Spelman
Memorial
Hospital
A friend to care

U. S. Nuclear Regulatory Commission
Material Licensing Section
Region III
799 Roosevelt Road
Glen Ellyn, Illinois 60137

January 10, 1986

Re: License #24-18631-01

Gentlemen:

Please amend our NRC license #24-18631-01 to include the following information in the attached supplement for "Monitoring and Evaluating 133-Xenon Collection and Trapping Devices". Our current procedure involves surveying the 133-Xenon trap prior and after ventilation studies with a low level survey meter.

The method of measuring 133-Xenon leakage from the trap is more accurate with the supplements directions as to our current procedures. We wish to leave both methods in our license as to be able to perform the surveys if the supplement procedure can not be performed.

Your consideration in this matter will be appreciated.

Sincerely,

Gene Meyer
Chief Executive Officer

enclosure: $120.00 amendment fee

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Applicant Spelman
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Highway 169 P.O. Box 289
Smithville, Missouri 64089
816 532-3700

CONTROL NO. 80511

SUPPLEMENT

METHOD FOR MONITORING AND EVALUATING 133-XENON COLLECTION AND TRAPPING DEVICES

I. Determine approximate gamma camera efficiency for low energy radionuclides. A 57-Co flood source, while having a somewhat higher energy than 133-Xe, may be used to approximate camera efficiency at this gamma energy range. The efficiency factor for 57-Co (.124MEV) will be lower than that for 133-Xenon (0.081MEV) when counted using similar detector geometries.

A. To determine counting efficiency Fe:

1. With camera detector facing up, place the 57-Co flood source close to the crystal and determine CPM.

2. With no activity in room, determine camera system background.

3. Using the calibration data from the flood source, calculate counting efficiency from:

(1) $$Fe = \frac{\text{Flood CPM-B}_g\text{ CPM}}{2.22 \times 10^6 \text{DPM/uCi} \times \text{uCi (of flood source)}}$$

II. Using the counting efficiency Fe, we can approximate the number of microcuries present in an unknown sample (such as in a 133-Xe collection bag) that is reasonably close in energy level and counted using similar counting geometry from:

(2) $$\text{uCi} = \frac{\text{net CPM}}{2.22 \times 10^6 \text{ DPM/uCi} \times \text{Fe}}$$

III. To check the efficiency of the 133-Xenon trap, we connect a 10 liter gas collection bag at the exhaust port of the gas trap. When the collection bag fills, it is removed from the gas trap port and the time from the beginning of wash out, until the bag is filled, is noted. Total time of wash out is also noted. The uCi quantity of 133-Xenon in the bag is calculated from formulae (2).

IV. Since we know the assayed amount of 133-Xe administered to the patient, and we have approximated the uCi of 133-Xenon present in the bag, we can approximate the percent of administered dose present in the collection bag from:

$$(3)\quad \frac{\text{uCi in collection bag} \times 100}{\text{uCi administered to patient}} = \%\text{ of gas in bag}$$

To calculate the % of gas escaping from the trap for the entire procedure, one must assume that it is escaping at a uniform rate during trap wash out. If this assumption is made then:

$$(4)\quad \%\text{ of gas escaping} = \%\text{ of gas in bag} \times \frac{\text{Total wash out time}}{\text{Bag filling time}}$$

When the ratio of total wash out time to bag filling time equals 1 then:

% of gas escaping = % of gas in bag.

V. This procedure will be performed initially on the delivery and trapping unit, and as a minimum, on a monthly basis. When our monitoring demonstrates that the trap is less than 90% efficient we will replace the Xenon trap filters.

VI. As an option a 99m-Tc99 flood source will be used which will demonstrate a lower efficiency factor than that of 57-Co. In equation (2) the term 2.22×10^6 DPM/uCi x F_e may be substituted for by expressing this term in CPM/uCi of activity in flood source.