given clear-cut answers to the predictability of beneficial results following various neurosurgical shunting procedures, probably because no series has been large enough to provide definitive data on the subject. Recently, two articles (*4,5*) have suggested that there is poor correlation between a "positive" cisternogram and the results likely to be achieved by shunting. These articles have further suggested that patients with "normal" cisternograms may nonetheless show improvement in neurological status following surgery. Thus, we are faced with at least three questions. First, is a "positive" radionuclide cisternogram an adequate indicator of communicating hydrocephalus? Second, can the success of shunt in any given patient be predicted by the particular cisternographic abnormality observed? Third, are there other entities not definable by radionuclide cisternography that may be amenable to shunting? In other words, are we denying surgery to patients based on a "normal" cisternogram? Conversely, are we unintentionally participating in the decision to offer surgery to too large a segment of our aging population based on too little knowledge on our part concerning the sensitivity and specificity of cisternography as well as the overall risk and cost of this diagnostic test.

The understanding of rates of tracer migration and early ventricular entry are, likewise, areas for study. For reasons already mentioned, it would seem appropriate for nuclear medicine to embark upon a multi-institutional study concerning the usefulness of radionuclide cisternography in the evaluation of this disease spectrum. Until such time as a more definitive study is undertaken, there will continue to be a serious question concerning the value of cisternography in helping to select patients most likely to benefit from various neurosurgical interventions. It is time to resolve this question and we would like to know who would be interested in participating in such a project.

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RADIONUCLIDIC CONTAMINATION OF ELUATES FROM FISSION-PRODUCT MOLYBDENUM-TECHNETIUM GENERATORS

The USAEC and the agreement states have promulgated regulations that limit the presence of specific radionuclidic contaminants in eluates from ^{99}Mo generators whether they are produced from irradiated molybdenum or separated from fission products. Additionally, they have imposed a gross limit on other gamma-emitting impurities in the eluates. Thus, it is required that the licensee, or user, perform at least a "pseudoradionuclidic" impurity check before the administration of any eluate to patients so that these limits will not be exceeded.

The current state of the art in the manufacture of molybdenum-technetium generators is such that a serious breakthrough of the parent ^{99}Mo in the eluate is not likely. Indeed, only two such instances have been observed in our laboratories over the past 3½ years. We still consider it necessary, however, to perform a radionuclidic purity check each time a generator is eluted for at least two reasons:

1. To guard against massive breakthrough of the parent which may be caused by any break in the integrity of the alumina column or filter frit;
2. To identify any other radioactive impurities that may be present in the eluate.

We note with interest that others have confirmed the presence of ^{132}I in fission-product generator eluates (*1*). We note also with interest the concern of Bardfeld and Rudin (*2*) in radionuclidic contamination of instant ^{99m}Tc. We would encourage them to augment their investigation with firm radionuclidic identification.

In eluates from irradiated molybdenum generators, we have found ^{92}Nb to be more common than ^{99}Mo. In eluates from fission-product molybdenum generators we have found only trace amounts of ^{99}Mo but we have found some measurable amount of ^{132}I in every eluate. On occasion we have detected in

fission-product eluates ^{132}I sufficient to appear to be "excessive ^{99}Mo breakthrough".

Figure 1 illustrates these points. These spectra were obtained with a 3 × 3 in.-thallium-activated sodium iodide crystal coupled to a multichannel analyzer. They are characteristic of eluates from fission-produced ^{99}Mo generators we have observed over the past year; only the relative amounts of ^{99}Mo and ^{132}I vary for both are nearly always present. The upper two spectra are almost identical in appearance to the gross spectra from which they were taken. The gross spectra from this eluate consisted of the iodine spectra plus the ^{99}Mo residuum shown below. The iodine spectra were stripped of the molybdenum to facilitate a half-life determination to complete the absolute identification of the radionuclide tentatively made from the gamma ray energies. The half-life of the material identified as ^{132}I is 2.34 hr from these data.

The multiplicity of photon energies present in the decay scheme of ^{132}I causes this frequent contaminant of ^{99m}Tc eluates from fission-product generators to masquerade as significant breakthrough of molybdenum when observed either with a single-channel analyzer or a dose calibrator. For example, 1 μCi of ^{132}I looks like 10 or more μCi of ^{99}Mo when counted in a 600–1,000 keV window of a single-channel analyzer when the "moly equivalent" of a ^{137}Cs standard is used. It also causes a response equivalent to approximately 13 μCi of ^{99}Mo in a dose calibrator. Thus, small levels of ^{132}I in an eluate may give the appearance of more than the allowable 1 μCi of ^{99}Mo/mCi of ^{99m}Tc when observed either with a single-channel analyzer or a dose calibrator.

The following recommendations are offered to resolve the occasionally bothersome problem of apparent significant molybdenum breakthrough of one of these generators. If a single-channel analyzer is being used with a 600–1,000 keV window:

1. The presence of only ^{99}Mo will be indicated if near background counts are observed when the lower discriminator is raised to 860 keV.
2. The presence of only ^{132}I will be indicated if 5–8% of the counts originally observed in the 600–1,000 keV window are seen when the lower discriminator is raised to 860 keV.

If the radionuclidic purity determination is made with a dose calibrator of the ion-chamber type or by single-channel analyzer with a 600–1,000 keV window:

1. The presence of only ^{132}I will be shown if the original counting rate or apparent ^{99}Mo activity drops to approximately 75% of that original value after about 1 hr.

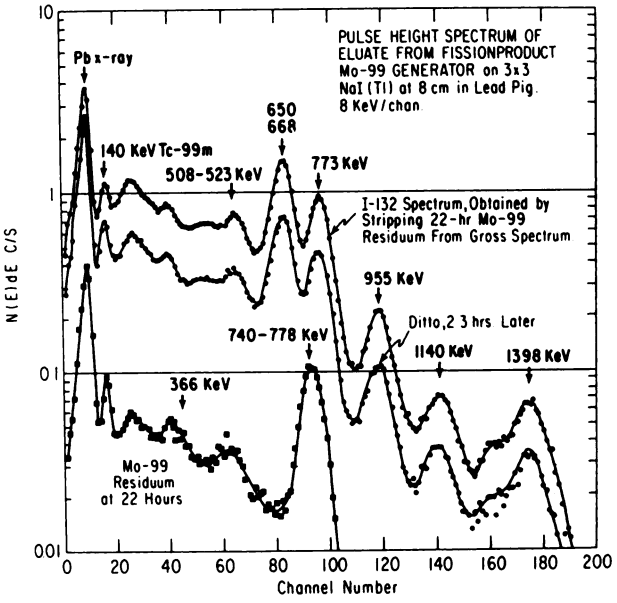

FIG. 1. Pulse-height spectra from eluate from fission-product molybdenum-technetium generator obtained with 3-in. × 3-in. sodium iodide crystal. Eluate was contained in vial in lead pig with 1.1-cm-thick bottom placed 8 cm from crystal. Gross spectra, of which these spectra are components, consisted of ^{99}Mo spectrum plus appropriate ^{132}I spectrum. Only few of 26 gamma energies reported in ^{132}I decay below 1.6 MeV are noted. (At 8 keV/channel, full scale on pulse-height axis is 1.6 MeV.)

2. If only ^{132}I is present, the apparent activity will drop to about 84% of the original value after the elapse of only ½ hr.

In either method, the presence of both ^{99}Mo and ^{132}I makes quantitation much more difficult. The use of a multichannel analyzer facilitates this determination greatly.

In summary, we find that in actual practice radionuclidic contaminants in concentrations greater than those permitted by regulatory agencies are not highly probable in currently available molybdenum-technetium generators but they can occur. Therefore the need persists to check each elution from these generators and, further, to identify presumptively and quantitate any observed contaminant present in significant amount before adjudging any eluate to be too highly contaminated to use in clinical studies.

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