Fayette Memorial Hospital
association, inc • jack a. peters, executive director

December 9, 1980

John W. Cooper, PH.D., Chief
Regional Licensing Section
Material Licensing Branch
Division of Fuel Cycle and Material Safety
U.S. Nuclear Regulatory Commission, Region III
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Gentlemen:

The following information is provided in response to your letter of October 2, 1980 signed by Samuel L. Pettijohn (Control No. 03521).

1. We have obtained a 5 mCi Cobalt-57 source and a 200 uCi Cesium-137 source for calibration of our dose calibrator. Both sources have a calibration accuracy of at least 5%. In addition to these sources, our consulting radiation physicist will periodically check the performance of the dose calibrator with other calibration sources.

2. Enclosed is a sketch of the nuclear medicine facility.

3. All radioactive Iodine-131 used in our facility will be in capsule form.

4. Enclosed are the required form NRC-313M Supplements A and B to support the addition of Dr. Kendall W. Caldwell as an individual user on our license.

5. Based on prior experience, the anticipated number of Xenon-133 studies is approximately five patients per week. The usual administered activity per patient is 10 millicuries. Thus our desired possession limit of 500 millicuries should be sufficient to provide for shipments whose calibration dates are several days after receipt.

On the enclosed diagram of the nuclear medicine facility are shown the locations and airflow rates for supply and exhaust vents. No air is recirculated and the nuclear medicine facility is under negative pressure. Velometer measurements of the exhaust vents will be performed semiannually by our consulting physicist in order to determine that the airflow rates are maintained at the described levels.

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The Xenon-133 gas will be used in the following manner: The dose will be measured in the dose calibrator. The patient will be instructed on the details of the procedure with a special emphasis on the steps where his cooperation is needed. The unit dose vial will be loaded into the shielded Calidose Dispenser furnished by New England Nuclear in the hot lab. The dispenser will be taken to the imaging room and the Xenon-133 will be administered to the patient through an Atomic Products Corporation Lung Function Unit. Nose clamps will be utilized to prevent the patient from exhaling the Xenon-133 into the room. Upon completion of the study, the used Xenon-133 will be washed out into an Atomic Products Corporation Xenon gas trap.

In the event there is an accidental release of a full patient dose of Xenon-133 into the imaging room, the patient and staff will vacate the room for approximately 30 minutes. Based on the exhaust rate, this allows for approximately 6 air changes. The room will be surveyed upon reentry in order to verify that no detectable Xenon-133 is remaining.

In the event there is an accidental release of a full patient dose of Xenon-133 into the hot lab, the staff will vacate the hot lab for approximately 30 minutes, allowing for approximately 7 air changes, based on the exhaust rate for this room. The hot lab will be surveyed on reentry in order to verify that no detectable Xenon-133 is remaining.

<u>Air Concentrations in Restricted Areas</u>

Assumptions: 5 studies per week or
50 millicuries/week = A

20% lost during use and storage = f

$$\frac{A \times f}{1 \times 10^{-5} \text{ uCi/ml}} = 1 \times 10^{9} \text{ ml/week}$$

$$\frac{1 \times 10^{9} \text{ ml/week}}{40 \text{ hr/week}} = 2.5 \times 10^{7} \text{ ml/hour}$$

$$\frac{2 \times 10^{7} \text{ ml/hour}}{1.7 \times 10^{6} \text{ ml/hour/CFM}} = 14.7 \text{ CFM}$$

Thus, in order to meet the requirements of 10CFR Part 20.103, the imaging room and hot lab must each have a ventilation rate of at least 14.7 CFM with no recirculation of air. As shown on the enclosed diagram, the actual ventilation rates are far in excess of the required minimum of 14.7 CFM.

Air Concentrations of Xenon-133 in Unrestricted Areas

As described earlier, the Xenon-133 will be disposed of by adsorption onto a charcoal trap.

Assume 20% leakage:

$$A = 5 \text{ studies/week} \times 52 \text{ weeks/year} \times 10 \text{ millicuries/study} \times .2$$

$$A = 520 \text{ millicuries released/year}$$

$$V = 624 \text{ CFM} \times 1.484 \times 10^{10} \text{ ml/year/CFM}$$

$$V = 9.26 \times 10^{12} \text{ ml/year}$$

$$C = \frac{5.2 \times 10^{5} \text{ uCi/year}}{9.26 \times 10^{12} \text{ ml/year}}$$

$$C = 5.6 \times 10^{-8} \text{ uCi/ml}$$

Thus, the maximum anticipated air concentration, averaged over one year, does not exceed 3×10^{-7} uCi/ml, as required.

To insure that the trap is working properly, the exhaust air from the trap will be monitored as follows: immediately after the last lung ventilation procedure each week, a 5 liter polyethylene bag will be placed over the exhaust port of the trap and the unit will be operated until the bag is full. The bag will be sealed and placed in front of the gamma camera and counted for one minute. The counts obtained will be recorded and compared to the previous readings. A replacement cartridge will be installed when there is a significant increase in the weekly counts, The saturated cartridge will be placed in the hot lab behind lead bricks and stored for decay.

Please let us know if you have any further questions.

Sincerely,

Jack A. Peters
Chief Executive Officer