# NUTRITION AND PROSTATE CANCER PREVENTION



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Treating the man and the cancer.



 Populations that consume large amounts of fruits and vegetables have overall <u>lower cancer incidence rates</u>.

### Some Terminology:

- Chemoprevention: use of specific agents (diet) to block or delay cancer development, to inhibit cancer <u>metastasis (spread)</u> and to reduce deaths from prostate cancer.
- DNA and mutations: Genetic material in all our cells that can be damaged or changed (mutated)—often to harm us.

#### Differences between normal and cancer cells

- Normal cells can:
  - Reproduce themselves exactly
  - Stop reproducing at the right time
  - Stick together in the right place
  - Self destruct if their DNA is damaged
  - Become specialized or 'mature'
  - Die off when they are supposed to
- How cancer cells are different:
  - \*\*Cancer cells don't stop reproducing
  - Cancer cells don't receive signals from other cells
  - Cancer cells don't stick together-they metastasize or spread to other parts of the body
  - Cancer cells don't specialize, but stay immature
  - \*\*Don't die (immortal)



# We can study prostate cancer cells in the lab

#### <u>Or</u> we can study cancer in animals

- Nude Mouse Tumor Models (mice have no hair)
  - Inject tumor cells under the skin
  - Feed mice protective agents
- Genetically-modified mice/rats that develop prostate cancer in a similar way as do humans (TRAMP mice)



What can we include in our diets that will help prevent cancer and/or reduce prostate cancer deaths??



Many of the factors shown to have anti-cancer effects are relatively simple and numerous. They work to protect our cells in multiple ways.





 Curcumin, active component of the Indian curry spice turmeric, may help slow down tumor growth in castration-resistant prostate <u>cancer patients</u>, a study from researchers at Jefferson's Kimmel Cancer Center suggests.

\*\*Spices\*\*

- Curcumin can also significantly slow the growth of prostate cancer cells in the lab.
- Curcumin induces the abnormal cells to die before they become cancerous, while leaving the healthy ones alone.
- Curcumin is useful for cancer prevention and therapy.

# Ginger

• Used as spice and in several beverages

- Inhibited prostate cancer cell growth in the lab
- Nude mouse models—daily feeding of ginger inhibited growth of implanted prostate cancer tumors
- No toxic effects on normal mouse tissues (gut and bone marrow)
- Capsaicin

## •Found in red chilli

• Anti-cancer effects in animal models, suppresses cancer of the prostate





# \*\*Fruits and Vegetables\*\*

- Resveratrol--associated with red wines
- ~25,000 Isoprenoids (Isops)
- Fisetin
- Lycopenes
- Sulforaphane



#### **Resveratrol** = anti-oxidant & polyphenol

• Resveratrol: Plant chemical most commonly found in blueberries, cocoa, cranberries, grapes (purple grape juice and red wine), peanuts and walnuts

Different red wines also have differing amounts of resveratrol—CA pinot noirs have high levels !



### Resveratrol

- Affects multiple cellular factors
- Numerous lab and clinical studies show:
  - Protects our cells from DNA mutations
  - Inhibits tumor cells from dividing and reproducing



- Reduces growth and spread of prostate cancer cells in the lab
- Prostate tumors can develop resistance to anti-cancer drugs. Resveratrol treatment enables tumor cells to respond to drugs.
  - Also protects against heart disease

## Isoprenoids--examples



Limonene (in lemon oil) can also be extracted from old tires.

 $\gamma$ -Tocotrienol is in barley extracts. Barley beers also are strongly linked to cancer prevention.



**Perillyl alcohol:** found in peppermint, celery seeds, cherries

- Isoprenoids stop prostate tumor cell growth and cause tumor cell death in lab studies
  - Normal human prostate cells do not die
- In nude mouse tumor models, doses of isoprenoids needed to <u>inhibit</u> implanted tumors are low
  - Have little or no impact on growth of the mice
- Isoprenoids also <u>inhibit prostate cancer</u> <u>metastasis</u> (spread) in lab studies

Fisetin: (flavonoid) Fruits such as strawberries, apple, persimmon, kiwi fruit and vegetables including onion and cucumber



- In the lab, <u>inhibits</u> various factors that help new blood vessels to form in tumors to bring in nutrients
- Stops tumor cells from dividing
- Decreases factors involved in metastasis/ spread in prostate cancer cells (lab)
- Inhibits the growth of PSA-producing prostate tumors in nude mice & reduces serum PSA (prostate specific antigen) levels
  - Could delay progression of prostate cancer

# Sulforaphane: in broccoli, cabbage

- Reduces prostate cancer risk at multiple stages of carcinogenesis
- Is an effective chemoprotective agent for prostate cancer in lab cells and in mouse models by selectively slowing tumor growth and causing the cells to die.

• No side effects observed

 Broccoli sprouts fed to TRAMP mice significantly retarded prostate tumor growth.



# Lycopenes: rich in tomatoes, watermelons, fruits (carotenoids)

- Harvard School of Public Health tested 47,000 males and found that eating 2 servings of tomatoes a week was associated with 22-34% reduced risk of prostate cancer (study reported in 2001).
- Those eating more than 10 servings a week had 45% less risk of developing prostate cancer. Harvard concluded lycopene can be used as an anticarcinogen.
- Side effects of lycopene are limited.



Cooked tomatoes have the highest lycopene content !!

# Green tea and EGCG—epicat

Protects our cells from
DNA damage— "anti-oxidant"



- Epidemiological studies suggest consumption of green tea reduces risk of prostate cancer
- Has <u>both</u> cancer chemopreventive and therapeutic effects
- Lab studies: EGCG decreases factors involved in prostate cancer metastasis/spread
- TRAMP mice given ~6 cups of green tea/day: reduced tumor growth and had greater survival
  - Early but not late stage cancer was inhibited

# Green tea (EGCG)

- Nude mouse studies—green tea inhibited growth of implanted prostate tumors & reduced serum PSA
  - Also reduced a key factor that allows metastasis/spread
- Combination of EGCG and ibuprofen (Advil): Huge decrease of prostate cancer cell growth in lab studies
  - Also combination of dietary soy and green tea is beneficial
- Many patient clinical trials suggest green tea protects against prostate cancer
  - Phase II trial: Daily doses (4 to 6 wk) of Polyphenon E (high level of green tea extracts) were given until time of radical prostatectomy to patients with + biopsies.
    - Reduction in patients' serum levels of PSA (modest) and also several factors associated with metastatic disease

## SELECT Clinical Trial: Selenium & Vitamin E (National Cancer Institute)

- Oaily selenium and vitamin in E supplements, taken either alone or together for a median of 5.5 years, <u>did not</u> <u>prevent prostate cancer.</u>
- The data also showed two concerning trends: a small increase in the number of prostate cancer cases in men taking only vitamin E, and a small increase in the number of cases of diabetes in men taking only selenium.
  - Selenium is a trace mineral found in soil, water, and some foods.
    - Corn, wheat, soybean, Brazil nuts (most highly concentrated source of selenium), brewer's yeast, wheat germ, butter, garlic, grains, sunflower seeds, walnuts, raisins, shellfish, fresh-water and salt-water fish.

# The Mediterranean diet is <u>excellent</u>:

- Eating primarily plant-based foods, such as fruits and vegetables, whole grains, legumes and nuts
- Replacing butter with healthy fats such as <u>olive oil</u> and canola oil
- Using herbs and spices instead of salt to flavor foods
- Limiting red meat to no more than a few times a month
- Eating fish and poultry at least twice a week
- Drinking red wine in moderation (optional)
- The diet also recognizes the importance of enjoying meals with family and friends.

# What about cooked or canned vegetables???

- Carrots—raw is best, but boiling for less than 15 min was OK
- Peas/lentils—raw is best, but steaming was better than boiling them (more antioxidants were retained)
- Artichokes—cooking (either steaming or boiling) enhanced protective antioxidants
- Frozen/Boil-in-bag green beans were more nutritious than boiling them in water



- Microwaving broccoli also preserved protective compounds
- Excessive cooking times are generally associated with reduced protective compounds
- Tomatoes are better cooked than raw
- Deep frying vegetables—generally not beneficial
- Even canned vegetables retain anticancer properties, but <u>less</u> than raw



# Other health conditions that are improved by plant compounds

#### • Diabetes

- Quercetin (onions, kale, berries) <u>reduces</u> retinal degeneration in rats prone to diabetes — may prevent or reduce blindness associated with diabetes
- Tart cherry extracts improve glucose tolerance & insulin sensitivity in obese rats

#### Obesity

- Isoprenoids prevent development of fat cells which in turn prevents obesity in mice
- Heart disease
  - Plant compounds reduce serum cholesterol and decrease arterial stiffness

#### Increase in Weight May Stimulate Prostate Cancer

A study of 526 prostate cancer patients found that those who were **obese** (body mass index of 30 or more) when diagnosed were more likely to experience "biochemical failure" than patients who weren't obese.

**Biochemical failure** : rising level of prostate specific antigen (PSA) in the blood, which may indicate that cancer is advancing.

After surgery, a patient's PSA should go back to being undetectable, but if it begins to rise, that is an indicator of progression.

The study suggests that diet and exercise may be effective in reducing the risk of prostate cancer progression.

# Exercise is great !



"Early detection & prevention will likely reduce cancer deaths by 70%"--B. Vogelstein, Johns Hopkins University







# Parting thoughts:

Everything in moderation

- Eating right is like wearing a car seat belt.
- Exercise and weight loss are very protective.
  - Adipose/fat tissue releases a hormone (leptin) that can indirectly make cells immortal—not good for us
- Lots of scientific evidence that plant-derived compounds act synergistically—their effects are greater if consumed together.
  - Thus eating combinations of fruit/veggies with spices and tea is beneficial !

# Words to the wise !!

- Healthy eating is <u>not</u> a substitute for visiting your doctor on a regular basis for a PSA test and prostate exam.
- Equally important if prostate cancer is found, seek treatment by an experienced physician /cancer specialist.
  - Recent clinical research is revealing more effective therapeutic regimens, especially for African-American men.
- Talk with the doctor about various treatment options: active surveillance, surgery, radiation, chemotherapy, cryotherapy, hormone treatment and any combination of therapies that may be appropriate.

Seating well is important for everyone, but it is essential if you have cancer, both during and after treatment.

- Good nutrition can boost your immune system and reduce the risk of infection during treatment.
- Getting the nutrients you need will also help your body heal after the stress of therapy.
- Eating a balanced diet and being physically active will provide a solid foundation for a long, healthy life as a cancer survivor !

# Last words to the wise: Mom was right !

EAT YOUR VEGGIES !!

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