The problem of radiation safety in modern nuclear medicine

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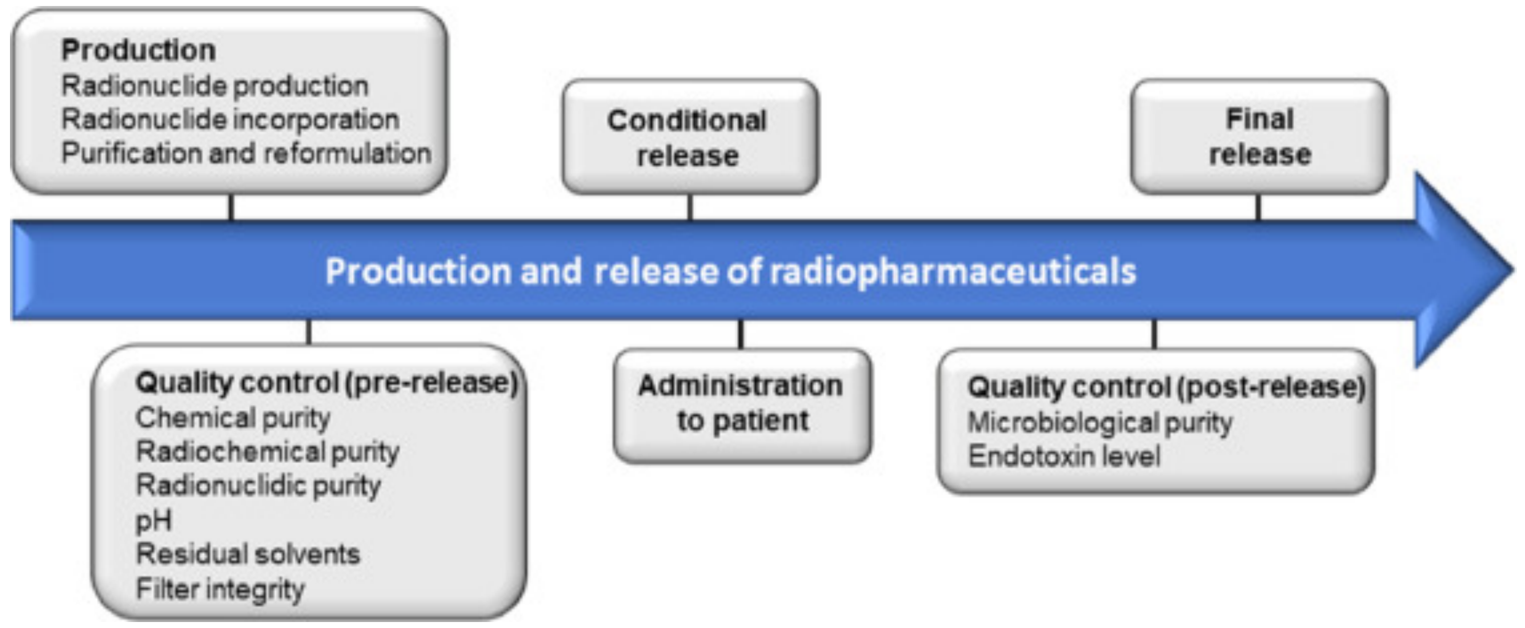
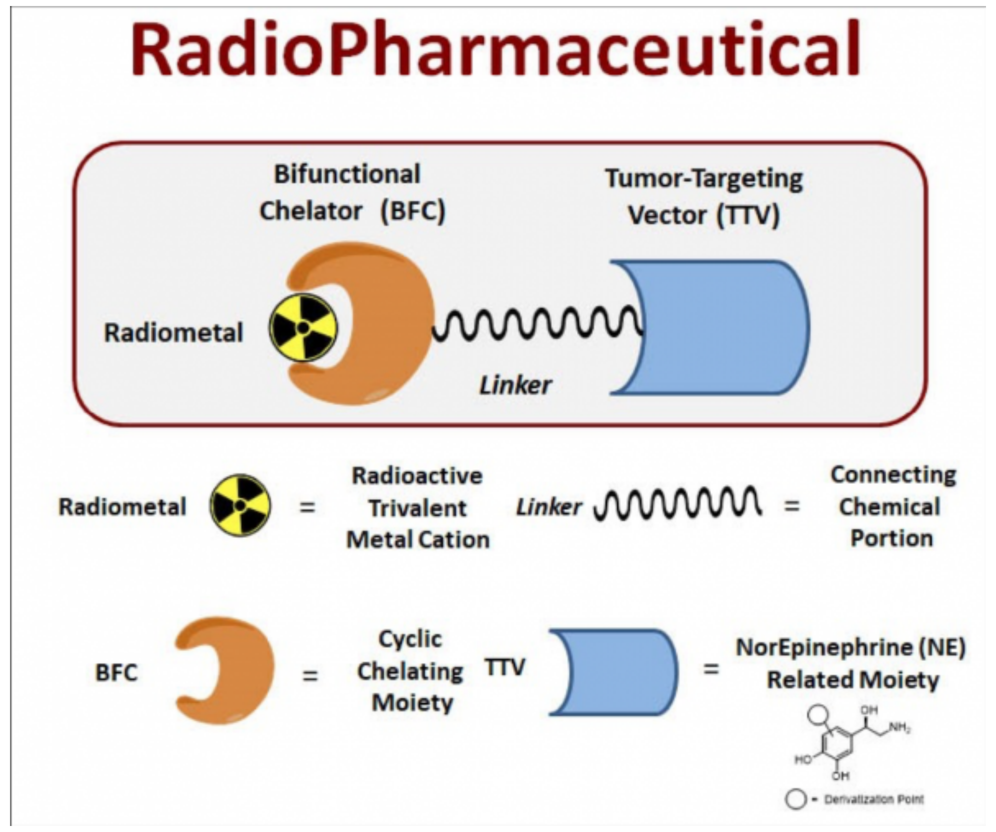
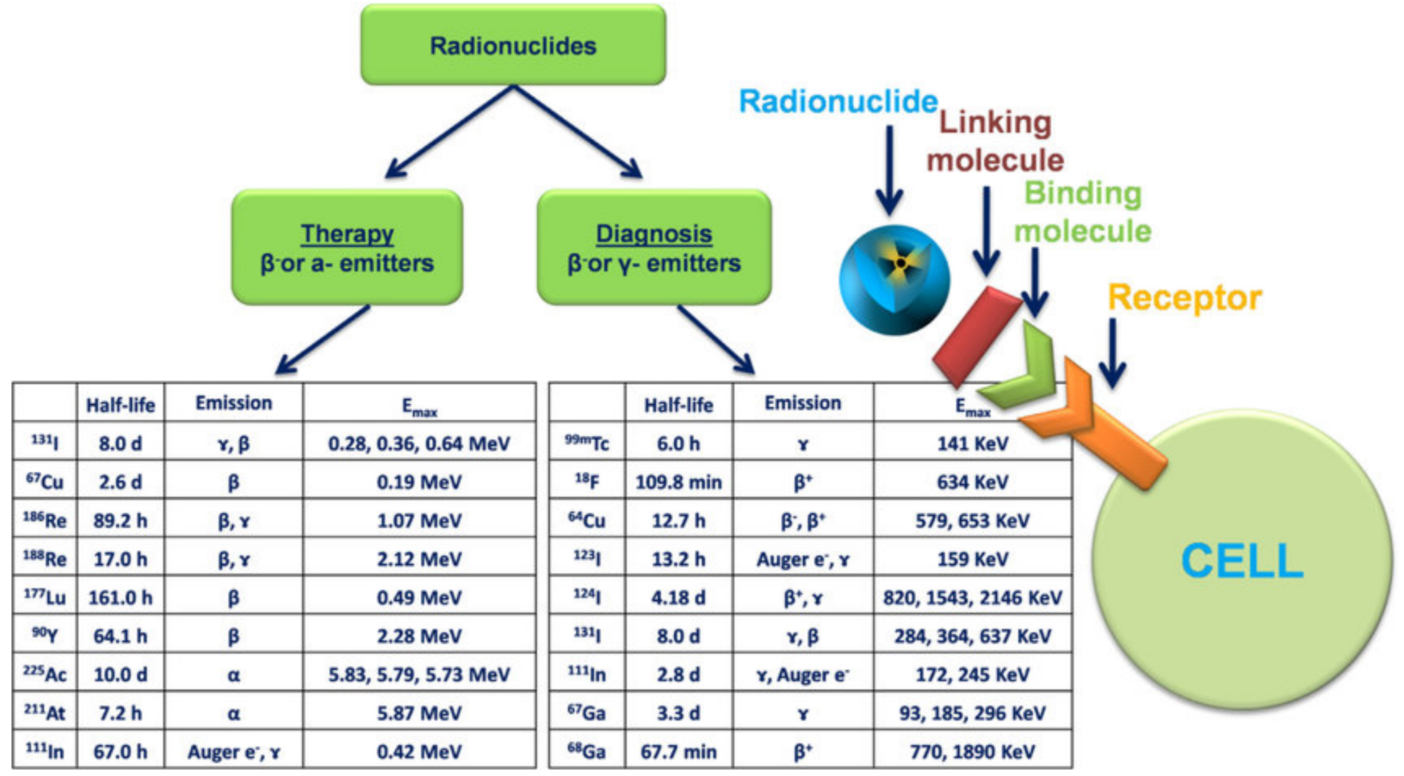
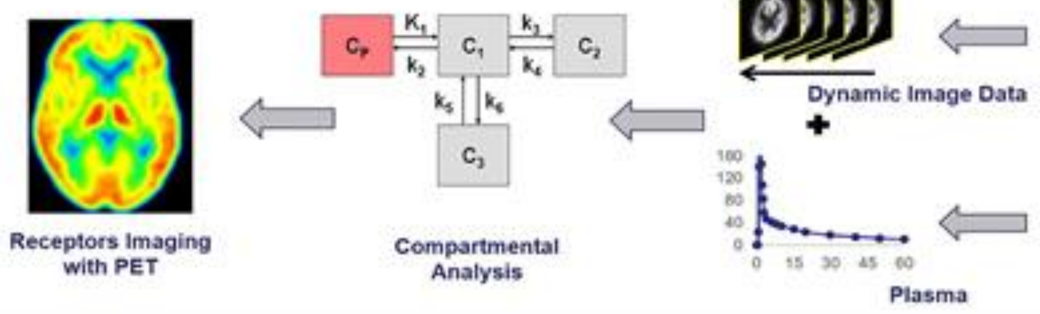






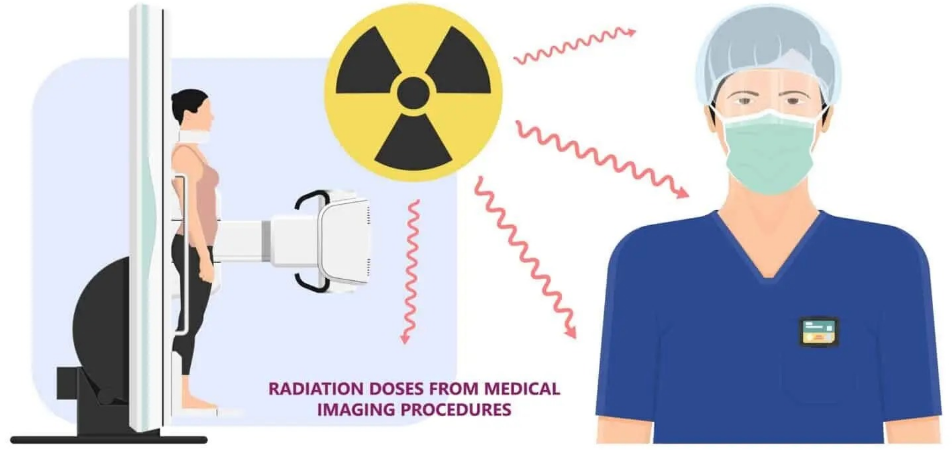
	Half-life	Emission	E_{max}
^{131}I	8.0 d	γ, β	0.28, 0.36, 0.64 MeV
^{67}Cu	2.6 d	β	0.19 MeV
^{186}Re	89.2 h	β, γ	1.07 MeV
^{188}Re	17.0 h	β, γ	2.12 MeV
^{177}Lu	161.0 h	β	0.49 MeV
^{90}Y	64.1 h	β	2.28 MeV
^{225}Ac	10.0 d	α	5.83, 5.79, 5.73 MeV
^{211}At	7.2 h	α	5.87 MeV
^{111}In	67.0 h	Auger e^-, γ	0.42 MeV

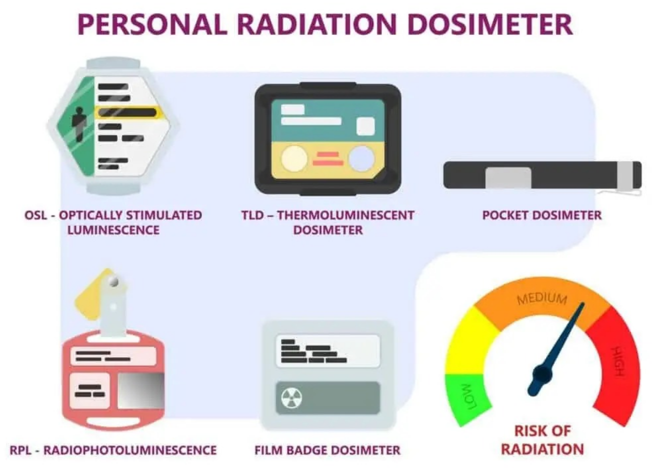
	Half-life	Emission	E_{max}
^{99m}Tc	6.0 h	γ	141 KeV
^{18}F	109.8 min	$β^+$	634 KeV
^{64}Cu	12.7 h	$β^-$, $β^+$	579, 653 KeV
^{123}I	13.2 h	Auger e^-, γ	159 KeV
^{124}I	4.18 d	$β^+$, γ	820, 1543, 2146 KeV
^{131}I	8.0 d	γ, β	284, 364, 637 KeV
^{111}In	2.8 d	γ, Auger e^-	172, 245 KeV
^{67}Ga	3.3 d	γ	93, 185, 296 KeV
^{68}Ga	67.7 min	$β^+$	770, 1890 KeV



Radioisotope	Half-life ($t_{1/2}$)	Typical method of production	Decay of Radioisotope	Main Emission Energy used for imaging
Technetium-99m	6.0 hours	Generator	Isomeric transition $^{99m}_{43}Tc \rightarrow ^{99}_{43}Tc + \gamma$	140 keV
Iodine-123	13.2 hours	Cyclotron	Electron Capture $^{123}_{53}I + e^- \rightarrow ^{123}_{52}Te + \gamma$	159 keV
Gallium-67	78.3 hours	Cyclotron	Electron Capture $^{67}_{31}Ga + e^- \rightarrow ^{67}_{30}Zn + \gamma$	93 and 185 keV
Indium-111	67.3 hours	Cyclotron	Electron Capture $^{111}_{49}In + e^- \rightarrow ^{111}_{48}Cd + \gamma$	171 and 245 keV
Thallium-201	72.9 hours	Cyclotron	Electron Capture $^{201}_{81}Tl + e^- \rightarrow ^{201}_{80}Hg + \gamma +$ x-ray (from Hg)	135 and 167 keV The lower energy x-rays obtained from the mercury-201 (68.9 to 80.3 keV) can also be used for imaging

Table 1: Examples of SPECT radioisotopes commonly used in nuclear medicine; where Tc = technetium, I = iodine, Te = tellurium, Ga = gallium, Zn = zinc, In = indium, Cd = cadmium, Tl = thallium, Hg = mercury





Goal of the research:

To familiarize the audience with the issue of radiosafety in nuclear medicine

Objectives of the research:

In the context of a study on radiation safety problems in modern nuclear medicine, the object of the study will be various aspects of the use of radioactive materials for medical purposes.

Materials and Methods:

1.Radioactive pharmaceutical products;

2. Equipment and technology;

3. Documents and Standards;

4* Environmental monitoring;

5* Experimental research;

6* Literature Review.

Main results:

Development of strategies and technologies for monitoring and managing the environmental impact of radioactive medicine

Introduction of modern research methods aimed at assessing and minimizing the impact of radioactive materials on the environment, ensuring sustainability and environmental safety in the field of nuclear medicine.