

Background



- 18 million cancer cases around the world in 2018, of these 9.5 million cases were in men and 8.5 million in women.

In the U.S., your lifetime risk of developing cancer is:
1 in 2 for men, 1 in 3 for women

In the U.S., your lifetime risk of dying of cancer is:
1 in 4 for men, 1 in 5 for women

**excludes basal and squamous cell skin cancer

American Cancer Society
National Cancer Institute
Worldwide Cancer Data

Background



For cancer cases in the U.S.

- Approximately 1/3 can be attributed to tobacco use
- Approximately 1/3 can be attributed to diet and physical activity habits
- Inherited risk plays a small part

****2/3 of our cancer risk is modifiable!**

World Cancer Research Fund
American Institute for Cancer Research

Causes of Cancer



- Smoking and Tobacco use
- Diet and Physical Activity
- Sun and other types of Radiation
- Viruses and Other Infections
 - HPV, HBV, HCV, etc.
- Genetic & Family Cancer Syndromes
 - Lynch Syndrome (HNPCC)
 - Colon Cancer
 - BRCA 1/2
 - Breast and Ovarian Cancer
 - Hereditary Diffuse Gastric Cancer (CDH1)
 - Li Fraumani Syndrome (TP53)



- **Can Cancer be prevented?**

- Cancer can take years to develop
- Cancer risk depends on a combination of our genes, our lifestyle, and our environment
 - Things we can and cannot control

- **Why is Prevention important?**

- 1 in 4 people in the U.S. will develop cancer
- Diagnosis is devastating, can lead to death
- There's added emotional and financial burden to patients and their family

- **How many cancers could be prevented?**

- 30-40% of cancer cases are preventable in the U.S.

Strong Evidence for Risk

- Smoking
- Alcohol
- Red meat
- Processed meats
- Obesity



Red and Processed Meat



- International Agency for Research on Cancer (IARC) reviewed >800 epidemiological studies (mostly case-control and cohort studies) regarding cancer risk with consumption of red and processed meats
- Processed meat includes ham, hot dogs, sausage, bacon, and some deli meats
- Eating 50 gm of processed meat per day (equivalent of 4 strips of bacon or one hot dog) raises colon cancer relative risk by 18%
- Increases lifetime colon cancer absolute risk from 5% to ~6%
- Consuming more than 100 gm of red meat per day increases risk of colorectal, pancreatic, and prostate cancer

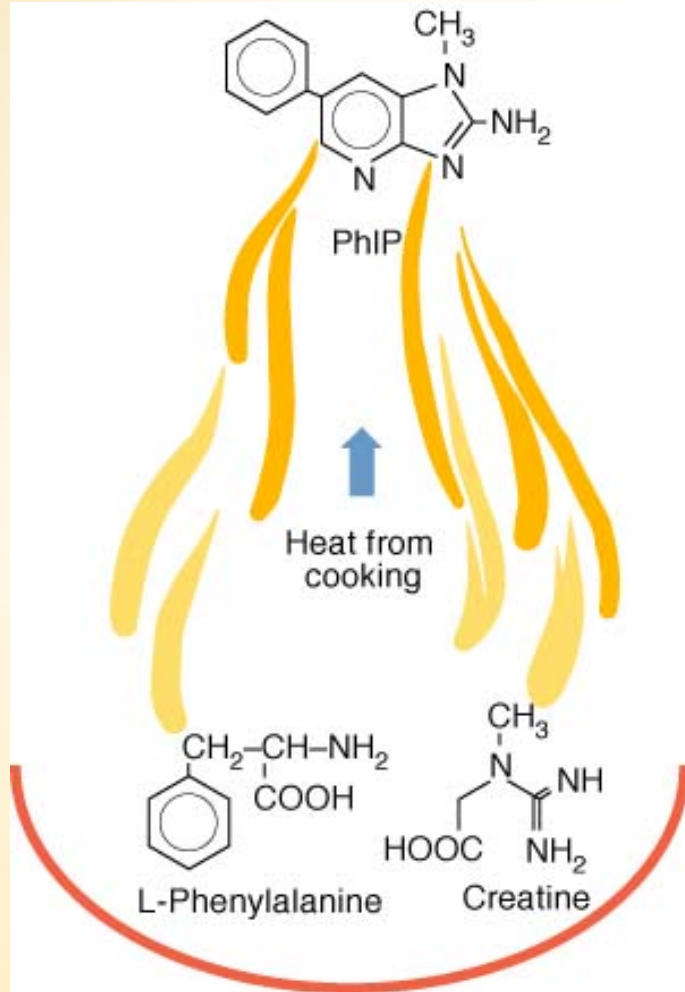
Red and Processed Meats



- Over 500,000 people in the NIH-AARP Diet and Health Study (age 51-70) were prospectively surveyed on diet, exercise, family history, smoking, exercise, and other factors. They were followed from 1995 to 2005.
- Cohort divided into quintiles based on meat consumption
- Cancer mortality for 1st vs 5th quintile for red meat:
 - Men HR, 1.22 (95% CI, 1.16-1.29)
 - Women HR, 1.20 (95% CI, 1.12-1.30)
- Cancer mortality for 1st vs 5th quintile for processed meat:
 - Men HR, 1.12 (95% CI, 1.06-1.19)
 - Women HR, 1.11 (95% CI 1.04-1.19)

Sinha et al. *Arch Intern Med.*
2009;169(6):562-571

Red and Processed Meats



Proposed mechanism of mutagen.

- Heterocyclic amines (HCA) and Polycyclic aromatic hydrocarbons (PAH) are formed when meat is heated to high temperatures, such as with pan frying or grilling, or when meat is smoked.
- Formed by amino acids, sugars and creatine
- PAHs can also be found in cigarette smoke and car exhaust

NCI: <http://www.cancer.gov/about-cancer/causes-prevention/risk/diet/cooked-meats-fact-sheet>

Red and Processed Meats



- HCAs and PAHs are known to induce DNA damage and tumor formation when fed to mice in high concentrations
- Must be enzymatically metabolized to become bioactive (mutagenic)
 - metabolized by CYP1A2 and other enzymes
 - Forms DNA adducts at guanine bases
 - Likely induces genomic instability
- Humans do not consume enough to cause significant direct DNA damage, but many HCAs and PAHs may potentiate other forms of DNA damage and increase sensitivity to tumor promoters

Red and Processed Meats



Strategies to reduce risk:

- Reduce consumption of red and processed meats
- Baking, broiling or poaching meats may reduce risk compared to charbroiling or frying
- Cook meat to less “doneness” (less than well done)
- Marinades (particularly containing garlic, citric acids, rosemary, and certain other spices) can reduce HCA formation with cooking

BMI



- Body Mass Index (kg/m²)
 - Underweight
 - <18.5 kg/m²
 - Normal
 - Between 18.5 and 25 kg/m²
 - Overweight
 - Between 25 and 30 kg/m²
 - Obesity
 - >30 kg/m²

Obesity



Increases the risk for many types of cancer through many different mechanisms:

- Clearly increases risk of postmenopausal breast, colorectal, endometrial, kidney, esophageal (adeno), and pancreatic (adeno) cancers
- Likely increases risk of gallbladder and liver cancers
- May increase risk of non-Hodgkin lymphoma, multiple myeloma, cervical, ovarian, and aggressive prostate cancers

Obesity



- Increased cytokines associated with chronic inflammation
- Insulin resistance and hyper-insulinemia leading to increased IGF-1 signaling → increase in multiple cancer types
- Increased circulating estrogens and androgens
 - Decreased SHBG production → more circulating free androgens
 - Insulin → stimulates adrenal androgen production
- Increased peripheral conversion of androgens to estrogen



Increased breast and endometrial cancer, possibly advanced prostate cancer

- increased GERD and Barrett's esophagus → esophageal adenocarcinoma
- NASH cirrhosis → HCC

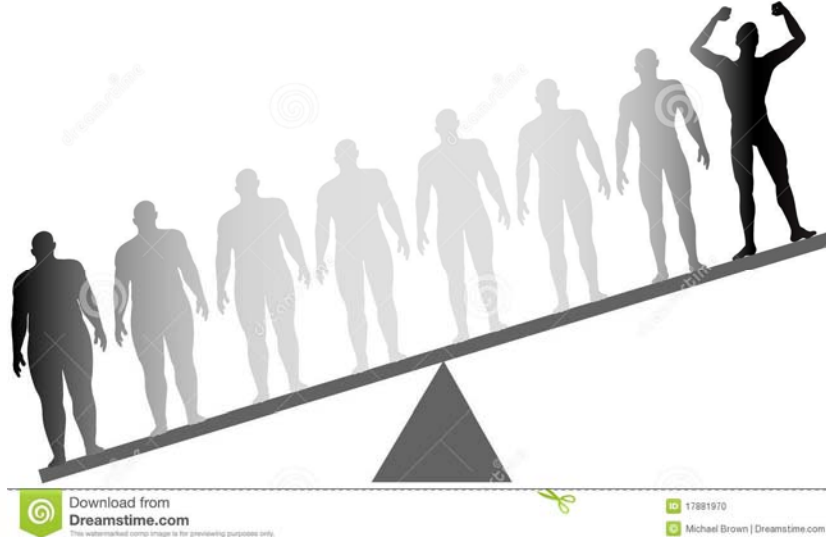
Calle and Kaaks. Nature Reviews Cancer 2004;4:579-591

Kaaks et al. Cancer Epidemiol Biomarkers and Prev 2002;11:1531

Obesity



These aberrations can be corrected with restoring a healthy body weight, reducing cancer risk nearly back to “lean” baseline



But lifestyle changes and weight loss are not easy...even in the face of compelling evidence!

Strong Evidence for Benefit



- High fiber diet
- Regular exercise
 - Protects against cancers of the colon, breast, and endometrium
 - Prevents excess weight gain and obesity
 - Therefore, indirectly contributes to reduced risk of obesity-related cancers

High Fiber Diet



Soluble Fiber

- Absorbs water
- Lowers cholesterol
- Slows digestion
- Increases satiety and decreases PO intake

Insoluble Fiber

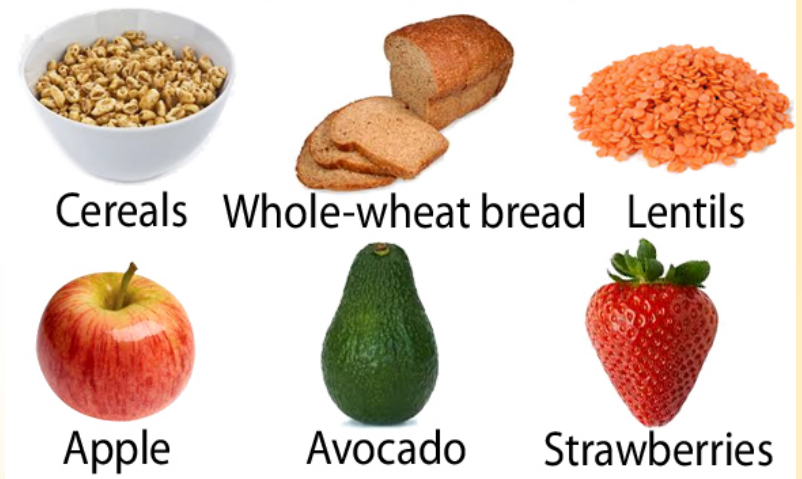
- Does not absorb water
- Promotes transit of stool
- Decreases PO intake

Soluble Fiber



©Nutrientsreview.com

Insoluble Fiber



©Nutrientsreview.com

High Fiber Diet



- Numerous prospective cohort studies have shown that diets high in both soluble and insoluble fibers reduce the risk of multiple cancers, particularly colon cancer
- No decrease in adenomas or colon cancer in randomized trials of fiber supplements
- The benefit may come from other things in fiber-rich foods and from the associated healthier body weight



Alberts et al. NEJM 2000;342:1156-1162
Bonithon-Kopp et al. Lancet 2000;356:1300-1306

Regular Exercise



- Multiple mechanisms of benefit for multiple cancer types
 - Maintaining healthy body weight and restoring proper balance of insulin, IGF-1, androgens, and other cytokines associated with chronic inflammation and obesity
- “Dose” dependent benefit; more exercise = more reduction in cancer risk
- Optimal level unknown
- Target at least 150 minutes of moderate intensity or 75 minutes of vigorous activity per week
- Being generally more active is also important, not just during scheduled workouts
 - Unknown optimal steps/day (10,000 often quoted, but may actually need to target 11k-12k)

Kush et al. CA Cancer J Clin
2012;62:30-67

Salted Foods



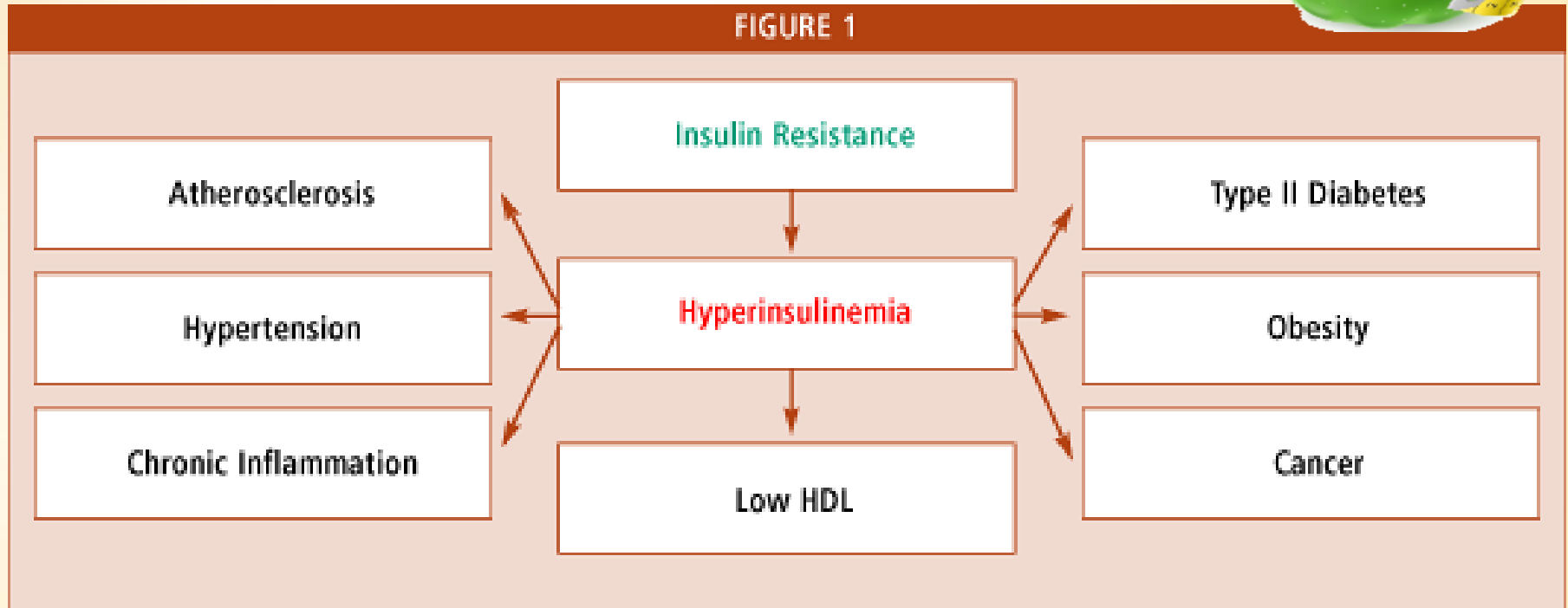
- Diets rich in salt cured or pickled meats and vegetables are associated with increased risk of nasopharyngeal, laryngeal, and gastric cancers
- Patterns observed particularly in certain Asian populations where consumption of pickled or salt-cured foods is high
- Mechanism not fully understood; salt cured foods may promote H pylori growth
- Salt for flavoring or processing in the U.S. has not been associated with increased cancer risk



High Sugar Diet



FIGURE 1



Picture courtesy of Life Extension magazine, September 2004

Fruits and Vegetables



- Indirectly reduce cancer risk by helping to maintain a healthy body weight and through increased natural fiber
- Seems to directly reduce risk of cancers of the lung, mouth, larynx, pharynx, esophagus, stomach, colon, and rectum
- Rich in antioxidants such as vitamin C, vitamin E, carotenoids and other phytochemicals, lycopene
 - This is not the same as taking antioxidant or vitamin supplements; not fully understood, but it is clear the benefit is greater in their natural forms

Recommendations

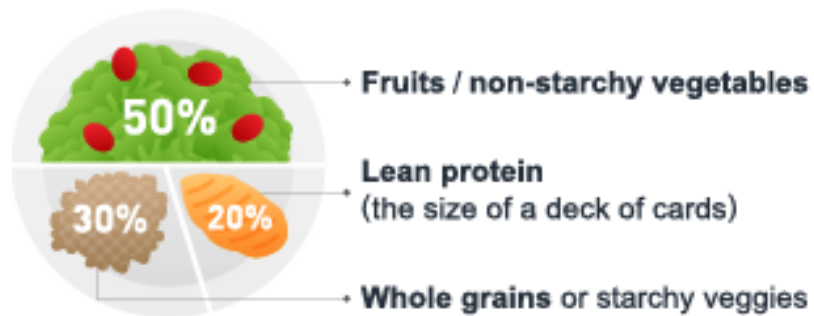


Do the things you already knew were healthy!

- Maintain a healthy body weight
 - BMI between 18.5 and 25 kg/m²
- Eat lots of fruits and veggies (2.5 cups/day or 400 g/day)
- Have a wide variety of fruits and veggies
- Be active

DECREASE CALORIES CONSUMED

PAY ATTENTION TO PORTION SIZES



Source: www.choosemyplate.gov

LESS JUNK... MORE FRUITS AND VEGGIES



- Added sugars
 - Cake, cookies, white bread
 - Fried foods
- Fruits
 - Vegetables
(at least 2½ cups daily)





INCREASE CALORIES BURNED

BE MORE PHYSICALLY ACTIVE



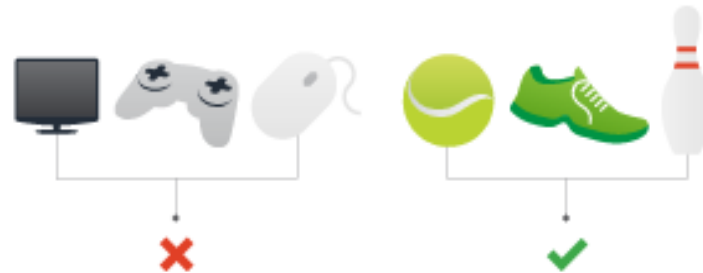
150 MINUTES
moderate intensity activity / week

or



75 MINUTES
vigorous intensity activity / week

LIMIT SEDENTARY BEHAVIOR



- On-screen entertainment
- Sitting around
- Lying down

- Playing sports
- Walking or running
- Other physical activities

Recommendations



- Limit red meat and processed meats
- Limit alcohol consumption
 - do not exceed 2U/d (1 U= 10 g of alcohol=1 beer/wine)
- Garlic is good! But who can eat that much...
- Coffee is good! But who can drink that much...
- Eat organic because you want to or for the environmental impact, but not because it's proven to have more nutrients or prevent cancer ... yet
- Likely no harm in curcumin/turmeric, but no established dose or proven benefit yet
- Be cautious with herbal supplements
 - There is no supplement recommended by National Cancer Institute or American Cancer Society as proven to prevent cancer!