

## PHOSPHORUS-33 [<sup>33</sup>P]

### PHYSICAL DATA

- Beta energy:  
0.249 MeV (maximum, 100% abundance)  
0.085 MeV (average)
- Physical half-life:  
25.4 days
- Biological half-life:  
19 days (40% of intake; 30% rapidly eliminated from body, remaining 30% decays)
- Effective half-life:  
24.9 days (bone)
- Specific activity:  
1,000 - 3,000 Ci/millimole
- Maximum beta range in air:  
89 cm = 35 inches = 3 feet
- Maximum range in water/tissue:  
0.11 cm = 0.04 inch
- Maximum range in plexiglas/lucite/plastic:  
0.089 cm = 0.035 inch
- Half-Value Layer (HVL):  
0.30 mm (water/tissue)

### RADIOLOGICAL DATA

- Critical organ (biological destination) (soluble forms): Bone marrow
- Critical organs (insoluble forms or non-transportable <sup>33</sup>P compounds): Lung (inhalation) and G.I. tract/lower large intestine (ingestion)
- Routes of intake: Ingestion, inhalation, puncture, wound, skin contamination (absorption)
- Internal exposure and contamination are the primary radiological concerns
- Fraction of <sup>33</sup>P beta particles transmitted through the dead skin layer is about 14%.

- Tissues with rapid cellular turnover rates show higher retention due to concentration of phosphorus in the nucleoproteins.
- $^{33}\text{P}$  is eliminated from the body primarily via urine.
- Phosphorus metabolism:
  - 30% is rapidly eliminated from body
  - 40% has a 19-day biological half-life
  - 60% of  $^{33}\text{P}$  (ingested) is excreted from body in first 24 hrs

## SHIELDING

- Not required; however low density material is recommended, e.g., 3/8 inch thick plexiglas, acrylic, lucite, plastic or plywood

## SURVEY INSTRUMENTATION

- GM survey meter with a pancake probe.
- Liquid scintillation counting of wipes may be used to detect removable surface contamination.

## PERSONNEL DOSIMETERS

- Are not required, since they do not detect this low energy nuclide.

## GENERAL PRECAUTIONS

- Inherent volatility (STP): Insignificant
- Skin dose and contamination are the primary concerns.
- Drying can form airborne  $^{33}\text{P}$  contamination.
- Monitor work areas for contamination, using smears or wipes to check for removable contamination.