A SIMPLE METHOD OF CHECKING FILTERS USED FOR STERILIZATION

Since the publication of a previous letter (*1*) concerning the testing of Millipore* filters after their use for sterilization of short-lived radiopharmaceuticals, a much simpler modification of the method has been adopted. It is based on exactly the same principles and has proved equally effective. If instead of measuring the actual "bubble-point" pressure an attempt is made to force a standard volume of air through a wet filter with a syringe, it is possible to determine whether the integrity of the filter has been maintained. This volume can be determined beforehand by trial and error with filters known to be intact. The same starting and finishing points on the syringe must of course be maintained each time and the particular conditions only apply to one combination of filter holder and syringe because of differences in dead space. The "bubble point" or lack of it is observed by immersing the needle on the holder in a beaker of water. Using a 5-ml syringe, an 0.22-micron filter, and a disposable 25-mm filter holder it was found that by starting with the syringe set at 5 ml and forcing the plunger to the bottom of the barrel it was never possible to force air through an intact wet filter. With the same combination of syringe and filter holder but approximately 6 ml of air it was usually just possible to do so.

One objection to the method is that if there is any liquid remaining in the filter holder it will be expelled first, causing an erroneous starting volume of air and a low testing pressure. This can be overcome by performing the test twice so that the first time the remaining liquid is expelled and the second, after removing the syringe and resetting the volume, the answer required is provided. However, the smallest defect such as that made by the tip of a fine syringe needle is immediately detectable with an air volume of much less than 5 ml.

This simple method is considered to offer a reliable and effective means of testing the integrity of filters so that there can be no justification for not running this test each time circumstances warrant it.

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A NUCLEAR MEDICINE QUALITY CONTROL PROGRAM

Early in 1970 the New England Chapter of the Society of Nuclear Medicine appointed a Standards Committee whose general purpose was to investigate locally the accuracy with which radioactive materials were measured in nuclear medicine laboratories and to investigate the relative performance of nuclear medicine equipment in those laboratories. At about this time, an organization known as the New England Radiological Physics Organization (NERPO) was founded with the principal purpose of launching a regional collaborative effort in dosimetric, operational, and educational areas of medical radiation use. This organization has 24 physicist members distributed throughout the New England region. One of the NERPO committees has substantially the same purpose as the SNM Standards Committee and therefore it was logical to merge these activities into a joint committee.

It is the purpose of this letter to summarize briefly the work during the past year of the Committee, which is probably unique in this country, in order to encourage formation of similar committees in other regions for rendering service to the medical community. Thus far the activities in nuclear medicine have been in two areas—comparison of source standardization equipment (calibrators) and comparison of gamma cameras.

Calibrator tests. A preliminary survey was made of relative calibration results in seven facilities in major Boston hospitals, together with one facility of a commercial standard supplier. Three sources in different energy ranges were circulated to each facility as follows: a ^{57}Co source simulating ^{99m}Tc, a ^{133}Ba source simulating ^{131}I, and a ^{137}Cs source. Each source was measured by a technologist or physicist in the facilities using normal procedures. Results

TABLE 1. ACTIVITIES RECORDED ON DIFFERENT CALIBRATION SYSTEMS

Facility:	A	B	C	D	E	F	G	H*
Instrument:	V_1	V_2	W	X_1	X_2	X_3	Y	Z
^{57}Co (mCi)	6.25	6.26	5.2	5.45	5.8	5.3	6.5	6.2
^{133}Ba (μCi)	215	224	240	246	258	236	250	225
^{137}Cs (μCi)	20.5	20.9	—	20.6	22.6	20.1	19.2	20.5

* H is the measurement of a commercial standard supplier, based on NBS reference standards.
V, W, X and Y represent different types of commercial calibrator.

TABLE 2. RELATIVE PHANTOM COUNTING RATE OF NUCLEAR-CHICAGO PHO/GAMMA III CAMERAS

Facility:	A	B	C	D	E	F	G	H
^{57}Co counting rate (%)*	100.0	95.1	92.5	88.3	81.1	76.0	71.3	52.2
^{133}Ba counting rate(%)*	98.9	97.5	89.1	86.1	90.4	50.9	76.3	85.9

* Average of three test conditions relative to best for each condition.

produced by four types of commercial instrument are given in Table 1. It will be noted that relative to the measures provided by the supplier of the source standards, the hospital laboratory results varied by −16% to +5% for "^{99m}Tc"; by −6% to +11% for "^{131}I," and by −6% to +10% for ^{137}Cs. Results produced by three instruments of a given model varied from −14% to −8% for "^{99m}Tc," from +15% to +5% for "^{131}I," and from −2% to +10% for ^{137}Cs.

Subsequently further comparisons were made of the readings obtained on different instruments when a particular source was measured at all available nuclide settings. These readings allowed a comparison of electrical reproducibility of different examples of the same instrument model.

Gamma camera tests. A protocol was prepared for measurements to be made on two line-source phantoms. The first phantom consisted of a ½-in.-thick Lucite plate in which a 2-mm i.d. plastic tube was embedded containing ^{57}Co fixed in a gel. The line source followed a configuration similar to that described by Jahns and Hine (*1*) with line spacing varying from 0.2 to 5 cm. The second phantom consisted of a similar Lucite plate in which plastic tubes containing ^{133}Ba were embedded in a grid pattern with a 2.5-cm line spacing. The protocol was designed to provide information on sensitivity and relative "image quality". For each phantom, tests were made under three conditions: (A) with a specified collimator in contact; (B) separated by 3 in. of air; and (C) separated by 3 in. of masonite. Window width and "isotope range" were specified. The time to acquire 100,000 counts was noted. No attempt was made to ascertain the condition of the instruments prior to the tests described.

These phantoms were circulated within a period of a few weeks to facilities possessing eight different Nuclear-Chicago Pho/Gamma III cameras. Other results were obtained for high performance cameras which are not reported here. Table 2 lists the relative counting rates of these cameras of the same type, averaged for the three counting conditions.

Image quality was judged by circulating the scintigrams to a group of eight reviewers who independently ranked them for each given test condition in image quality. This method has the disadvantage of not providing an objective numerical criterion of resolution capability. The end result, however, has been salutary: each scintigram was returned to the operator of the facility together with a copy of the "best" scintigram obtained in the overall comparison for each test condition.

A protocol has also been prepared for a comparison of Picker 5-in. Magnascanners which is presently being conducted.

The objective of the Committee is to alert operators of nuclear medicine laboratories of possible variances in their equipment relative to the performance which appears to be possible under the best local conditions. This service, of a self-help nature, is intended to indicate to the operator "where he stands" with regard to the performance of his equipment.

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