation and toxic overload.
- Lead to autoimmune diseases, cancer and heart attacks
Antioxidants

• Vitamin C
• Vitamin A
• Vitamin E
• Selenium
Glutathione – The Mother of all Antioxidants

- Actually produced in every cell in our bodies in the form of GSH.
- Important in preventing damage to cells by free radicals (leading to cancer development).
- It can regenerate itself in the liver after each fill-up of free radicals.
- First line defense against disease and illness (boosts immune system).
- Maintains healthy cellular mitochondria (damage to mitochondria is part of the cancer process.)
Boosting glutathione

- Food sources include sulfur foods – garlic, onions, cruciferous vegetables
- Foods high in folate – garbanzo beans, liver, pinto beans, lentils, spinach, asparagus, avocado, broccoli
- Foods high in selenium – brazil nuts, halibut, grass-fed beef, eggs, spinach
- Foods high in vitamin C – oranges, red peppers, kale, broccoli, strawberries, etc.
- Vitamin E – almonds, spinach, sweet potato, avocado, sunflower seeds, wheat germ
- Breastfeeding - colostrum
“But I take antioxidant supplements in pill form, so I’m good, right???”

**Food First:** Don’t use supplements to protect against cancer.
Phytonutrient litmus test...

- If a fruit or vegetable has a strong smell or taste, it's probably biomedically active.
- If it stains your shirt, it's definitely biomedically active.
Color kills cancer…

eat a RAINBOW!

<table>
<thead>
<tr>
<th>Colors</th>
<th>Foods</th>
<th>Colorful Protective Substances and Possible Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Tomato and tomato products, watermelon, guava</td>
<td>Lycopene: antioxidant, cuts prostate cancer risk</td>
</tr>
<tr>
<td>Orange</td>
<td>Carrot, yam, sweet potato, mango, pumpkin</td>
<td>Beta-carotene: supports immune system; powerful antioxidant</td>
</tr>
<tr>
<td>Yellow-orange</td>
<td>Citrus fruits—orange, lemon, grapefruit, papaya, peach</td>
<td>Vitamin C, flavonoids: inhibit tumor cell growth, detoxify harmful substances</td>
</tr>
<tr>
<td>Green</td>
<td>Spinach, kale, collard, and other greens</td>
<td>Folate: builds healthy cells and genetic material</td>
</tr>
<tr>
<td>Green-white</td>
<td>Broccoli, brussels sprouts, cabbage, cauliflower</td>
<td>Indoles, lutein: eliminate excess estrogen and carcinogens</td>
</tr>
<tr>
<td>White-green</td>
<td>Garlic, onion, chive, asparagus</td>
<td>Allyl sulfides; destroy cancer cells, reduce cell division, support immune system</td>
</tr>
<tr>
<td>Blue</td>
<td>Blueberries, purple grapes, plums</td>
<td>Anthocyanins: destroy free radicals</td>
</tr>
<tr>
<td>Red-purple</td>
<td>Grapes, berries, plums</td>
<td>Resveratrol: may decrease estrogen production</td>
</tr>
<tr>
<td>Brown</td>
<td>Whole grains, legumes</td>
<td>Fiber: carcinogen removal</td>
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Cruciferous Vegetables

**Glucosinolates**
- These give vegetables their “bite”
- Block the activation of carcinogens

**Sulphoraphane**
- Protect healthy cells from damage
- Promotes apoptosis (cell death) of cancer cells
Cruciferous Vegetables: Eat these daily

- Arugula
- Broccoli
- Brussels sprouts
- Cabbage
- Cauliflower
- Collard greens
- Horseradish
- Kale
- Kohlrabi
- Mustard greens
- Radishes
- Rutabaga
- Turnips
- Turnip greens
- watercress
Carotenoid-Rich Produce

- Deep Orange, Yellow, Red and Green
- Contain antioxidants that fight free radicals
- Protect healthy cells and fortify the immune system
- Protect against cancers of the mouth, pharynx, larynx and lung
Carotenoid-Rich Foods

- Yams, Squash and Sweet Potatoes
- Bok Choy
- Broccoli
- Carrots
- Corn
- Greens
- Pumpkin
- Bell pepper
- Tomatoes
- Apricots
- Cantaloupe
- Nectarines
- Peaches
- Oranges
- Papayas
- Watermelon
Garlic

- Allium
- Rich in Sulfur
- Reduction in stomach cancer in high-risk people
- May lower incidence of breast, colon, skin and lung cancer.
- Cook with garlic and ginger as a base
- Roast garlic as an appetizer spread on whole grain crackers.
Culinary Herbs and Spices

- Rich in antioxidants
- Cancer cell death (Apoptosis)
- Suppress potential carcinogens
- Some of the best herbs and spices include basil, caraway, cardamom, cinnamon, clove, coriander, cumin, garlic, ginger, rosemary, saffron, thyme and turmeric.
Curcumin and Carcinogenesis

- Curcumin stops the development of cancer.
- High efficacy in studies that target breast cancer (both estrogen and non-estrogen receptor types) and colon cancer.
- Cytotoxic characteristics of curcumin against gastric carcinoma have been tentatively established.
- Been found to selectively induce apoptosis in human leukemia cell lines
Other benefits of curcumin

- Anti-inflammatory
- Hypoglycemic
- Antioxidant
- Wound healing
- Antimicrobial
- Chemosensitization, chemotherapeutic and radiosensitization activities
- Exercise

Cancer Res Treatment. 2014; 46(1):2-18
Curcumin and Bioavailability

- Less than desirable
- Nanocurcumin, PLGA- curcumin, IV
- Regular consumption is key
- Approaches to enhance absorption include:
  - Piperine – the alkaloid in black pepper, may increase the bioavailability by 2000%
Turmeric Tea or “Golden Milk”

Ingredients
- 2 cups of milk of choice (almond, pecan, coconut and dairy all work in this recipe)
- 1 teaspoon Turmeric
- ½ teaspoon Cinnamon
- 1 teaspoon raw honey or maple syrup or to taste (optional)
- Pinch of black pepper (increases absorption)
- Tiny piece of fresh, peeled ginger root or ¼ tsp ginger powder
- Pinch of cayenne pepper (optional)

Instructions
- First, blend all ingredients in a high speed blender until smooth.
- Then, Pour into a small sauce pan and heat for 3-5 minutes over medium heat until hot but not boiling.
- Drink immediately
Organic vs. Conventional

- Organic contains more flavonoids and antioxidants
- Synthetic herbicides, pesticides and fertilizers can contribute to the risk of cancer
- More than ½ of dietary pesticide exposure comes from 12 foods – EWG “Dirty Dozen”
Environmental Working Group

www.ewg.org

EWG's 2016 DIRTY 12
1. STRAWBERRIES
2. APPLES
3. NECTARINES
4. PEACHES
5. CELERY
6. GRAPES
7. CHERRIES
8. SPINACH
9. TOMATOES
10. BELL PEPPERS
11. CHERRY TOMATOES

EWG's 2016 CLEAN 15
1. AVOCADOS
2. CORN
3. PINEAPPLES
4. CABBAGE
5. SWEET PEAS
6. ONIONS
7. ASPARAGUS
8. MANGOES
9. PAPAYAS
10. KIWI
11. EGGPLANT
12. HONEYDEW
13. GRAPEFRUIT
14. CANTALOUPE
15. CAULIFLOWER
Data suggest that Devil’s Club acts through targeting the intrinsic mitochondrial apoptosis pathway in the pancreatic cancer cells. The high antiproliferation potency of DC on PANC-1 is potentially useful as an adjust therapy for treating pancreatic cancer, which is known for developing resistance to conventional chemotherapeutics.
Reduce Your Cancer Risk: MEAT
Meat

- Limit consumption of red meat (beef, pork and lamb) to no more than 11-18 ounces per week
- Eat lean cuts – choose loin and round
- Eat smaller portions
- Avoid grilling, charring or frying
Heterocyclic Amines (HCA's)

- HCA’s are formed when charring meat and are very carcinogenic.
- Use lower heat – cook food to medium or medium rare
- Marinate in polyphenolics for 20 minutes (olive oil, garlic, spices, beer)
- HCA’s are metabolized more quickly when the diet contains crucifers such as Brussels sprouts, broccoli, watercress, arugula, kale, cabbage, cauliflower, radishes, etc.
Meat

AVOID processed meats
- Bacon
- Sausage
- Luncheon meats
- Hot dogs
Fish

- Omega-3 Fatty Acids which prevent colon cancer.
- Men who ate fish five times or more per week had a 40 percent lower risk of developing colon cancer than those who ate fish less than once per week.
- Protects against cancer by restricting the production of prostaglandins – inflammatory compounds that act as tumor promoters.
- DHA reduced solid tumor size and boosted the effect of the chemotherapy drug cisplatin.
Fish

**Best Sources:**
- Salmon
- Sardines
- Hooligan
- Seal Oil
- Herring
- Albacore tuna
- Rainbow trout

**Next Best:**
- Cod
- Clams
- Halibut
Alcohol

- Women who consume 1 drink or more per day have an increased risk of breast cancer (10-40%)
- If consumed, limit alcoholic drinks per day
  - 2 drinks per day for men
  - 1 drink per day for women
  - Servings is 12 ounces beer, 5 ounces wine and 1.5 ounces spirits
Eat food. Not too much. Mostly plants.

Michael Pollan,
In Defense of Food
“LET FOOD BE THY MEDICINE
LET MEDICINE BE THY FOOD

HIPPOCRATES