

# Radionuclide Safety Data Sheet

<sup>45</sup>Ca

## PHYSICAL DATA

Radionuclide:	Calcium-45 (Ca-45)
Decay Mode:	Beta (100% abundance)
Beta Energy : keV (average)	257 keV (maximum); 77
Physical Half-Life:	162.7 days
Biological Half-Life:	18,000 days (Bone)
Effective Half-Life:	163 days
Specific Activity:	17,800 curies / gram
Maximum Beta Range in Air:	52 cm = 20"
Maximum Beta Range in Water/Tissue:	0.062 cm = 0.024" Ca-45 beta particles CANNOT penetrate lens of eye (0.3 cm)
Maximum Beta Range in Lucite/Plastic:	0.053 cm = 0.021"

## RADIOLOGICAL DATA

Critical Organ:	Bone
Exposure Concerns:	Internal exposure & contamination
Committed Dose Equivalent (CEDE):	16.2 mrem/ uCi Bone (inhalation) 19.4 mrem/ uCi Bone (ingestion)
Annual Limit on Intake (ALI):	2 mCi (ingestion) 800 uCi (inhalation) 1 ALI = 5000 mrem CEDE

## SHIELDING/LABELING

Shielding:	Low atomic number material (e.g., 1/8" Lucite, plastic, acrylic) is recommended if working or storing millicurie amounts Ca-45.
Labeling:	Container with $\geq 100$ uCi must be labeled "Caution, Radioactive Material"

## SURVEY INSTRUMENTATION

Ca-45 can be detected with a survey meter equipped with a GM probe (pancake probe preferable)  
Counting efficiency with GM survey meters is about 6%  
Wipes/smears should be counted on a liquid scintillation counter to detect Ca-45 contamination. Counting efficiency on a Perkin Elmer liquid scintillation counter is approximately 96%.

### **SKIN CONTAMINATION (Ca-45):**

Localized Dose Rate to Basal Cells at 7 mg/cm<sup>2</sup> or 0.007 cm tissue depth (without air reflection)

Skin Contamination Dose Rate (Extremity Skin): 3180 mrem/hour per 1 uCi/cm<sup>2</sup>

Ca-45 beta particles CANNOT penetrate lens of the eye (0.3 cm)

### **PERSONAL RADIATION MONITORING DOSIMETERS**

Personnel dosimetry (whole body & ring badges) are typically NOT required when working with Ca-45

### **BIOASSAYS**

Not normally required. Notify Radiation Safety if an intake of Ca-45 is suspected

### **DOSIMETRY**

Millicurie quantities of Ca-45 do not present a significant external exposure hazard because the low energy betas emitted barely penetrate gloves and the horny outer skin layer. The critical organ for uptake of Ca-45 is the bone. The metabolism of Ca-45 is complex. The majority of Ca-45 is deposited in the bone and is retained with a long biological half-life of 1.8 x 10<sup>4</sup> days. A smaller fraction is rapidly eliminated. Ca-45 is initially eliminated via the urine but eventually half the radionuclide is eliminated via the feces.

### **RADIOACTIVE WASTE**

Isolate waste from other radionuclides in clearly labeled containers.

Sanitary sewer disposal limit is 100 uCi in any one day via a designated "hot" sink provided it is readily soluble, dispersible in water, and contains no hazardous materials. A sewer log must be maintained.

### **GENERAL RADIOLOGICAL SAFETY INFORMATION (Ca-45)**

Inherent Volatility (STP): Insignificant / Negligible

- Use transfer pipettes, spill trays or absorbent coverings to confine contamination.
- Volatile chemical forms will be handled in a certified fume hood.
- Use lab coats and disposable gloves. Select gloves appropriate for chemicals handled.
- Regularly monitor and replace gloves as needed.
- Regularly monitor and promptly decontaminate work surfaces to maintain contamination and exposures as low as reasonably achievable.
- Shielding provided by the vial is adequate.