Can Cancer Be Prevented?

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Cancer is a common Disease

1 of 3 North Americans will develop some type of cancer in their lifetime
Can Cancer Be Prevented?

**YES-** In some individual patients

Ex. would be Familial Adenomatous Polyposis Syndrome or FAP.

**Yes-** From the Public Health Perspective

EX. Smoking cause 80% Lung Cancer, Diet related to 30% all cancer

**NO-** No one can be given a 100% guarantee
Overview-
Can Cancer be Prevented?

- Risk factors for cancer that you can control
- Risk Factors for cancer you can **not** control
- Genetics of Cancer
- Breast Cancer
Lifetime Risk for Specific Cancers for Males

- Prostate 1/6
- Colon 1/17
- Lung 1/13
- Melanoma 1/52
- Bladder/Urinary 1/28
- Leukemia 1/67
- Lymphoma 1/46
Lifetime risk of Cancer - Females

- Breast 1/8
- Colon 1/18
- Lung 1/17
- Melanoma 1/77
- Urinary/bladder 1/88
- Leukemia 1/93
- Lymphoma 1/55
- Cervix 1/135
- Uterus 1/38
Risk Factors for Cancer
“What you can control”

- Smoking
- Alcohol
- Diet
- Viruses
- Your occupation
- Hormones
What you can control

- Smoking
  Single most preventable cause of death
- Alcohol
- Diet
  35% of all Cancers
What you can control: Viruses

15-20% of all Cancers are due to Viruses
World wide, 10% of Cancers in developed countries
Ex. HPV type 16 and 18- cervical cancer
Helicobacter- stomach cancer
HTLV- leukemia and non Hodgkin's lymphoma
HHV-8 Kaposi Sarcoma
What you can control: Hormones

- Replacement Hormones - Increased risk of breast cancer
- Birth control pills - decreased risk for ovarian cancer, Increased risk for breast cancer
- DES - daughters increased risk for vaginal cancer, sons testicular cancer
What you Can Control:

Occupational Risks for Cancer

High Risk Occupations account for approximately 4% of all cancer

Ex.

Chimney sweeps - cancer of the scrotum 1775
Radiation workers   Leukemia, thyroid
Leather workers     Nasal Cavity
Farmers             Leukemia
Rubber Industry     Bladder
Risk Factors for Cancer “What you can not Control”

- **Age**
- **The Environment**
  1. Pollution- air and water
  2. Solar radiation
  3. Pesticides, insecticides
- **Radon**
- **Ethnic or cultural background**
- **Ionizing radiation**
- **Drugs for the treatment of cancer**
- **Viruses**
- **GENETICS**
Things you can **not** control

**AGE**

½ of all cases of cancer are reported in individuals over the age of 65

Ex. Breast Cancer

<table>
<thead>
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<th>Age</th>
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<tr>
<td>30</td>
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<td>80</td>
<td>1/10</td>
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</table>
Things you can **not** Control: The Environment

- Air pollution - possible increased risk of lung cancer
- Radon exposure possible increased risk of lung cancer
- Solar radiation - skin cancer
- Pesticides, insecticides - variety of cancer
Things you can **not** control:

Where you live

- **Highest rates of Cancer**
  - **Males:** Hungary, Czechoslovakia, Luxembourg
  - **Females:** Denmark, Scotland, Hungary

- **Lowest Rates of Cancer**
  - **Males:** Thailand and Mexico
  - **Females:** Thailand
Things you can **not** control:
Drugs for the treatment of Cancer

- Chemotherapy drugs- increased rate of leukemia
- Immunosuppressive Drugs- increased rate of non Hodgkin's-lymphoma, sarcoma, melanoma
- Anti-estrogen Drugs increased rate of uterine cancer
Genes & Family
What Science Can Tell You About Your History And Your Health
Genetics of Cancer

- Most Cancer is a result of environmental factors and genetic factors.
- 10% of all cancers are related to a hereditary predisposition syndrome—"cancer syndrome"
- Hereditary versus Familial
When to Suspect Hereditary Cancer Syndrome

- Cancer in 2 or more close relatives (on same side of family)
- Early age at diagnosis
- Multiple primary tumors
- Bilateral or multiple rare cancers
- Constellation of tumors consistent with specific cancer syndrome (eg, breast and ovary)
- Affects multiple generations
Dirk brings his family tree to class.
Cancer Genes - The risk for Cancer

- BRCA1 and BRCA2
  50-85% Breast Ca and 20-40% ovarian cancer

- HNPCC
  80% colon Cancer, 40-60% ovarian cancer

- P53 90%
- FAP 100%
- PTEN 50%
How Much of Cancer Is Hereditary?

- Breast Cancer:
  - Sporadic: 15%
  - Family clusters: 20%
  - Hereditary: 5–10%

- Ovarian Cancer:
  - Sporadic: 5%
  - Hereditary: 5–10%
Genes are the Units of Inheritance

Cell → Nucleus → Chromosomes → Gene → DNA Molecule → Protein

Adapted from Understanding Gene Testing, National Institutes of Health, 1996.
Normal Male Karyotype
The Development of Hereditary Cancer

**Nonhereditary**

- 2 normal genes
- 1 mutated gene
- 1 normal gene
- Loss of normal gene

**Hereditary**

- Mother or Father
- 1 mutated gene
- 1 normal gene
- Loss of normal gene

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The DNA Double Helix

Sugar phosphate backbone

Bases

Adenine (A)

Cytosine (C)

Thymine (T)

Guanine (G)

Base pair
Disease-Associated Mutations

A mutation is a change in the normal base pair sequence

Commonly used to define DNA sequence changes that alter protein function
Benefits to Knowing if you have a Genetic Predisposition to Cancer

- Proactive Health Care- Knowledge is Power
- High risk surveillance
- Prophylactic or elective surgery
- Presymptomatic genetic testing
American Cancer Society Guidelines for the Early Detection of Cancer

- **Cancer-related Checkup**
- For people aged 20 or older having periodic health exams, a cancer-related checkup should include health counseling, and depending on a person's age and gender, might include exams for cancers of the thyroid, oral cavity, skin, lymph nodes, testes, and ovaries, as well as for some non-malignant (non-cancerous) diseases.
Breast Cancer

Yearly mammograms are recommended starting at age 40 and continuing for as long as a woman is in good health.

Clinical breast exam (CBE) should be part of a periodic health exam, about every 3 years for women in their 20s and 30s and every year for women 40 and over.

Women should know how their breasts normally feel and report any breast change promptly to their health care providers. Breast self-exam (BSE) is an option for women starting in their 20s.

Women at increased risk (for example, family history, genetic tendency, past breast cancer) should talk with their doctors about the benefits and limitations of starting mammography screening earlier, having additional tests (for example, breast ultrasound or MRI), or having more frequent exams.
Breast Cancer Risk Factors

- Genetics- your family history
- Age- are you over 55
- Hormones
- Alcohol
- High breast density
- Early menses or periods (before 12)
- Never having children
- First child after the age of 30
- High Fat Diet
- Weight (estrogen is in the fat tissue)
- High bone density
Things that Reduce Rate of Breast Cancer

- Exercise, Exercise, Exercise
- Having “lots” of children
- Late onset of your periods
- Children before 30
- Breast Feeding
- Tamoxifen- Chemoprevention
- Removing the ovaries
Thank you