PHARM.D • YEAR 1

Pharmaceutical Inorganic Chemistry

CHAPTER 21

Radiopharmaceuticals

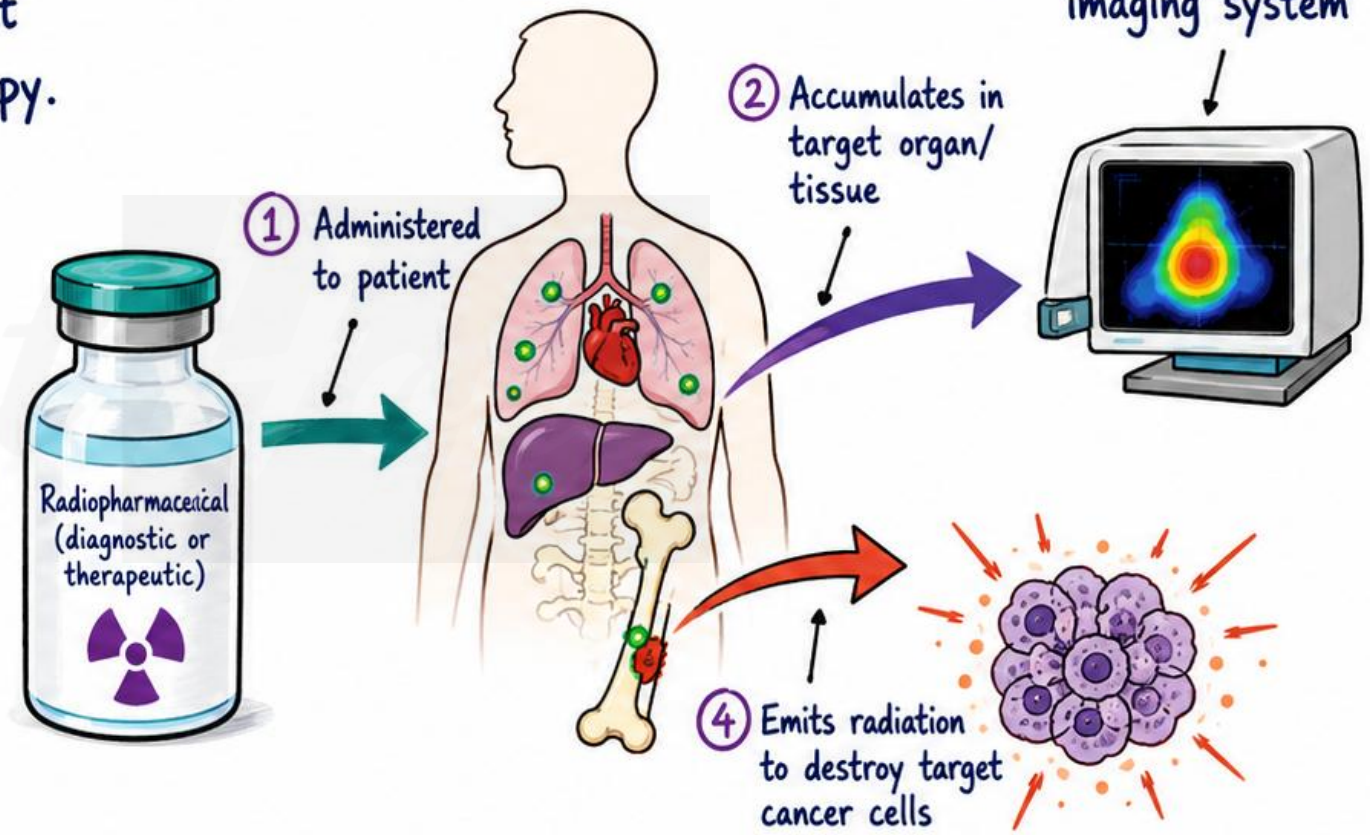
PPT CHAPTER COVER



DOCTOR OF PHARMACY

Radiopharmaceuticals: Definition and Uses

- Radiopharmaceuticals are specialized medicinal products containing radioisotopes (unstable atoms that emit radiation) and are used for diagnosis and therapy.
- **Uses:**
  1. **Diagnostic Imaging:** Used as imaging agents to visualize the function of specific organs or tissues.
  2. **Targeted Radiotherapy:** Deliver targeted radiotherapy, selectively targeting cancer cells while sparing healthy tissues.
  3. **Example — A. Dichloride:** An alpha-emitting radiopharmaceutical used to treat bone metastases in castration-resistant prostate cancer.



➔ **Takeaway:** Radiopharmaceuticals enable non-invasive imaging of organ function and targeted radiotherapy, improving the precision of diagnosis and cancer treatment.

Diagnostic Radiopharmaceuticals

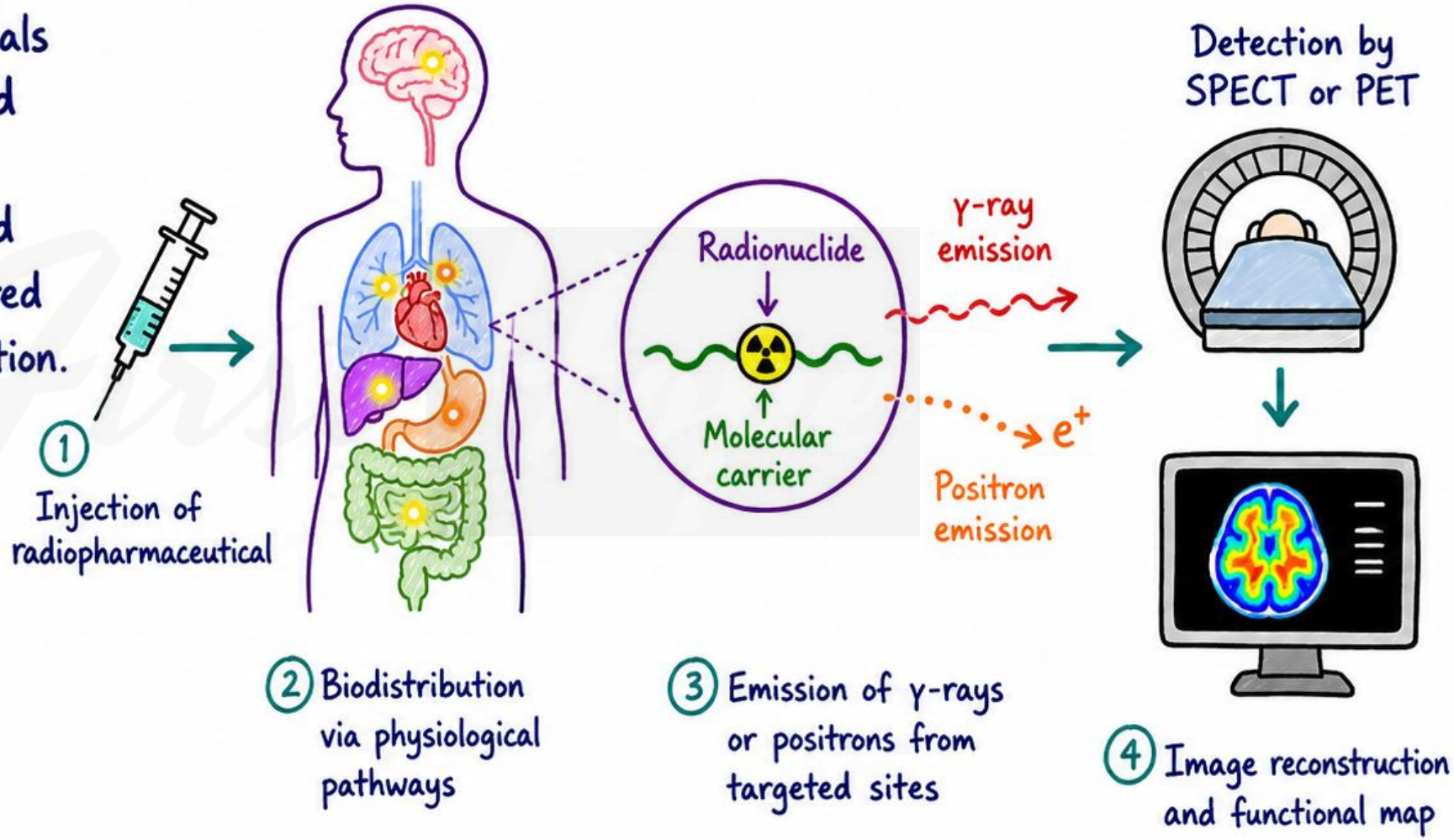
Diagnostic radiopharmaceuticals contain a radionuclide linked to a molecule that follows a physiological pathway; emitted γ-rays or positrons are detected by SPECT or PET to map function.

Key point:

- Use the lowest activity (ALARA) that provides adequate image quality.

Common examples:

- Technetium-99m agents (γ emitter)
- Fluorine-18 FDG (positron emitter)



Therapeutic Radiopharmaceuticals

What are they?

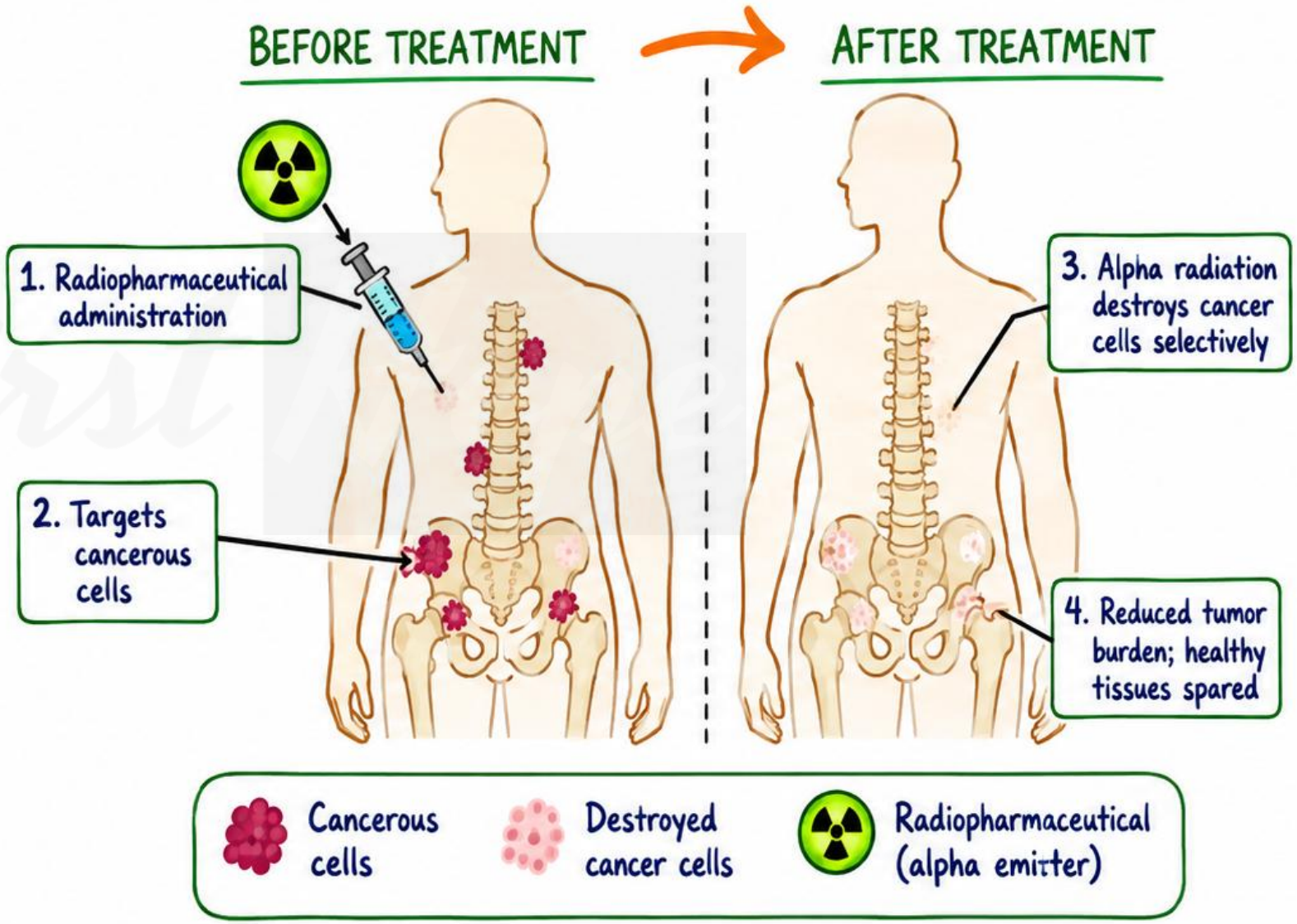
- Specialized medicinal products containing radioisotopes used in nuclear medicine for therapeutic applications.

Therapeutic use

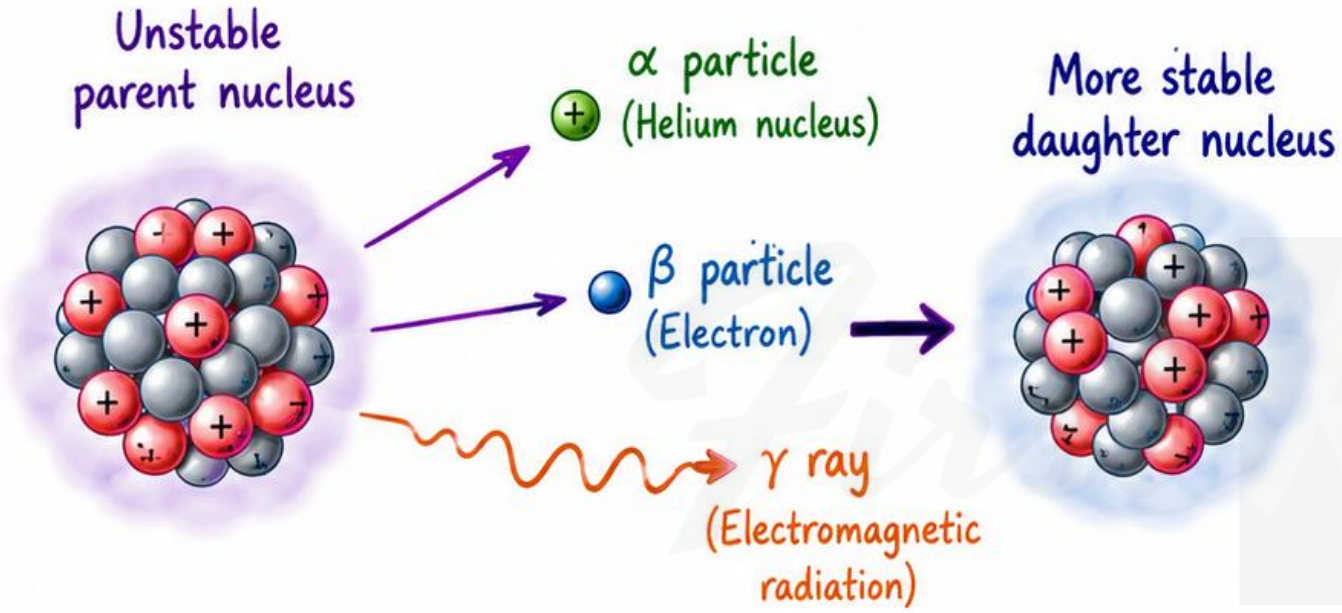
- Deliver targeted radiotherapy to cancerous cells, minimizing damage to healthy tissues.

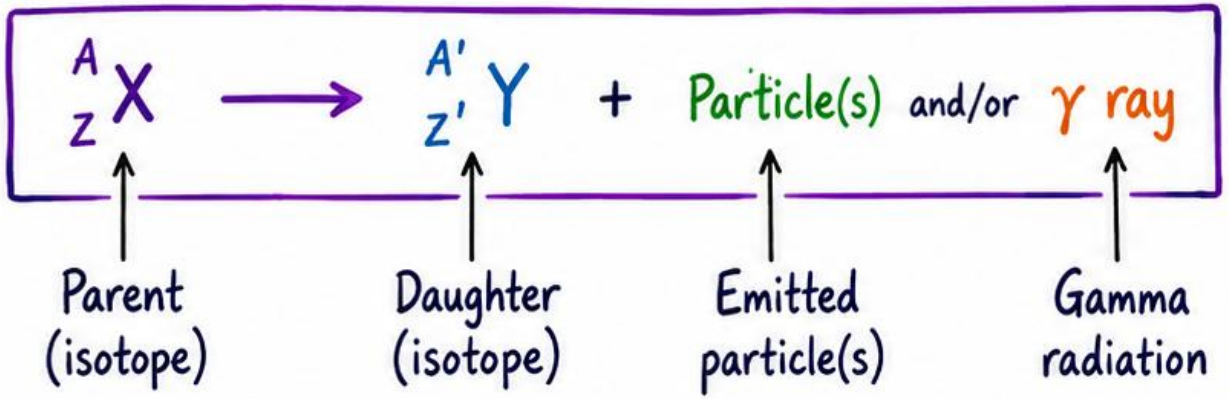
Example:

★ Radium-223 dichloride (Ra-223 dichloride): Alpha-emitting radiopharmaceutical used to treat bone metastases in castration-resistant prostate cancer.



Radioactive Decay





1. Radioactive decay is the natural process in which an unstable atomic nucleus loses energy by emitting particles (α, β) or electromagnetic waves (γ), forming a more stable nucleus.

2. The activity of a radioactive source is measured in becquerels (Bq), where 1 Bq = 1 nuclear decay per second.

3. Radioactive decay underpins nuclear power generation, dating techniques, industrial uses, and is the basis for measurement of radioactivity in radiopharmaceuticals.

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