

# Plant It On Your Plate:

## A close up look at popular plant-based diets for cancer prevention



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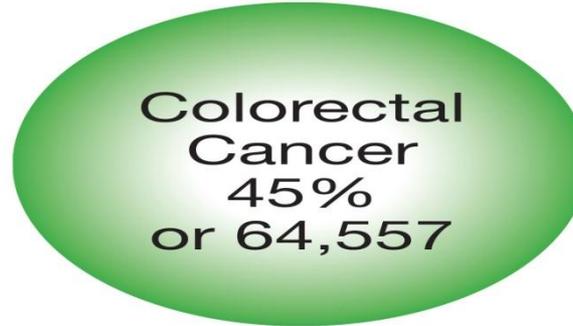
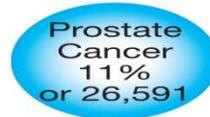
UNC  
CANCER CARE

# Americans can prevent **1/3** of the most common cancers\*

STAYING LEAN

EATING SMART

MOVING MORE





“What should I eat?”

“What’s the best diet?”

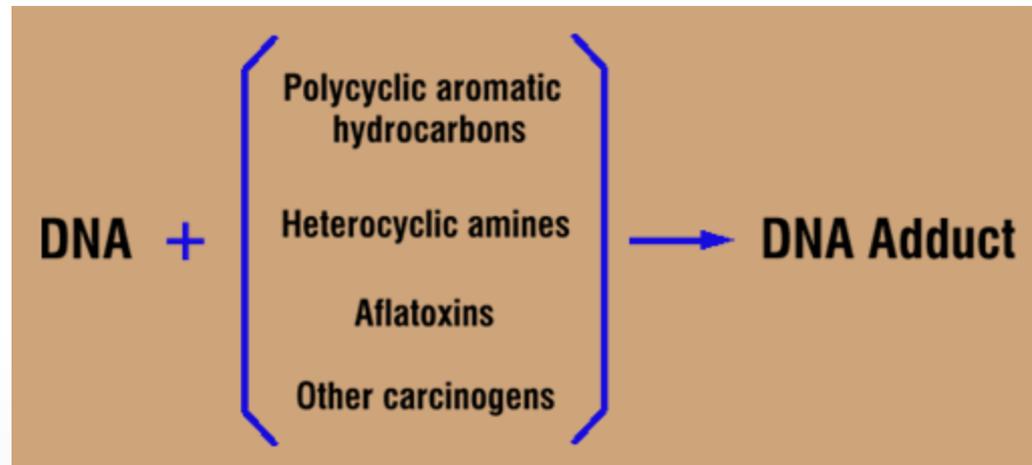
“What super food is most important?”

# Typical American Plate



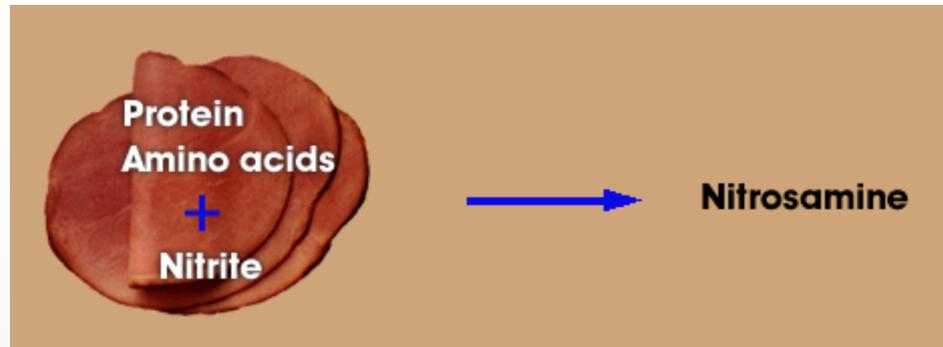
# Common Food Carcinogens

- *N*-nitroso compounds
- Polycyclic aromatic hydrocarbons (PAH)
- Heterocyclic amines (HA)



# N-nitroso Compounds

- Formed in foods containing nitrates or nitrites
- Formed in the body (stomach)
- Dietary nitrates and nitrites are probable human carcinogens because they are converted in the body to N-nitroso compounds (nitrosamines or nitrosamides)
- Associated with of DNA damage in colon cells



# Polycyclic Aromatic Hydrocarbons

- Produced in meat and fish that has been grilled (broiled) or barbecued (charbroiled) over a direct flame
- Also come from pollution caused by traffic and industry (thus can contaminate grains, fruits, veggies)
- Glucosinolates can attenuate the effects of PAHs



Aluminium foil reduces PAH exposure

# Heterocyclic Amines

- Formed when muscle meats (beef, pork, poultry, fish) are cooked
- High cooking temperatures cause amino acids and creatine to react to form these chemicals
- Temperature is the most important factor in HCA formation (frying, grilling, barbecuing are worse than oven roasting and baking)



# Vegetarian Diets: Cancer-Protective Elements

- Lower average BMI
- Higher dietary fiber
- Higher plant foods' phytochemicals, vitamins, minerals
- Less red and processed meat
- Less alcohol
- Lacto-ovo vegetarians
  - Higher dairy



# Mediterranean Diet

- Abundance of plant foods
- Fruit typically as dessert
- Olive oil primary source of fat
- Low to moderate amounts:
  - Dairy (primarily cheese and yogurt)
  - Fish
  - Poultry
- Low amounts:
  - Eggs 0-4 weekly
  - Red meat
- Alcohol
  - Wine in low to moderate amounts
- Use herbs and spices vs salt



# Mediterranean Diet Pyramid

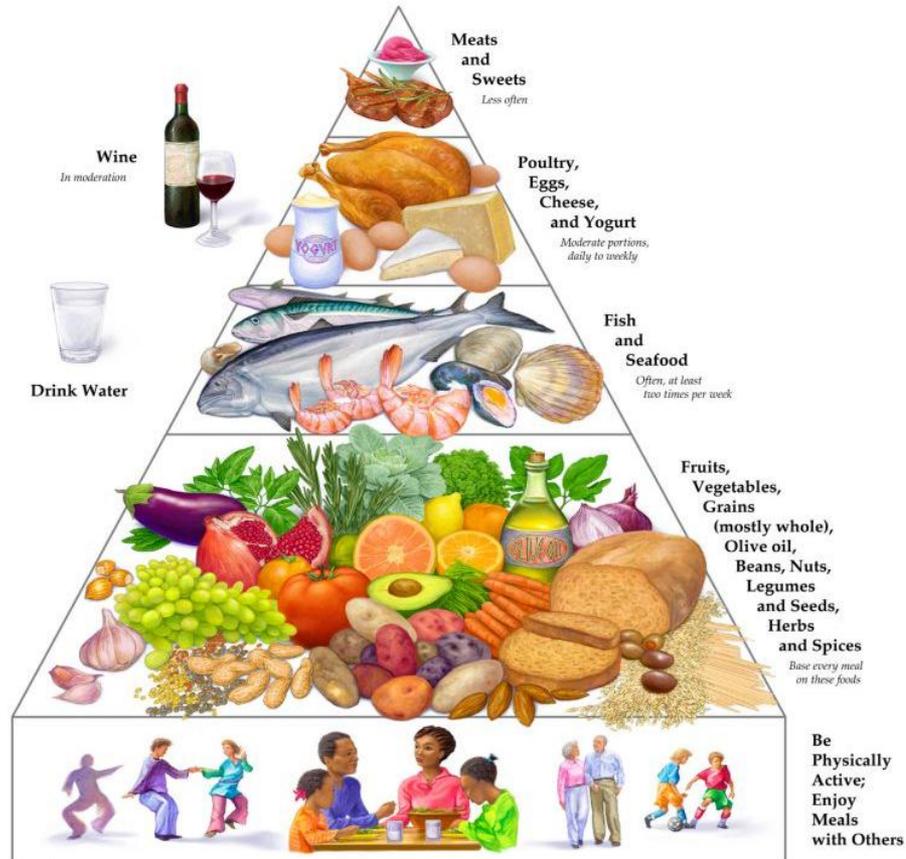


Illustration by George Middleton

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[www.oldwayspt.org](http://www.oldwayspt.org)

# Mediterranean Eating Pattern

- Not Low Fat (30-38%)
- Low Saturated Fat (<10%)
- Moderate Carbohydrate (39-47%)
- Moderate Protein (15-18%)
- At 2000 Kcal level:
- Fiber varies 20-30 gm
- Sodium varies; may not be <2500 mg
- High Potassium 4600 mg
- Variable Calcium 1000 mg or less
- High Magnesium 500 mg

# Mediterranean: Olive Oil

- Extra Virgin Olive Oil
  - ◆ MUFA ◆ Polyphenols ◆ Tocopherols ◆ Squalene
- Animal studies –  
Decrease mammary tumor growth  
Change cell signaling pathways, gene expression
- Limited Short human interventions –  
Decrease plasma oxidative stress & DNA oxidation  
Change signaling pathways & gene expression
- Observational - Southern Europe, high vs lower use  
? lower risk esophageal, colon, breast cancers

Machowetz, FASEB J 2007;  
Escrich, Pub Hlth Nutr 2011; Pelucchi, Curr Pharm Des. 2011



# Mediterranean Diet and Weight

- Mediterranean vs Low-fat Diets among Overweight
  - Not linked with wt gain; Allows wt loss
  - May decrease waist
- % calories from fat does not produce weight loss
- Reducing calorie density for weight management
  - Calorie density of overall diets
  - High vegetables makes low calorie density, even if >35% calories from fat

Romaguera, Am J Clin Nutr 2010; Beunza, Amer J Clin Nutr 2010;  
Esposito, Met Syn Rel Dis 2011; Nordmann, Am J Med 2011

# Very Low-Fat Vegan Diet

- After dx with early stage, non-aggressive prostate cancer

At 1 year:

- Serum PSA 4% decrease  
(control group increase 6%)
- Serum on LNCaP cells ~70% decrease growth  
(control group ~9% decrease)
- Change PSA & LNCaP Growth significant link to change in lifestyle index

Ornish, J Urol 2005



# Very Low-Fat Vegan Diet

- Very Low Fat (11%)
- High Carbohydrate\* (75%)
  - avoid simple sugars
  - high complex CHO
- High Fiber - average 59 g/day
- Moderate Protein (20%\*)
  - with daily soy protein isolate drink
- Additional Supplements:
  - vit E, Selenium, vit C, 3 gm Fish oil (900 mg n-3)



Dwell, J Am Diet Assoc 2008

# Very Low-Fat Vegan Diet

- 3-month study: (Ornish, PNAS 2008)
  - Change Gene Expression in healthy prostate cells
  - 48 up-regulated, 453 down-regulated
- 5-year study: (Ornish, Lancet Oncol 2013)
  - Telomere length increase vs decrease in control group
- Telomere lengthening linked to lifestyle adherence
- Increased telomerase activity not the whole answer

# The DASH Diet

- **D**ietary **A**pproaches to **S**top **H**ypertension
- Research led by NHLBI
- Two levels: 2300 mg sodium, 1500 mg sodium
- Typical Western diet: 3000-4000 mg sodium/day
- Results seen in only 2 weeks



# DASH Eating Pattern

- Low Fat (27%)
- Low Saturated Fat (6%)
- High Carbohydrate (55%)
- Moderate Protein (18%)
- Sodium: 2300 mg unless otherwise specified
- At 2000 Kcal level:
  - High Fiber 30 gm
  - High Potassium 4700 mg
  - High Calcium 1250 mg
  - High Magnesium 500 mg

# The DASH Diet

- At 1600-2600 Calories Daily
- High Vegetables & Fruit 7-12 svgs
- High Grains\* 6-11 svgs
  - Recent versions:
    - Whole Grains: >1/2 grains or >4-5 svgs/day
- Dairy (low-fat or fat-free) 2-3 svgs
- Fish, Poultry, Lean Meat up to 3-6 oz
- Nuts, Seeds, Legumes 4-7 svgs/week
- Low added fat 2-3 tsp oil
- Limited Sweets (< 5 small/wk except at high kcal)

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# DASH and Cancer Risk

- Weight management: low calorie density
- May decrease oxidative stress?
- May decrease inflammation?

8-wk crossover trial in T2Diabetes:

Decrease CRP: DASH diet 26.9% vs  
Control diet 5.1%

- May increase insulin sensitivity??

\*Even after adjust for BMI, Wt loss, Kcal intake, Activity

Azadbakht, J Nutrition 2011; Shirani, Nutrition 2013

# Traditional Japanese Diet



# Japanese Diet & Cancer

- Age-standardized international data:
  - Stomach cancer high
  - Breast & Prostate cancers low
  - Low BMI & Adult weight gain minimal
- Observational studies in present-day Japan
  - Prudent pattern: Veg, Fruit, Seafood, Soy
- High vs low: 21% less colorectal cancer
  - Healthy pattern: Veg, Fruit, Fish, Soy, Yogurt
- High vs low: 13-17% lower CRP ( $p < .001$ )

GLOBOCAN 2008, IARC; Kurotani, Br J Nutr 2010; Nanri, Amer J Clin Nutr 2008

# Japanese Eating Pattern

- Very Low Fat (6-8%)
- Very Low Saturated fat (2%)
- High Carbohydrate (80-85%)
- Moderately Low Protein (9-15%)

At 2000 Kcal level:

- Moderate Fiber varies 20-36 gm
- Sodium may be high (esp. outside Okinawa)
  - Soy sauce, Pickled vegetables, Salted fish
- Potassium can be high 2600-5800 mg
- Low Calcium 300-600 mg

# Asian Diet Pyramid



# Eating Asian Style

- Fish and soy
  - re-thinking uses, learning how to prepare
- Reducing calorie density with broth soups and abundant vegetables
- Hara hachi bu

Eat only  
till **80%**  
full



# Traditional Nordic Diet



# New Nordic Diet

- More fruit and vegetables
- More whole-grain produce
- More food from the seas and lakes
- Higher-quality meat, and less of it
- More Food from wild landscapes
- Organic produce when possible
- Avoid food additives
- More meals based on seasonal produce
- More home-cooked food

# Healthy Nordic Food Index

- Fish
- Cabbage and other commonly eaten cruciferous vegetables (broccoli, cauliflower, kale and Brussels sprouts)
- Root vegetables (mainly carrots)
- Whole grain rye bread
- Oatmeal
- Apples and pears



# Nordic Diet and Health

- Drop in systolic blood pressure
- Improved insulin sensitivity
- Drop in LDL (“bad”) cholesterol
- Weight loss
- Anti-inflammatory
- Lower mortality
- Reduced risk of colorectal cancer

Adamsson, J Intern Med 2011; Kryo, Br J Nutr, 2012  
Olson, Nutr 2011; Uusitupa, J Intern Med 2013

# Nutrition Recommendations

**The World Cancer Research Fund/AICR  
says:**

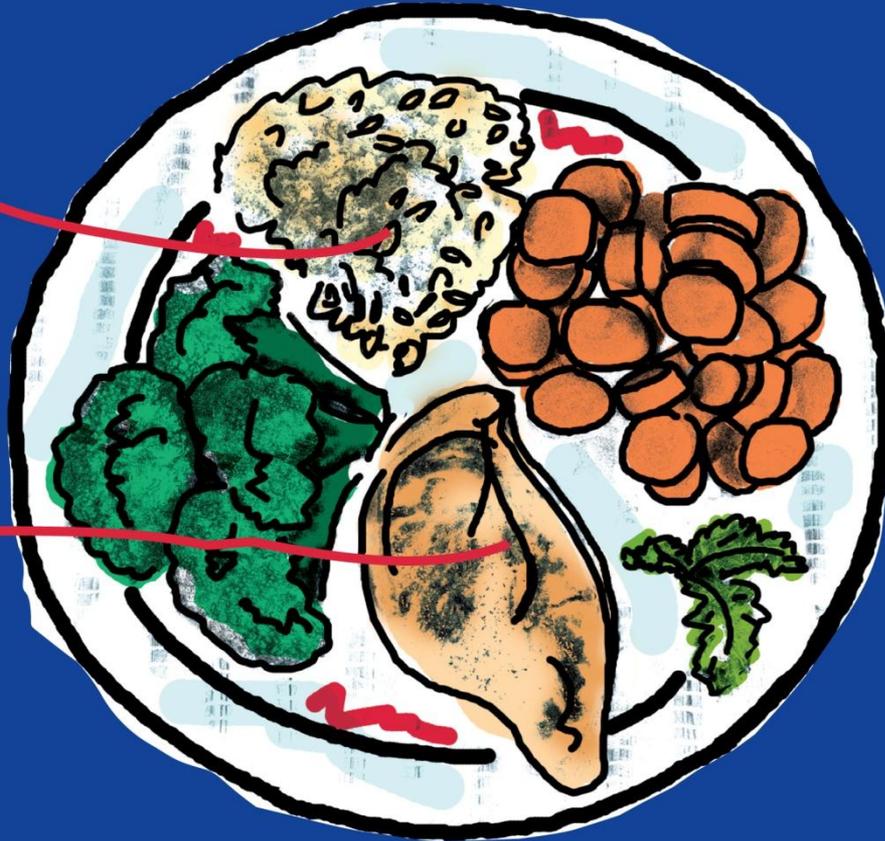
1. Be as lean as possible without becoming underweight
2. Be physically active for at least 30 minutes every day
3. Limit intake of energy-dense foods and avoid sugary drinks
4. Eat a variety of vegetables, fruits, whole grains, and legumes/beans
5. Limit intake of red meat and avoid processed meat
6. Limit intake of salty foods and foods processed with salt
7. Limit alcoholic drinks
8. Don't use supplements to prevent cancer



# The New American Plate

$\frac{2}{3}$  (or more)  
vegetables,  
fruits,  
whole grains  
and beans

$\frac{1}{3}$  (or less)  
animal  
protein



Ready, Set, Go!!!

**Eat Smart**

**Weight Less**

**Move More**

