PHOSPHORUS-33
[\textsuperscript{33}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 \textsuperscript{33}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 \textsuperscript{33}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.