Chapter 13

Cancer

The Inside Matters: Other Factors

Preventable cancers

More than 40 percent of cancer cases can be prevented, the American Cancer Society finds in a new report. Here is a list of things people can change and their share of cancer cases:

- Smoking: 19.0%
- Obesity: 7.8%
- Alcohol: 5.6%
- UV radiation: 4.7%
- Physical inactivity: 2.8%
- Poor diet: 1.9%

Source: American Cancer Society

Cancer

- 565,000 deaths in the U.S. each year (1,500 per day)
- Leading cause of disease-related death among people under age 65
- Second most common cause of death
- Most cancers could be prevented by simple lifestyle changes
- Tobacco is responsible for about 30% of all cancer deaths
- Poor diet and exercise habits account for another 30% of cancer deaths
Definition of Cancer

- Abnormal and uncontrollable multiplication of cells or tissue that can lead to death.
- Every case of cancer begins as a change in a cell that allows it to grow and divide when it should not.
- Tumor: a mass of tissue that serves no purpose.
  - Benign tumor: mass of cells enclosed in a membrane that prevents their penetration of other tissues.
  - Malignant tumor: (Neoplasm) cancerous, can invade surrounding tissues.

Types of Malignant Tumors

- _________: most common - arises from the epithelial tissue that cover body surfaces. Linings, tubes, cavities and secretion glands
- _________: cancers of connective and fibrous tissues. Bone, muscle, cartilage and membranes covering muscle or fat
- _________: cancers of the lymph nodes
- _________: cancers of the blood-forming cells in bone marrow
  - Abnormal production of immature white blood cells; rapidly growing cells displace red blood cell precursors
  - Immature WBCs cannot fight off infections
  - Risk factors are unknown
Seven substances added to 14th Report on Carcinogens
*Five viruses, a chemical, and a metallic element listed in new HHS report (11/3/2016)*

<table>
<thead>
<tr>
<th>Substance</th>
<th>Listing Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human immunodeficiency virus type 1 (HIV-1)</td>
<td>Known to be a human carcinogen</td>
<td>Virus</td>
</tr>
<tr>
<td>Human T-cell lymphotropic virus type 1 (HTLV-1)</td>
<td>Known to be a human carcinogen</td>
<td>Virus</td>
</tr>
<tr>
<td>Epstein-Barr virus (EBV)</td>
<td>Known to be a human carcinogen</td>
<td>Virus</td>
</tr>
<tr>
<td>Kaposi sarcoma-associated herpesvirus (KSHV)</td>
<td>Known to be a human carcinogen</td>
<td>Virus</td>
</tr>
<tr>
<td>Merkel cell polyomavirus (MCV)</td>
<td>Known to be a human carcinogen</td>
<td>Virus</td>
</tr>
<tr>
<td>Trichloroethylene (TCE)</td>
<td>Known to be a human carcinogen</td>
<td>Industrial solvent</td>
</tr>
<tr>
<td>Cobalt and cobalt compounds that release cobalt ions in vivo</td>
<td>Reasonably anticipated to be a human</td>
<td>A metal and its compounds</td>
</tr>
<tr>
<td></td>
<td>carcinogen</td>
<td></td>
</tr>
</tbody>
</table>

HIV-1 is Carcinogenic

- Human immunodeficiency virus type 1 (HIV-1)
- A virus spread through infected semen, vaginal fluids, or blood
- Cancer Prevention
  - Practice safe sex (use condoms and reduce sexual partners)
  - Don't share needles or drug injection equipment
  - Get tested
  - If infected, make choices that keep you healthy and protect others:
    - Take prescribed treatments
    - Quit smoking
- Sufficient evidence of cancer:
  - Cervical cancer
  - Conjunctival eye cancer
  - Hodgkin lymphoma
  - Invasive anal cancer
  - Kaposi sarcoma, a blood vessel cancer
  - Non-Hodgkin lymphoma
  - Non-melanoma skin cancer
  - Penile cancer
  - Vaginal/vulvar cancer
Cancer: New Cases & Deaths

Tumor sizes. The size of a tumor may be compared to the size of a pea (1 cm), peanut (2 cm), grape (3 cm), walnut (4 cm), lime (5 cm), egg (6 cm), peach (7 cm), or grapefruit (10 cm)
Staging Cancer

<table>
<thead>
<tr>
<th>Stage</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 0</td>
<td>Carcinoma in situ (literally means &quot;cancer in place&quot;). The cancer cells have not yet invaded into surrounding tissues, therefore the tumor can’t spread and the cure rate is 100%</td>
</tr>
<tr>
<td>Stage I</td>
<td>The primary tumor is small but invasive into surrounding tissues and has not spread</td>
</tr>
<tr>
<td>Stage II</td>
<td>The primary tumor is larger, but there is still no clinical evidence of spread</td>
</tr>
<tr>
<td>Stage III</td>
<td>The tumor has spread to lymph glands (also called lymph nodes) in the region of the body</td>
</tr>
<tr>
<td>Stage IV</td>
<td>The cancer has spread beyond the region where it originated to a distant tissue or organ</td>
</tr>
</tbody>
</table>

The progressive spread of an intestinal cancer and its invasion into surrounding tissues.

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Three stages of colon cancer as the cancer cells divide and the tumor grows. In stage I, the tumor is small and has not penetrated the layer of cells lining the colon. In stage II, the tumor has penetrated the muscle wall of the colon. In stage III, the tumor has spread to nearby lymph nodes. Source: MedlinePlus, a service of the U.S. National Library of Medicine and the National Institutes of Health.

Metastasis

The spreading of cancer cells from one part of the body to another. When cancer cells enter the lymphatic or blood system they can form secondary sites elsewhere.

FIVE-YEAR SURVIVAL AMONG WOMEN AGES 15–49 INITIALLY DIAGNOSED WITH DISTANT-STAGE BREAST CANCER

1992–1994: 18%
2005–2012: 36%

Source: Mariela Arti et al., Cancer Epidemiology Biomarkers Prev. 2017;26(4).
Types Of Treatment

The types of treatment that you receive will depend on the type of cancer you have and how advanced it is. The main types of cancer treatment include:

![Pie charts showing treatment types]

HISTORY OF CANCER TREATMENT MODALITIES

<table>
<thead>
<tr>
<th>Approach</th>
<th>Surgery</th>
<th>Radiation</th>
<th>Chemotherapy</th>
<th>Targeted Drugs</th>
<th>Immuno-Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Since</td>
<td>1800s</td>
<td>early 1900s</td>
<td>late 1940s</td>
<td>2000s</td>
<td>2010s</td>
</tr>
<tr>
<td>Limitations</td>
<td>Many inaccessible tumors, limited effectiveness if tumor has already begun to spread</td>
<td>Limited effectiveness if tumor has already begun to spread; potentially dangerous for tumors near vital organs</td>
<td>High toxicity and often does not destroy the whole tumor, leading to high rates of recurrence</td>
<td>Limited tumor types, highly effective but short durability driving high rates of recurrence</td>
<td>Applicable to all tumors at all stages of disease, including metastatic tumors; responses are highly durable; potential for lower toxicity, possibly synergistic with other treatments</td>
</tr>
</tbody>
</table>

[Links to related content]

https://www.biolegend.com/NewsLegend/090915blog

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CAR T-cell therapy? It involves changing a patient’s immune cells in the lab so they’ll attack cancer cells.


Cancer treatment side effects.

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http://www.beautydespitecancer.co.uk/assets/images/stock_images/JY_FB_sm_01[1].jpg
Cancer screening

Cancer Screening Guide

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Age</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>21–29 years</td>
<td>Ask your provider about your risk.</td>
</tr>
<tr>
<td></td>
<td>30–49 years</td>
<td>Breast cancer screening every 2 years.</td>
</tr>
<tr>
<td></td>
<td>50–65 years</td>
<td>Breast cancer screening every 1–2 years.</td>
</tr>
<tr>
<td></td>
<td>66+ years</td>
<td>Breast cancer screening every 1–2 years.</td>
</tr>
<tr>
<td>Colorectal</td>
<td>50–75 years</td>
<td>Colorectal cancer screening recommended.</td>
</tr>
<tr>
<td></td>
<td>75+ years</td>
<td>No colorectal cancer screening recommended.</td>
</tr>
<tr>
<td>Lung</td>
<td>50+ years</td>
<td>Lung cancer screening not recommended.</td>
</tr>
<tr>
<td>Skin</td>
<td></td>
<td>Baseline skin exam recommended every 2 years.</td>
</tr>
</tbody>
</table>

*Note: This is a summary of the current U.S. Preventive Services Task Force (USPSTF) recommendations for cancer screening. The USPSTF is an independent group of volunteer, nonfederal experts with experience in primary care and prevention. The recommendations apply to people with no signs or symptoms of these diseases.

**For more information, contact the Vermont Department of Health Foodborne Disease Control Program.**

Professor Betty C. Jung

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AICR Recommendations for Cancer Prevention

<table>
<thead>
<tr>
<th>A Blueprint to Beat Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Not smoking</strong></td>
</tr>
<tr>
<td><strong>Limit alcohol intake</strong></td>
</tr>
<tr>
<td><strong>Limit processed meat</strong></td>
</tr>
<tr>
<td><strong>Limit red meat and processed meat</strong></td>
</tr>
<tr>
<td><strong>Limit sugary drinks</strong></td>
</tr>
<tr>
<td><strong>Limit calorie intake</strong></td>
</tr>
<tr>
<td><strong>Be physically active</strong></td>
</tr>
<tr>
<td><strong>Eat a variety of fruits and vegetables</strong></td>
</tr>
<tr>
<td><strong>Limit sugary drinks</strong></td>
</tr>
</tbody>
</table>

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Dietary Factors

Food choices affect your cancer risk by exposing you to potential dangerous compounds and depriving you of protective ones.

LIMIT/AVOID
- Dietary fats
- Processed & red meat
- Omega-6 polyunsaturated fats
- Alcohol
- Fried foods

Include:
- Fiber
- Fruits and vegetables
- ______________ versus ______________
- ______________ – protect against chronic diseases

(found to lower glucose production and improve control in T2D patients)

Strategies For Reducing Your Risk of Cancer

Do More
- Eat a varied, plant-based diet that is high in fiber-rich foods such as legumes and whole grains.
- Eat 7–13 servings of fruits and vegetables every day, favoring foods from the following categories:
  - Cruciferous vegetables
  - Citrus fruits Berries
  - Dark green leafy vegetables
  - Dark yellow, orange, or red fruits and vegetables
- Be physically active.
- Maintain a healthy weight.
- Practice safer sex (to avoid HPV infection).
- Protect your skin from the sun with appropriate clothing and sunscreen.
- Obtain recommended screening tests and discuss with your physician any family history of cancer.

Do Less
- Don’t use tobacco in any form:
  - Cigarettes
  - Spit tobacco
  - Cigars and pipes
  - Bidis and clove cigarettes
- Avoid exposure to environmental tobacco smoke.
- Limit consumption of fatty meats and other sources of saturated fat.
- Avoid excessive alcohol consumption.
- Limit consumption of salt.
- Don’t eat charred foods, and limit consumption of cured and smoked meats and meat and fish grilled in a direct flame.
- Avoid occupational exposure to carcinogens.
- Limit exposure to UV radiation from sunlight.
- Avoid tanning lamps or beds.