Appendix E

Instrument Efficiencies

Counting efficiency for a radiation detection instrument is defined as the events it detects, counts, divided by the number of disintegrations the source that is being counted emits times 100 to give the counting efficiency in terms of percent:

CPM/DPM x 100 = Efficiency (in percent)

Counting Efficiency for the Liquid Scintillation Counter:

The LSC counter is calibrated using H-3 and C-14 standards. The activity in the small, 7 mL, vials is as follows:

H-3 = 54,822 DPM (corrected for decay)

C-14 = 42,802 DPM

Using program#3, which is set up so that Channel A "sees" H-3, Channel B "sees" 125I and S-35 and Channel C "sees" 32P maximum beta energy and gamma emitters.

Counting Efficiency for H-3:

28,028 /54,822 x 100 = **51%**

Counting Efficiency for C-14 and S-35:

20,675 /42,802 x 100 = **48 %**

Counting Efficiency for Higher Energy Beta Emitters and Gamma Emitters:

Since the half-life for P-32 is ~ 2 weeks, standards are not readily available. The efficiency is quite high **> 90%.**

Counting Efficiency for Portable Survey Instruments:

For H-3:

Portable survey instruments will not detect H-3 (tritium)

For C-14, S-35, P-33 and other low energy beta emitters (E max. < 0.25 MeV):

The counting efficiency using a thin window pancake GM detector is **~ 5%**

For P-32, high energy beta emitters and gamma emitters other than I-125:

The counting efficiency using a thin window pancake GM detector is **~ 20%**

For I-125:

The counting efficiency using a **thin crystal scintillation detector is ~ 10%**