

## RADIATION SAFETY DATA --<sup>33</sup>P

Phosphorous-33 (P-33) is used in the life sciences research. It is easily detected, measured, and is widely available in a variety of radiochemicals. <sup>33</sup>P is used in a similar manner to <sup>32</sup>P, but has a lower energy beta emission and a longer half-life.

### Physical Data

Decay Mode	beta decay to Sulfur-33 (stable)
Physical Half-life	25.4 days
Major Emissions	beta minus, 249 keV max, 76.6 keV ave.
Range in Air	49 cm
Range in Tissue	.059 cm

### Biological Data

Dose to live skin	1300 mrem/hr per $\mu\text{Ci}/\text{cm}^2$
Other doses	.888 mrem/ $\mu\text{Ci}$ ingested .607 mrem/ $\mu\text{Ci}$ inhaled
Annual Limit on Intake	Ingestion – 6 mCi Inhalation – 8 mCi

ICRP shows that for most phosphorous intake into the body, about 15% is excreted with a half-life of about ½ day; 15% goes into intracellular fluids with half-life of about two days, 40% goes to soft tissue with a half-life of about 19 days, and 30% is retained in the bone permanently. Intake of 1 $\mu\text{Ci}$ , resulting in 0.33  $\mu\text{Ci}$  in the bone, will produce a dose equivalent of ~ 9 mrem.

### Common Hazards-Precautions

Overall, <sup>33</sup>P is less hazardous than <sup>32</sup>P but somewhat more hazardous than <sup>35</sup>S. Due to the longer half-life vs. <sup>32</sup>P (25 vs. 14 days), stock material would remain viable for a longer period of time; thus, the total activity per unit time brought into the lab would be lower. The opposite is true in comparison to <sup>35</sup>S (87 day half-life).

### Specific requirements for Handling at OSU

Personnel dosimeters (XBG body badge and TLD finger rings) are not necessary due to the low energy of the beta emission. However, the beta is of sufficient energy to be easily detected using a thin-window GM survey instrument. A GM pancake probe should be used to survey the work area following use of <sup>33</sup>P.

Liquid <sup>33</sup>P waste should be stored in appropriate containers for disposal. These containers must

be inside secondary containers capable of containing all fluid within the primary container. Drain Disposal is not permitted; disposal containers will be picked up by Radiation Safety.

The Oregon State limit for  $^{32}\text{P}$  release in a fume hood is  $1 \times 10^{-8} \mu\text{Ci/ml}$  ( $2.83 \times 10^{-4} \mu\text{Ci/ft}^3$ ). A 3 foot fume hood drawing 100 linear feet/minute with the sash at 15" draws  $375 \text{ ft}^3/\text{minute}$ . Use these figures to estimate volatile release when preparing Radiation Use Authorization applications.