

Promising radionuclides for radiopharmaceuticals in the future

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Radiopharmacy Seibersdorf



Our business concept:

Commercial contract manufacturing organisation (CMO) with no own marketing authorizations and no own intellectual properties

Our services:

- GMP contract manufacturing of radiopharmaceuticals
- Development, optimization and validation of production lines for radiopharmaceuticals

Production routes

Production routes for radionuclides:

- Cyclotron
- Nuclear reactor
- Radionuclide generator

Selection criteria

Radionuclide selection from a CMO perspective:

- Supply issues
- Radiation protection issues
- Pharmaceutical issues
- Technical & commercial issues

Supply issues

- Availability of radionuclide
 - Number and location of suppliers
 - Maximum available amount
 - Robustness of supply
 - Technical up-scaling possibility

- Half-life of radionuclide

Radiation protection issues

- Radionuclide volatile
- Types and energies of emitted ionizing radiation
=> required shielding
- Special storage/handling conditions
- Half-life (including half-life of impurities)
- Impurity profile & decay profile

Pharmaceutical issues

- Pharmaceutical quality of radionuclide
- Impurities (chemical and radioactive impurities)
- Quality system of supplier
- Types and energies of emitted ionizing radiation
- Half-life (radioactive and biological)

Technical & commercial issues

- Robustness of associated production processes
- Chemical properties for radiolabelling
- Price of radionuclide
- Number of other existing or new radiopharmaceuticals with the same radionuclide

Half-life

Commercial CMO considerations:

- Not less than 2 h half-life
- Not less than 12 h half-life (if radionuclide not produced in-house)
- Not more than 2 weeks half-life

Alpha particle emitters

Thorium-226 decay chain:

Th-226->Ra-222->Rn-218->Po-214->Pb-210->Bi-210->Po-210->Pb-206

Thorium-227 decay chain:

Th-227->Ra-223->Rn-219->Po-215->Pb-211->Bi-211->Pb-207

Thorium-228 decay chain:

Th-228->Ra-224->Rn-220->Po-216->Pb-212->Bi-212->Pb-208

Thorium-229 decay chain:

Th-229->Ra-225->Ac-225->Fr-221->At-217->Bi-213->Pb-209->Bi-209

Other alpha emitters: At-211 and Tb-149

Theranostic pairs (part 1)

DIAGNOSTIC			THERAPEUTIC		
nuclide	half-life	decay	nuclide	half-life	decay
Cu-64	13 h	PET	Cu-67	2,6 d	beta minus
As-72	1,1 d	PET	As-77	1,6 d	beta minus
Sr-83	1,4 d	PET	Sr-89	2,1 d	beta minus
Y-86	15 h	PET	Y-90	2,7 d	beta minus

Theranostic pairs (part 2)

DIAGNOSTIC			THERAPEUTIC		
nuclide	half-life	decay	nuclide	half-life	decay
I-124	4 d	PET	I-131	8 d	beta minus
Pb-203	2,2 d	SPECT	Pb-212	11 h	alpha
Ga-68	1 h	PET	Lu-177	7 d	beta minus
In-111	2,8 d	SPECT	Ac-225	10 d	alpha

Terbium quadruplet

nuclide	half-life	application
Tb-149	4 h	alpha therapy
Tb-161	7 d	beta minus therapy
Tb-152	18 h	PET
Tb-155	5 d	SPECT



Any Questions?

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