Capintec, who stated that apparently an impurity was present in the gas of the T-lot chambers which caused the nonlinearity. Because of this, we currently use only the R-lot chambers.

We would caution departments receiving a new calibrator to study the linearity of the machine over the total range of the department's activity usage. This can be accomplished by comparative assay if another calibrator is available and known to be linear, or by the concentration-volume method mentioned by Kowalsky et al. (*1*). A probelm with the concentration-volume method is the fact that saline reservoir generator systems provide a different elution volume each time. This can be overcome by using the weighing technique described by Benedetto (*2*).

We hope that this communication will provide further information regarding the performance and quality control of dose calibrators.

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MORE ON DOSE CALIBRATOR PERFORMANCE

The article "Dose Calibrator Performance and Quality Control" in the March 1977 issue by Kowalsky, Johnston, and Chan is to be commended and is long overdue.

Mr. Kowalsky, however, reports an experience with a Radx Mark V dose calibrator which we have not been able to duplicate. First of all, it should be noted that the Mark V has been out of production for several years. It is also of interest that Mr. Kowalsky and his group have the dubious honor of owning the very first Mark V ever manufactured. Early Mark Vs differ from later Mark Vs in two respects, which could account for the "saturation effect" that Kowalsky et al. experienced.

The first difference is that the first-stage amplifier would saturate at an output equivalent to 700–800 mCi of Tc-99m. This was modified in later units by adding an electronic relay and a $3.0 \times 10^8\ \Omega$ resistor in such a fashion that when the 0–1000-mCi range selector button is depressed, the amplifier gain is lowered by a factor of 10. With this modification, the Mark V is capable of reading up to 7–8 Ci without saturating the amplifier. Our number of 700–800 mCi of Tc-99m required to saturate the first-stage amplifier is suspiciously close to the saturation effect at 709 mCi seen by Kowalsky et al.

Our records indicate that Mr. Kowalsky's unit was modified in May 1975 to include this relay and resistor. Unless this work was done prior to that time, amplifier saturation does not explain the effect seen. The experiment the authors ran on amplifier saturation would also negate this as a possible cause.

The second difference between early and late units is found in the ionization chamber. Chambers in early Mark Vs were made from acrylic butyl styrene (ABS) plastic, which was not checked for linearity at high activities since at that time high activities were not employed in clinical nuclear medicine. Later Mark Vs and the new Meletron utilize a polystyrene ionization chamber which has been checked for linearity at activities greater than 2 Ci. The amplifiers are capable of producing linear assays to levels greater than 10 Ci.

There are two possible explanations why their chamber may saturate at the levels indicated. The first is something all users of dose calibrators should be aware of—that an ionization chamber has a finite life and that one of the symptoms of aging is a lower saturation point. The chamber in Mr. Kowalsky's unit has never been replaced. The second possible explanation is that the ABS plastic had higher levels of contaminants than the polystyrene. When we were building ABS chambers, the raw material used had to be carefully selected; otherwise very erratic readings and low saturation points were experienced as a result of impurities in the plastic. There may be a relationship between saturation point and the amounts of impurities.

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ONE APPROACH TO IN-SERVICE EDUCATION

Reading the literature available and attending seminars and meetings are two time-honored means of continuing one's education. When time and funds are short, however, in-service education programs offer an excellent alternative.

Each nuclear medicine department can and should develop an in-service education program. The Joint Commission of the Accreditation of Hospitals states that, "all nuclear medicine personnel should participate in in-service education programs as well as outside workshops and professional society meetings.... The director shall contribute to the in-service education of nuclear medicine personnel." (*1*).

All nuclear medicine technologists have an excellent opportunity for learning on a daily basis within their own departments. I would like to share with other technologists the benefits our department has derived from the implementation of an informal in-service education program.

Using a rotation system, we strive to have at least one technologist present in the reading room when scans are being interpreted at the end of each day. Technologists have reacted favorably to being present when their work is reviewed each afternoon. This allows a break from the sometimes monotonous job of performing scans all day and provides the experience of an educational hour. When technologists are put in the position of looking at the films from an interpreter's point of view, they become more understanding of the problems of making a judgment on a technically poor image. Since the advent of this program, we have had a lower level of grumbling when additional scans are requested. The technologists who have participated in scan reviews are more able to exercise independent thinking with a problem scan, and more willing to use initiative in obtaining the necessary views.

In addition, technologists become more aware of the significance of their work. Frequently during the reading session, a physician will come in to see his patient's scan and to correlate scan findings with the patient's clinical picture. Being present when a physician discusses a patient in terms of the scan in question on the viewbox is more interesting than reading about a case or hearing it presented in a large auditorium. One may hear the physician say that he is taking the patient to surgery on the basis of the scan findings or that the extent of surgery he will perform is contingent on the information revealed in the study. This instills in the technologist a feeling of being part of the medical team and it reminds him that the quality of his work may directly affect a patient's course of therapy.

The technologist who performs in vitro studies is also scheduled to sit in on reading sessions. This is helpful in keeping him up-to-date on various procedures and views, and allows him to feel involved with the imaging division of the department.

As chief technologist in a busy department, I find that our in-service educational program gives me an additional advantage: I get an overall view of the quality of work being turned out. This allows me to see if technical problems are occurring with frequency.

The physicians in our department also appreciate the value of having technologists present when they are reading films. They find it helpful to have someone on hand who has been in direct contact with the patient. Typical questions that the physician might ask the technologist are: Did the patient have unusually large breasts? Was the patient perspiring? Which arm was used for injection of the radiopharmaceutical? Did the patient have a colostomy? Immediate answers to these and other questions are often helpful in interpretation of an image.

These sessions afford a relaxed time in which the physicians and the technologists can discuss the value of possible changes in technique, the advent of new procedures, and the rationale behind the studies performed. It has proved to be the ideal time for a busy physician to share his knowledge with technologists.

Our whole department has benefited from the increased communication and the exchange of ideas and comments between nuclear medicine physicians and technologists. It is a bridge between physicians and technologists and enables us to function better as a team. This program can be applied in any sized department. Why not give it a try?

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1. Joint Commission for Accreditation of Hospitals. *Accreditation Manual for Hospitals*, p 118, 1976