R&D Isotopes Summary

Medical Isotopes in proposals for recent BER solicitation

- At-211 (2)
- Bi-213 (3)
- C-11** (6)
- Cu-64* (8)
- F-18** (18)
- Ga-68* (3)
- Gd (stable) (2)
- In-111* (2)
- I-124* (1)
- Re-188 (1)
- Rh-105 (1)
- Tc-99m* (10)
- Y-86 ? (1)

*Commercial

**Commercial and in house

Diagnosis (2003 Workshop)

- Cu-64 - 3 sources (three year target supply)
- As-74
- Br-76 - one source (nine year target supply)
- Y-86 - sometimes available
- Zr-89
- I-124 - one source
- Ge-68 - generator (Ga-68) several sources
- Pb-203

Therapy (2003 Workshop)

- Cu-67*
- Br-77* (eight year target supply)
- Pm-149
- Ho-166
- Lu-177
- W-188/Re-188
- At-211*
- Pb-212
- Ac-225/Bi-213*

*Supply issues

Ac-225 Shortage

- ORNL can ship about 600 mCi/yr
- 500-550 mCi are already obligated
- Private company needs 15 shipments of 50 mCi each in next 18 months for toxicity studies in primates
- Limited stock for production (Th-229)

Actinides I

- Targets needed for heavy element production
  - Pu-242,244
  - Am-243
  - Bk-249
  - Es-254
  - Cf-249

Actinides II

- Heavy element chemistry (5f systems) for environmental release issues

  - Np, Pu, Am, Tc
- U through Cm for fuel cycle research (GNEP/Advanced Fuel Cycle)
- Bk, Cf, Es, and Fm chemistry – quantities limited who could get material

Actinides III

- Cf-252 issues
  - CARIBU at ATLAS (fission fragment beams)
  - weapons forensics
  - neutron sources
  - gamma sources
  - detector calibration standard (NIST, DHS, . . .)

Nuclear Batteries

- P-33, Po-210, Pm-147 as examples
- Need beta or alpha without gammas
- High specific energy but low specific power
- DARPA R&D work
- Need Ci quantities or more
- Minimum of 3 to 9 month timeframe for battery lifetime

Issues with Isotopes

- Actinides in short supply
- Availability of R&D isotopes often very time dependent
- Research planned around availability rather than what might work best (BER)
- Medical needs can vary widely from R&D to application

Issues with stable elements

- Neutron rich elements (Ca-48, Ni-64, Ti-50) needed for beams in NP
- For medical isotopes seems to be no shortage of target material

Production Issues

- Reactors not being fully utilized
- Medical cyclotrons and DOE accelerator facilities not being fully utilized
- Facilities not well matched to problem (cost)
- Shortage of trained people for doing chemistry (purity)
- Shortage of processing facilities
- Qualified shipping containers

Environmental Work

- Neutron activation on Fe nanoparticles through enriched Fe-58
- Cd-109 and Zn-65 with low requirements
- As-73 for drinking water standards
- Sr, Ge, and Co also of interest for tracers with half-lives around 100 days
- Si-32 - oceanographic studies
- Al-26 - acid rain, . . .