For articles on the TCM approach, see Teachings, Traditional Chinese Medicine

Second most common cause of death (after heart disease and stroke)
67% of deaths are in people overt age 65.
Most common (in USA):
  - Prostate – 24%
  - Breast – 13%
  - Lung – 13%
  - Colon-rectum – 9%
  - Uterus – 2.5%
Definition: transformation (carcinogenesis) of normal cells, causing them to enlarge and divide more rapidly.
Metastasis to other sites, via blood or lymph circulation, local extension, or surgical intrusion.

Types:
  - Adenocarcinomas – from epithelial and glandular tissue
  - Carcinomas – originate in epithelial cells
  - Erythroleukemia – from erythrocytes (RBC)
  - Gliomas – from glial cells (nerve cells in brain, spinal cord, pineal or pituitary glands, retina)
  - Leukemia – from lymphocytes
  - Lymphoma – from lymphatic tissue
  - Melanomas – from pigmented cells
  - Myelomas – from plasma cells (B lymphocytes, bone marrow)
  - Sarcomas – from connective, muscle or bone tissue (soft tissue)
Causes:

1) Starts in genes.

Molecular changes in DNA in cells after invasion by carcinogenic factors. Causes mutations and gradual changes in cellular genes.

There are 100 cancer genes that have been identified.

Two types of normal genes which mutate:

- Oncogenes – activate cell division
- Tumor suppressor genes – halt cell division

Two types of defects. Usually cancer results from combination of both types of defects:

- Genetic mutation – inherited defect
  - Neurofibroma
  - Rectal and colon polyps
  - Nephroblastoma (Wilms tumor)

- Acquired mutation – exposure to a carcinogen
  - Radiation most dangerous
  - UV radiation
  - Fibrous materials – asbestos, fiberglass

- Asbestos > lung
- Vinyl Chloride > liver
- Hydrocarbons, benzopyrene in air > lung
- Tobacco > lung, pharynx, pancreas, kidney, bladder, colon
- Nitrates, charcoal > SI and LI
- Estrogen > breast, vagina
2) Other causes

a) Microbes
   1) Viruses may trigger carcinogenesis.
      (China) At least 30 different kinds of tumors have shown signs of virus.
      May be coexisting, may be root cause (unknown).
      Leukemia, breast cancer, nasopharyngeal cancer, lymphoma, liver, cervix

   2) Fungus may trigger carcinogenesis. Contain mycotoxins that may be carcinogenic.

   3) Parasites may cause cancer.
      Schistosomiasis can cause liver cancer.

b) Endocrine factors can aggravate cancers of:
   Ovary, breast, pituitary, thyroid, testicle, prostate

c) Nutritional factors
   1) B12 deficiency > leukemia, stomach cancer
   2) Vitamin and mineral supplementation inhibits cancer growth:
      Vitamin C, iodine, copper, zinc, magnesium, molybdenum, selenium
   3) Low fat, high fiber inhibits cancer. High fat, low fiber >
      Cancers of colon, breast.

d) Psychological factors
   Optimistic people respond better to treatment
   Depression, anxiety, phobia diminishes success
   One study estimates that 75% of people with cancer had a history of anxiety or depression.
Carcinogens

At least 1000 identified carcinogens. These may account for 80% of all cancers.

Polycyclic aromatic hydrocarbons with 3,4 benzopyrene rings
Coal tar, nicotine, creosote
Alkylating agents (drugs, chemicals)
Aromatic amino compounds and dyes
Nitrosamine
Color additives (FDC yellow)
Heavy metals: zinc, cadmium, arsenic, nickel, and mercury
Phytotoxins
They cause carcinogenic metabolites, or alter enzymes that activate aromatic hydrocarbons

Immune response

Immunosurveillance
Body develops cancer cells all of the time, but immune system considers them foreign, and neutralizes them as they form.

Cell-mediated response:
T lymphocytes destroy antigens and creates killer cells against cancer cells
Humoral immune response – circulating antibodies.
In cancer, the tumor cell is able to release a factor that blocks the antibody.

Cancer arises when immune function decreases. These include:

1) Aging cells – when copying genetic material they begin to err, causing mutations. An aging immune system does not recognize the mutations as foreign, allowing proliferation into a malignant tumor.
2) Cytotoxic drugs, radiation or steroid drugs – decreases antibody production, destroys circulating lymphocytes.
3) Extreme stress – depresses immune system
4) Chronic viral infection – depresses immune system
5) AIDS – weakens cell-mediated immunity.
6) Cancer itself – immunosuppressive, lowered immune reactivity (anergy)
Diagnosis

X-ray, endoscopy, isotopes scan, CT scan, MRI.
Biopsy is best: by curettage, fluid aspiration (lung), needle aspiration (breast), dermal punch (skin or mouth), endoscopy (rectal polyp), surgical excision (organs, lymph nodes).
Carcinoembryonic antigen (CEA) used for colon, stomach, pancreas, lung, breast, sarcomas, leukemias, lymphomas.
These are useful for following up chemotherapy.
Other: Alpha-fetoprotein, beta human chorionic gonadotropin (testicular cancer), and prostate specific antigen.

Staging

TNM System is international:
Tumor size
Nodal involvement
Metastatic progress
Reliable comparison of treatments and survival rates among large population groups.

Grading
a) Classifies a lesion according to corresponding normal cells
b) Compares tumor tissue too normal tissue
c) Estimates tumor's growth rate
For example: a low-grade tumor has cells more closely resembling normal cells, whereas a high-grade tumor has poorly differentiated cells.
Therapies.
Used alone, or in combination depending on type, stage, localization, etc.

Surgery
Depends on cancer, but generally, 85% cure if at early stage

Radiation
Most effective for:
Lymphosarcoma, Hodgkin’s, ovary, multiple myeloma, nasopharynx

Chemotherapy
200 chemo-agents, of which 80 can be used clinically.
Necessary in metastasis
All harm normal cells
Only fairly effective
Best response (30 – 90 % cure rate):
Testicle, acute lymphocytic leukemia, lymphoma, Hodgkin’s
Can prolong life in 40 – 70% of:
Prostate, chronic lymphocytic leukemia, neuroblastoma, breast, multiple myeloma

Immunotherapy

Hormonal therapy