



Fifth lecture

Radiochemistry of Irradiated Targets

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Fourth Stage

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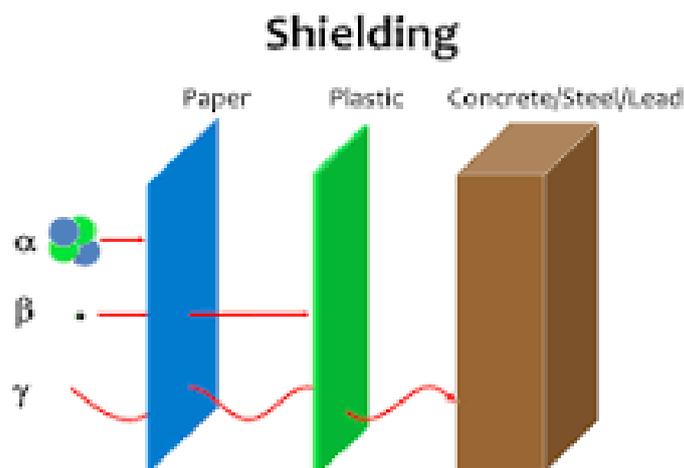
2025- 2026

Radiochemistry

What is the radiochemistry

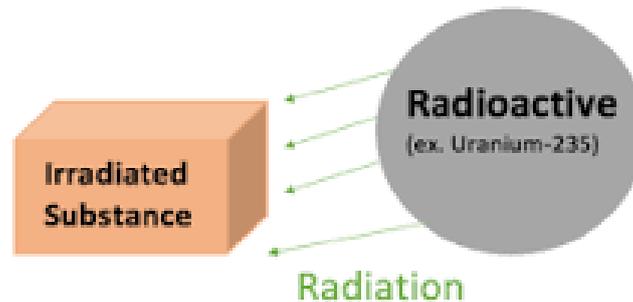
Radiochemistry is the chemistry of radioactive materials; it involves study of chemical transformations of radioactive substances, dealing with actinides and transuranium elements, development of physicochemical principles of handling radioactive waste from nuclear power engineering, solving radioecology problems.

Radiation is energy, in the form of particles or electromagnetic rays, released from radioactive atoms. The three most common types of radiation are alpha particles, beta particles, and gamma rays



What the different between radioactive and irradiate ?

Essentially, the main difference between the two is how radiation is connected to the object being discussed. A radioactive object is the source of some radiation, while an irradiated object is some object that has had some radiation interact with it.



What is radiochemical technique's?

Radiochemical methods are primarily concerned with the study of radioactivity in naturally occurring radioactive materials and in other materials in which radionuclides and their compounds are produced by irradiation.

What is radiochemical uses ?

Used in cancer treatment, food irradiation, gauges, and radiography

In medicin

Radioactive isotopes have revolutionized modern medicine, especially in the treatment of severe or life-threatening diseases. Radioisotopes treat medical diseases and health conditions through radiotherapy. Examples of their application include treatment for cancer, hyperthyroidism, blood disorders, and skin diseases.

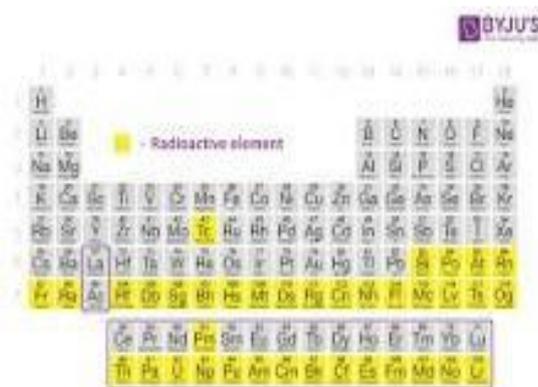
What is long live radionuclide ?

Long-lived fission products (LLFPs) are radioactive materials with a long half-life (more than 200,000 years) produced by nuclear fission of uranium and plutonium.

The common 4 radioactive elements are Uranium, Radium, Polonium, Thorium etc.

How does radiation therapy work? Radiation therapy uses special high-energy X-rays or particles to damage a cancer cell's DNA. When a cancer cell's DNA is damaged, it can't divide successfully and it dies. Radiation therapy damages both healthy cells and cancer cells in the treatment area. Still, radiation affects cancer cells more than normal cells. Cancer cells grow and divide faster than healthy cells and also are less organized.

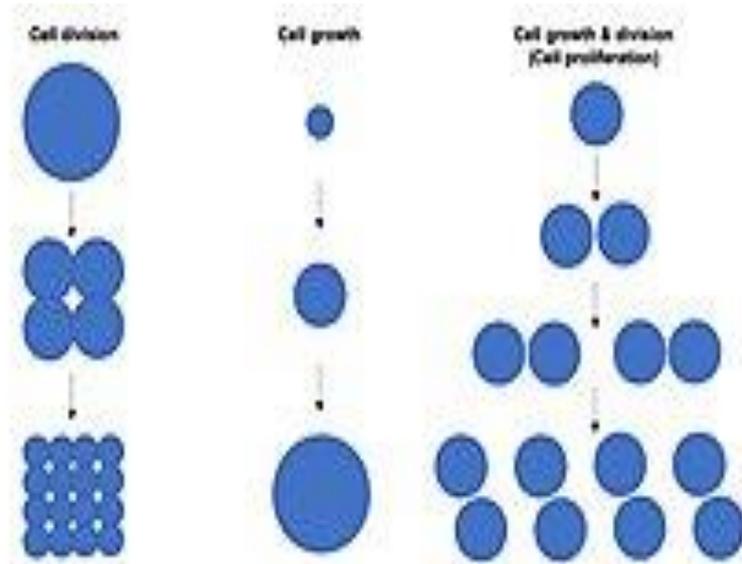
Because of this, it's harder for cancer cells to repair the damage done by radiation. So cancer cells are more easily destroyed by radiation, while healthy cells are better able to repair themselves and survive the treatment. The treatment area may include the breast area, the lymph nodes, or another part of the body if the cancer has spread. Radiation treatments are carefully planned to make sure you receive the greatest benefits and the fewest side effects possible.



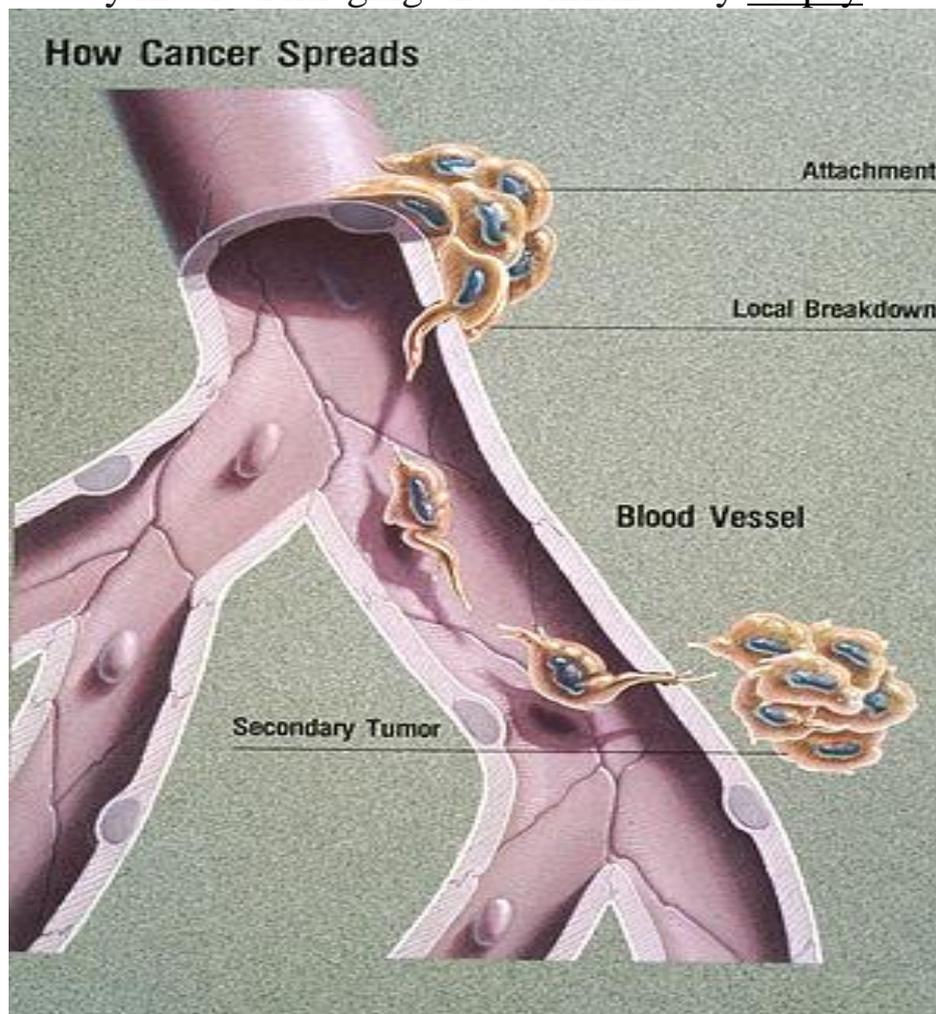
The image shows a periodic table of elements with a legend indicating that yellow highlights represent radioactive elements. The highlighted elements include: Technetium (Tc), Promethium (Pm), and all elements from Polonium (Po) to Oganesson (Og) in the bottom two rows, as well as several elements in the middle rows including Francium (Fr), Radium (Ra), Actinium (Ac), Thorium (Th), Protactinium (Pa), Uranium (U), Neptunium (Np), Plutonium (Pu), Americium (Am), Curium (Cm), Berkelium (Bk), Californium (Cf), Einsteinium (Es), Fermium (Fm), Mendelevium (Md), and Nobelium (No).

How Food Irradiation Works. Currently, food irradiators use one of three kinds of radiation: gamma rays (from cobalt-60 sources), electron beams, or x-rays. All three methods work the same way.

Cancer is a group of diseases involving abnormal cell growth with the potential to invade or spread to other parts of the body. These contrast with benign tumors.



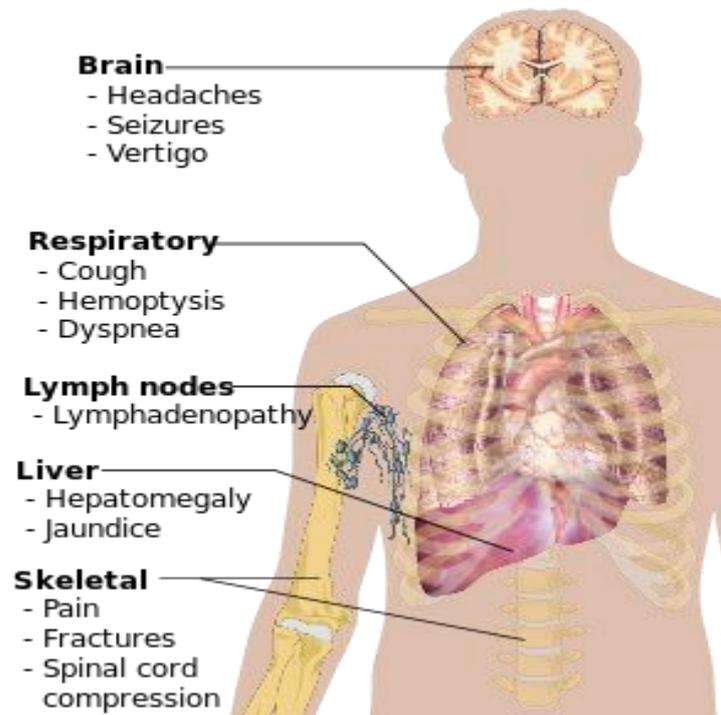
Cancer can be detected by certain signs and symptoms or screening tests. It is then typically further investigated by medical imaging and confirmed by biopsy.



Possible signs and symptoms include a lump, abnormal bleeding, prolonged cough, unexplained weight loss, and a

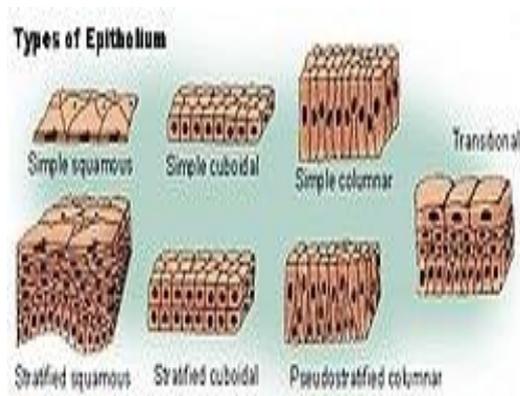
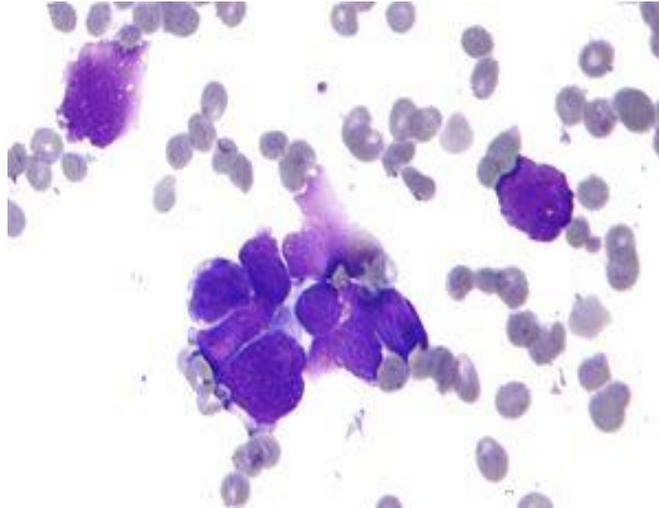
change in bowel movements. While these symptoms may indicate cancer, they can also have other causes

Common sites and symptoms of Cancer metastasis

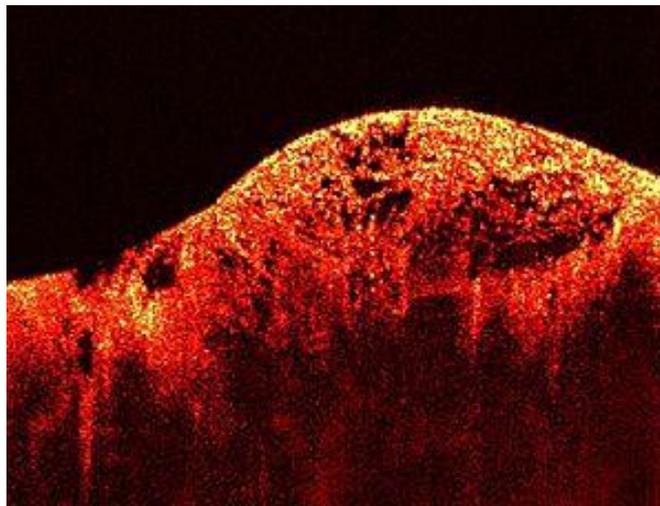


Cancers are often described by the body part that they originated in. However, some body parts contain multiple types of tissue, so for greater precision, cancers are additionally classified by the type of cell that the tumor cells originated from. These types include:

1. Carcinoma: Cancers derived from epithelial cells. This group includes many of the most common cancers that occur in older adults. Nearly all cancers developing in the breast, prostate, lung, pancreas, and colon are carcinomas.



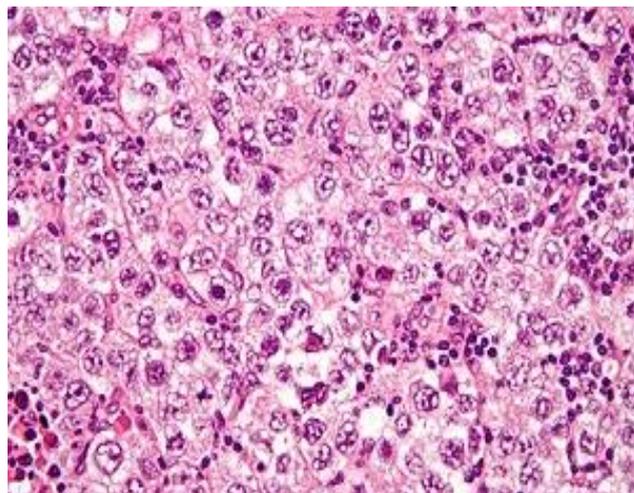
2. Sarcoma: Cancers arising from connective tissue (i.e. bone, cartilage, fat, nerve), each of which develop from cells originating in mesenchymal cells outside of the bone marrow.



3. Lymphoma and leukemia: These two classes of cancer arise from immature cells that originate in the bone marrow, and are intended to fully differentiate and mature into normal components of the immune system and the blood, respectively. Acute lymphoblastic leukemia is the most common type of cancer in children, accounting for ~30% of cases. However, far more adults than children develop lymphoma and leukemia.

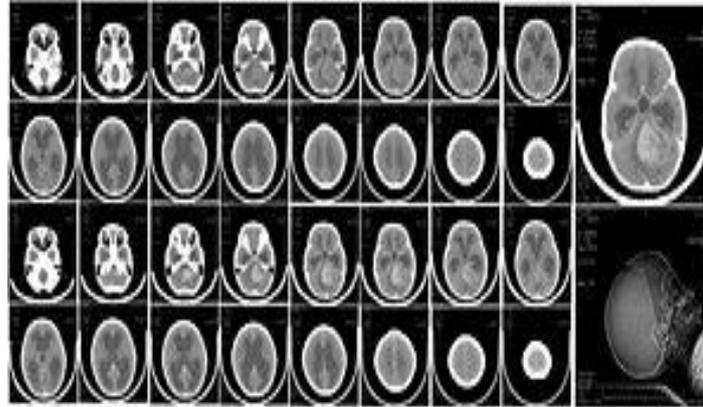


4. Germ cell tumor: Cancers derived from pluripotent cells, most often presenting in the testicle or the ovary (seminoma and dysgerminoma, respectively).



5. Blastoma: Cancers derived from immature "precursor" cells or embryonic tissue. Blastomas are *generally* more common in children

(e.g. [neuroblastoma](#), [retinoblastoma](#), [nephroblastoma](#), [hepatoblastoma](#), [medulloblastoma](#), etc.) than in older adults.



Causes The Cancer

1. Chemicals
2. Diet and exercise
3. Infection
4. Radiation
5. Heredity
6. Physical agents
7. Hormones
8. Autoimmune diseases

Management

1. Chemotherapy
2. Radiation
3. Surgery
4. Palliative care
5. Immunotherapy

6.Laser therapy

7.Alternative medicine

اسئلة عامة

Q₁-Cancers arising from connective tissue its called..... (i.e. bone, cartilage, fat, nerve).

- A. Lymphoma and leukemia B. Blastoma C. Germ cell tumor
D. Sarcoma E. Carcinoma

Q₂-Cancer arise from immature cells is.....that originate in the bone marrow.

- A. Blastoma B. Lymphoma and leukemia C. Germ cell tumor
D. Carcinoma E. Sarcoma

Q₃-The.....cancers derived from epithelial cells the breast, prostate, lung, pancreas, and colon

- A. Blastoma B. Lymphoma and leukemia C. Germ cell tumor
D. Carcinoma E. Sarcoma

Q₄-Thecancers derived from immature "precursor" cells or embryonic tissue.

- A. Germ cell tumor B. Blastoma C. Lymphoma and leukemia
D. Sarcoma E. Carcinoma

Q₅-Cancers derived from pluripotent cells in the testicle or the ovary its called.....

- A. Lymphoma and leukemia B. Blastoma C. Germ cell tumor
D. Sarcoma E. Carcinoma