Rhenium-188 - Rhenium-188 is available carrier-free from a tungsten-188/rhenium-188 generator. The generator which we have developed and optimized at *ORNL* is a chromatographic system which uses alumina as the adsorbent. Since one of the major issues facing the health care industry is the reduction of costs, a major important advantage for use of rhenium-188 is the inexpensive, ready availability from the generator which has a very long useful shelf-life of several months [15-19]. Another advantage is the emission of the 155 keV gamma photon for imaging. There are several rhenium-188-labeled agents which are currently under clinical investigation for bone palliation which include rhenium-188-*HEDP* and rehnium-188(V)-*DMSA (Table 3)*. We have demonstrated that large, clinical-scale generators loaded with high levels of tungsten-188 (> 1 Curie) provide reproducible high rhenium-188 yields of 75-85 %/bolus and low tungsten-188 parent breakthrough (< 10^{-6}) for periods of several months [15-19]. These studies have demonstrated that the costs of rhenium-188 will be very low on a bolus or unit does basis. Probably the most cost effective approach for using the tungsten-188/rhenium-188 generator would be its use the in a hospital or centralized radiopharmacy, and it remains to be seen if this will be possible.

***HFIR* Production of Tungsten-188** - We have had extensive experience over the last several years in *HFIR* production of tungsten-188, from both enriched tungsten-186 tungsten metal and tungsten oxide targets [16, 19-21]. The metallic powder targets are usually processed by oxidation with hydrogen peroxide and/or hypochlorite in the presence of base and oxide targets are dissolved in base with concomitant oxidation. The reactor production yield of tungsten-188 [16] is about one order of magnitude lower than the calculated values for the W-186(n,γ)W-187 (σ = 37.9±0.6 barns) and W-187(n,γ)W-188 (σ = 64±10 barns) reactions. The neutron burn-up cross section for the W-188(n,γ)W-189 nuclear reaction is one factor which has been recently shown to contribute to the reduced production yields observed for tungsten-188. By irradiation of tungsten-188, a value of 12.0±2.5 barns has been calculated for this neutron burn-up cross section [21].

Summary and Conclusions

Research reactors continue to represent important facilities for production of therapeutic radioisotopes for bone pain palliation. The very high flux of the *ORNL HFIR* is a unique capability and this reactor represents an important resource for the production of variety of medical radioisotopes, which require a very thermal neutron flux, including several of current interest for bone pain palliation, such as tungsten-188 (i.e. rhenium-188) and tin-117*m*.