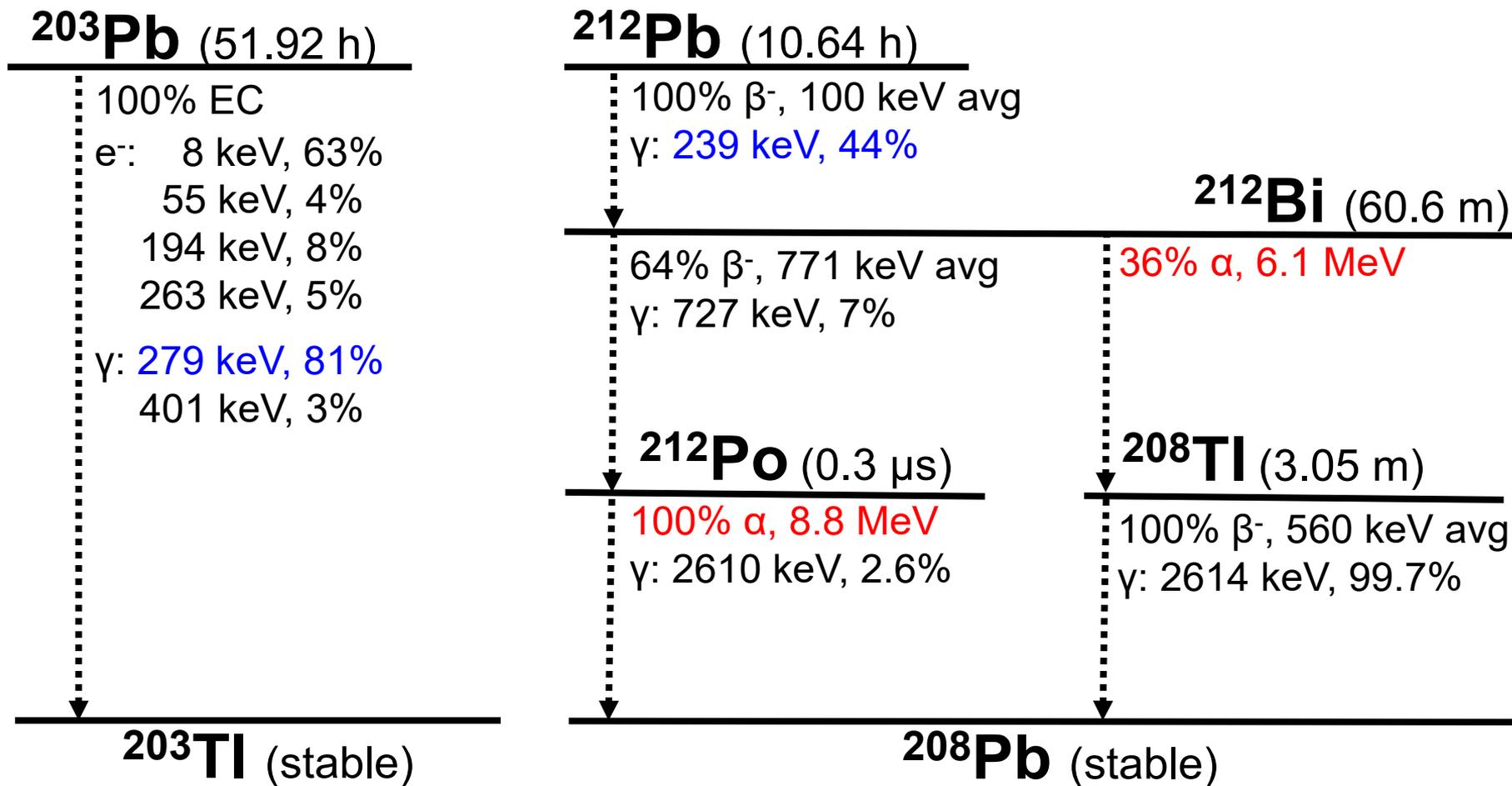


^{212}Pb Dosimetry

Stephen A. Graves, Department of Radiology, University of Iowa



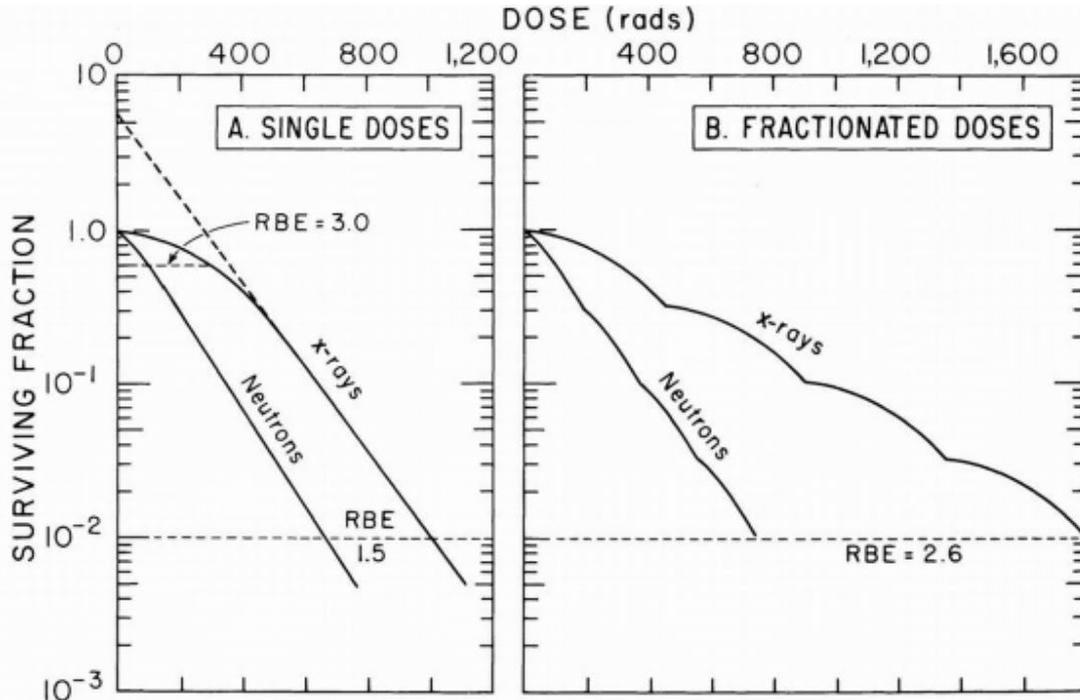
Standard Dosimetry Considerations

- Imaging surrogate sufficiently representative of therapeutic? - Yes
 - Specific binding in marrow? - Depends on tracer
 - Ability to obtain quantitative images? - Yes
-
- Conventional serial blood sampling + SPECT/CT is likely suitable for $^{203/212}\text{Pb}$ dosimetry
 - Blood sampling could be dropped in lieu of (or supplemented with) image-based methods

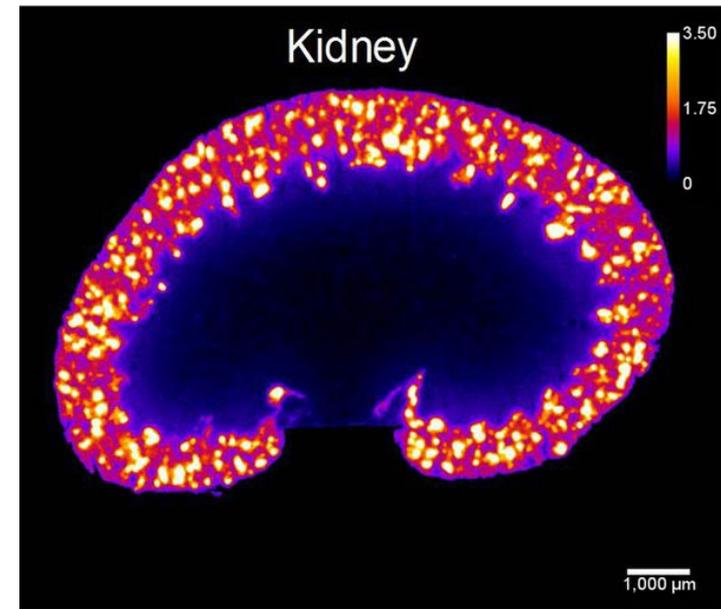
Alpha-specific Dosimetry Considerations

Once you have conventional dosimetry results...

- What is the relative biological effectiveness (RBE)? - 3-7
- What is the “geometry factor”? - Depends on tracer and tissue
- What dose-rate effect exists, if any? - Minimal



E Hall, A Giaccia, "Radiobiology for the Radiologist"

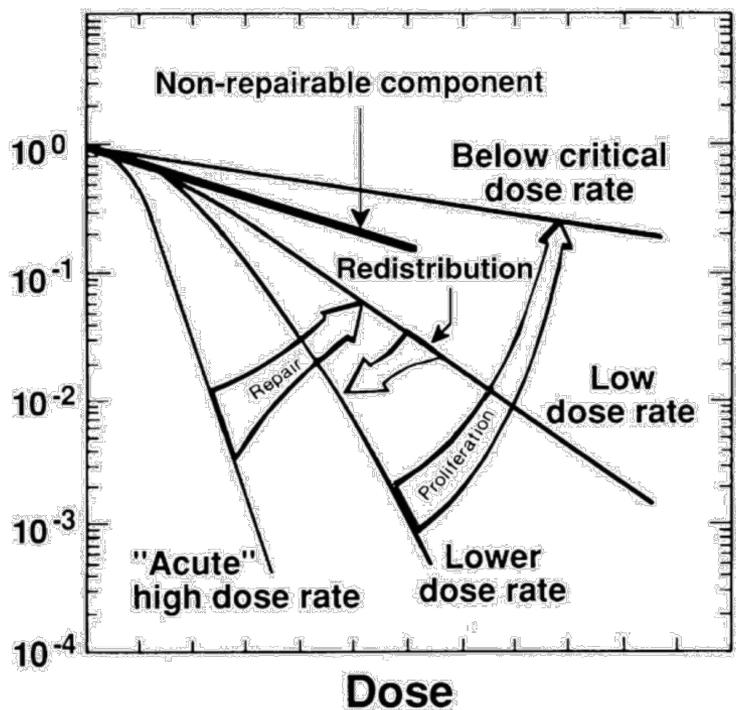


AP Kiess et al., "(2S)-2-(3-(1-Carboxy-5-(4-211At-Astatobenzamido)Pentyl)Ureido)-Pentanedioic Acid for PSMA-Targeted α -Particle Radiopharmaceutical Therapy", JNM, 2016.

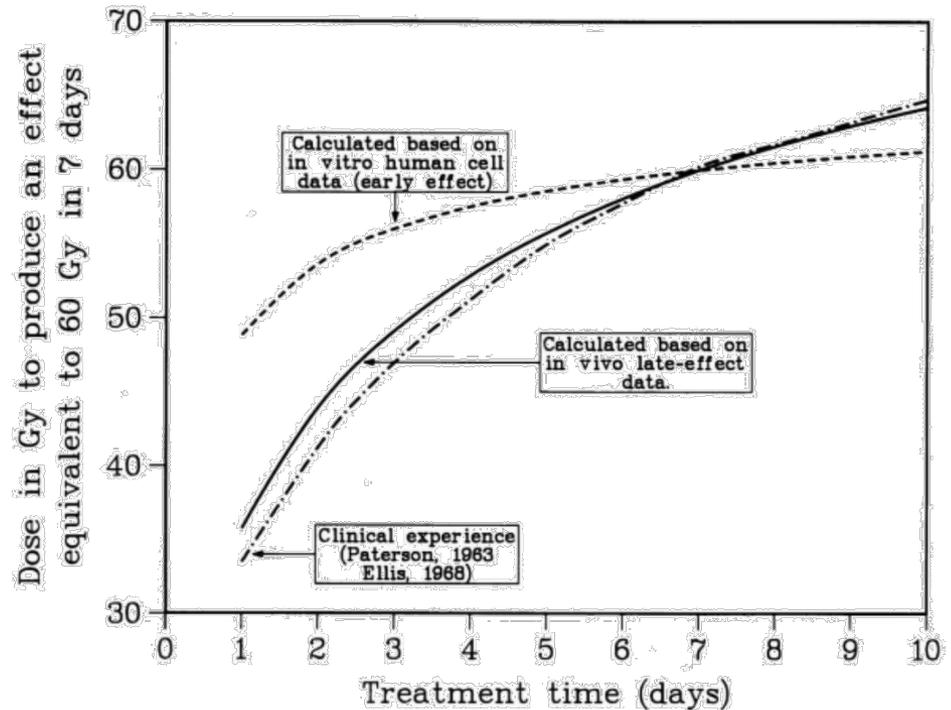
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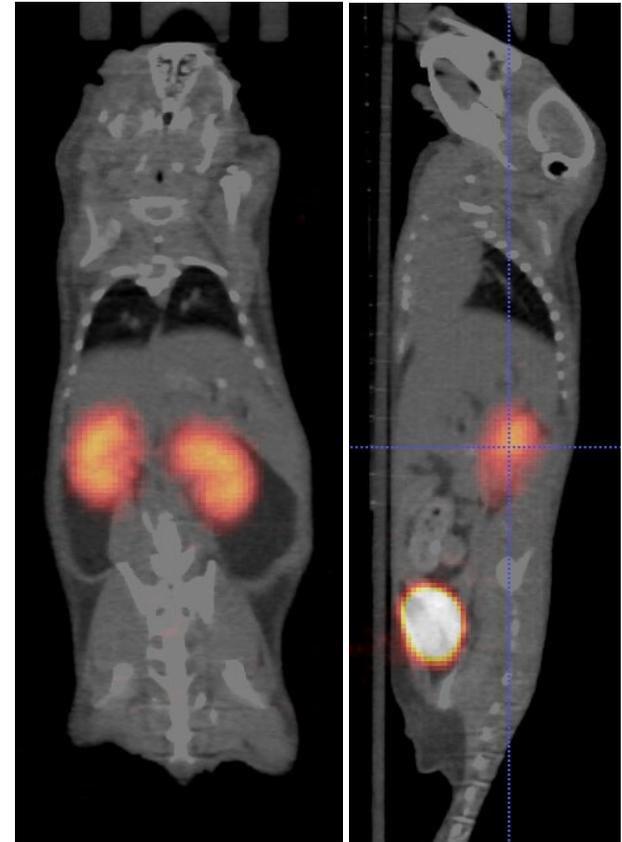


E Hall, A Giaccia, "Radiobiology for the Radiologist"

Toxicity prediction for ^{212}Pb -PSC-TOC

- Very limited human dosimetry and toxicity data in literature for alpha-emitters
- Extrapolation from animal models is challenging
- Can scale reports of ^{225}Ac and ^{213}Bi tolerability to ^{212}Pb using known pharmacokinetics of DOTATOC

Data Source	Method	Administered Activity
Murine Experiments	Allometric Scaling	2 Fx of 1.9 mCi
^{177}Lu -DOTATOC	Similar Drug	2 Fx of 4.9 mCi
^{90}Y -DOTATOC	Similar Drug	2 Fx of 11.7 mCi
^{225}Ac -DOTATOC	Similar Drug	2 Fx of 7.2 mCi
^{213}Bi -DOTATOC	Similar Drug	2 Fx of 17.0 mCi
	Average	2 Fx of 8.5 mCi



C Kratochwil et al., “ ^{213}Bi -DOTATOC receptor-targeted alpha-radionuclide therapy induces remission in neuroendocrine tumours refractory to beta radiation: a first-in-human experience.” EJNMMI, 2014.

C Kratochwil et al., “ ^{225}Ac -DOTATOC – dose findings for alpha particle emitter based radionuclide therapy of neuroendocrine tumors.” EJNMMI Annual Meeting, 2015.